and proactive management of operations, in line with the *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Donnelly et al., 2011), will allow effective modifications to mining activities so that these potential dust impacts reduced or avoided. As such, dust generated by the Project is not assessed as likely to have a significant visual impact. Further details regarding the potential impacts of dust as a result of the Project and measures to mitigate these impacts are provided in **Section 4.2**.

4.8 ECOLOGY

4.8.1 Impacts to Threatened Species

This section responds to submissions raised by stakeholders in relation to the potential impacts of the Project on threatened flora and fauna species, including Diuris tricolor (Pine Donkey Orchid), Cymbidium canaliculatum (Tiger Orchid), Acacia pendula (Weeping Myall) and Swift Parrot (Lathamus discolor). It also provides a discussion on the adequacy of proposed mitigation measures tailored for each species.

Submission: RA6, RA7, SIG1 and SIG5

Diuris tricolor (Pine Donkey Orchid)

A known population of *Diuris tricolor* occurs in the existing Drayton Wildlife Refuge. Since a wildlife refuge may be revoked at any time, OEH noted that the status of this refuge does not ensure the conservation of the *Diuris tricolor* population that occurs there.

OEH has submitted that Anglo American may be able to offset the Project impacts to *Diuris tricolor* by applying an additional conservation mechanism to the known population in the Drayton Wildlife Refuge to protect the population in perpetuity. OEH recommends the placement of a Conservation Agreement under Part 4, Division 12 of the *National Parks and Wildlife Act 1974* or a Biobanking Agreement under Part 7A, Division 2 of the NSW *Threatened Species Conservation Act 1995* (TSC Act).

Anglo American is willing to secure the area of the Drayton Wildlife Refuge supporting the *Diuris tricolor* population under an additional conservation mechanism. It is recognised that in doing so, the local occurrence of the species will be protected in perpetuity. Anglo American plans to consult with OEH and other relevant agencies to progress the matter.

The possibility of translocating *Diuris tricolor* from the Drayton South disturbance footprint to conservation areas has been considered but will not be undertaken by Anglo American given that this measure for ground orchids is difficult and often unsuccessful (Vallee *et al.*, 2004; Sommerville et al., 2013).

Cymbidium canaliculatum (Tiger Orchid)

OEH has recommended that the translocation of *Cymbidium canaliculatum* in the Drayton South disturbance footprint be undertaken to address the impacts of the Project on the species. Epiphytic orchids typically have a high chance of successful translocation (Vallee *et al.*, 2004; Tremblay, 2008). Mangoola Coal Mine, in conjunction with experts, is in the process of developing best practice procedures for the salvage and translocation of a large

number of *Cymbidium canaliculatum* from their approved disturbance area to suitable host trees in nominated biodiversity offset areas. Monitoring of already translocated individuals indicate good health and success rates (Umwelt, 2012).

Considering the above, Anglo American is committed to the translocation of the *Cymbidium canaliculatum* individual from the Drayton South disturbance footprint to a suitable conservation area. Translocation will be to an area of suitable remnant woody vegetation in a recipient site as close as possible to the location where the plant naturally occurs. Options include the proximate Drayton Wildlife Refuge or onsite biodiversity offsets within the Drayton South area, subject to the availability of a suitable mature host tree. This will ensure the individual and local occurrence of the species remains within the Hunter catchment management area and will be subject to the protection mechanisms to be applied to the Project's onsite biodiversity offsets.

Anglo American may consult with Mangoola Coal and appropriate experts regarding best practice for the translocation of *Cymbidium canaliculatum.* Translocation will be conducted according to *Guidelines for the Translocation of Threatened Plants in Australia* (Vallee *et al.*, 2004) to ensure the greatest chance of success.

Acacia pendula (Weeping Myall)

Two small patches of *Acacia pendula* regrowth have been recorded within the Drayton South area one of which is within the Drayton South disturbance footprint with the other located in the vicinity of Saddlers Creek, which will be protected in situ. The patches of regrowth do not contain mature *Acacia pendula* trees and do not conform to Weeping Myall Woodlands.

OEH has commented that *Acacia pendula* is not adequately offset by the Project's biodiversity offset package. Anglo American has considered options to translocate individuals within the Drayton South disturbance footprint; however, translocation is not considered to be a viable option for this species as it is known to be very difficult and is unlikely to succeed.

It is proposed that propagation trials be undertaken for the patch of *Acacia pendula* regrowth found outside of the Drayton South disturbance footprint, once the plants are mature enough to produce seed. As with many *Acacia* species, propagation from seed is a reliable method (ANPS, 2006 and 2010; Simmons, 2012) and such trials would increase our knowledge of the biology of the species and retain the local genetic diversity of this disjunct population.

Swift Parrot (Lathamus discolor)

MSC has commented that the Drayton South area is a forage location for the Swift Parrot (*Lathamus discolor*). Individuals of the species were recorded utilising the area during 2011 surveys for the Project.

Lathamus discolor is a generalist nectivore that can forage on the blossoms of many different tree species. It is likely to forage in the locality of the Drayton South area from time to time depending on their migration pathway and the availability of blossom resources. Although the species is not likely to be present in the locality every season, it was acknowledged in the ecology impact assessment (see Appendix J of the EA) that flowering

resources within the Drayton South area and wider locality may be locally significant for the species as the vegetation represents islands of foraging habitat within a predominantly cleared agricultural landscape.

Considering the above, the biodiversity offset package aims to enhance the quantity and quality of foraging habitat for the *Lathamus discolor* in both the onsite and offsite biodiversity offset areas. Due to the staged nature of mining and the fact that rehabilitation and restoration works will be carried out concurrently, the biodiversity offset package is capable of maintaining foraging habitat for the species over the life of the Project. Furthermore, provision has been made for regular monitoring to assess the improvement of potential foraging habitat as rehabilitation and restoration works progress.

4.8.2 Impacts to Regional Woodland and Connectivity

This section responds to submissions raised by stakeholders in relation to the potential impacts of the Project on woodland connectivity, remnant woodland and remnant valley floor habitat.

Submission: RA6, RA7, RA17, SIG3, SIG5, SIG8, SIG11, SIG12, P13, P14, P18, P22, P25, P28, P30 and P41

As discussed in the ecology impact assessment (see Appendix J of the EA), vegetation in the Drayton South disturbance footprint is already somewhat fragmented and isolated from other areas of woodland vegetation in the locality due to significant clearing of Hunter Valley floor communities for agriculture and mining. However, it is likely to still function as a *"stepping stone"*, allowing highly mobile species to migrate through the fragmented landscape to large conservation areas, such as Wollemi National Park to the south of the Project and the Mt Arthur conservation area in the north. Without the proposed mitigation and ameliorative measures, the Project will increase the isolation of existing vegetation patches and reduce their function as a stepping stone corridor.

Anglo American is committed to various measures, as outlined in the biodiversity offset package (see Section 8.8 of the EA), to maximise the role of vegetation in the Drayton South area in maintaining or enhancing regional woodland connectivity. For example, the sparse, narrow, linear remnants lining Saddlers Creek and its tributaries are currently not well connected to vegetation outside of the Drayton South area. Anglo American is proposing significant restoration works along the channels and floodplain as part of the onsite biodiversity offsets to mitigate the impacts on connectivity and improve its habitat value and functionality as a fauna movement corridor (see **Section 4.8.7**).

Regional woodland connectivity will be improved through valuable compensatory measures that will result in a *"like for like"* or better ecological outcome consistent with state offsetting policies (OEH, 2011b) and the MSC (2011) *Land Use Development Strategy*. Among these measures is the improvement of an existing 85 hectares (ha) of Central Hunter Box-Ironbark Woodland (Endangered Ecological Community (EEC)) and Cooba Scrub along the primary ridgeline in the Drayton South area and the restoration of the Saddlers Creek corridor, which will focus on the revegetation of 62 ha of Hunter Floodplain Red Gum Forest (EEC). One of the objectives of the restoration work is to enhance regional woodland connectivity by

building on and complementing Mt Arthur Coal's existing 295 ha conservation area along Saddlers Creek and Hunter-Central Rivers Catchment Management Authority (CMA) works in other tributaries of Saddlers Creek.

The rehabilitation of mined lands will result in the re-establishment of approximately 1,403 ha of woodland communities within the Drayton South disturbance footprint, comprised of approximately 777 ha of Central Hunter Box-Ironbark Woodland (EEC) and 626 ha of Narrabeen Footslopes Slaty Gum Woodland (Vulnerable Ecological Community (VEC)). In the medium to long term and in conjunction with the retention of patches of vegetation elsewhere in the Drayton South area, this will create a significant link in regional woodland connectivity and increase the area of forest and woodland communities that currently occur as scattered patches across the Drayton South disturbance footprint. As well as forming part of a north-south corridor, this vegetation will facilitate east-west movement between woodland patches to the west of Edderton Road and woodland around Plashett Dam.

4.8.3 Impacts to Aquatic Species

This section responds to submissions raised by stakeholders in relation to the potential impacts of the Project on downstream water quality and associated impacts to aquatic flora and fauna species.

Submission: RA6, RA7 and RA16

Proposed impacts of the Project should be evaluated in comparison to the current state of the environment within the Drayton South disturbance footprint. Currently, the land is grazed and there are no specific controls in place to protect water quality within Saddlers Creek, which flows into the Hunter River. The tributary stream has low water quality and relatively low value as an aquatic habitat due to many years of ongoing agricultural usage and the direct impacts of cattle in the stream bed. The riparian vegetation (stream bank vegetation) has largely been removed, though scattered trees and some native understorey remain.

Anglo American will remove livestock from along the Saddlers Creek corridor and restore the native vegetation around it. Creek bank restoration and livestock removal will both help to significantly improve water quality in Saddlers Creek and as such the water entering the Hunter River.

The Project will require two water pipelines and associated pumping infrastructure to be installed from Drayton South area to the Hunter River for the purpose of water extraction and discharge. Provided appropriate erosion, channel stability, run-off and pollution controls are implemented as per engineering and construction standards and best practice guidelines are followed, the Project is considered unlikely to have any significant or long-term adverse impacts on downstream water quality of Saddlers Creek or the Hunter River.

During wetter periods, it may be necessary for water to be discharged into the Hunter River. This will be undertaken in strict accordance with the levels prescribed by the Hunter River Salinity Trading Scheme (HRSTS). The release of saline water at times of high river flow is not expected to have a significant detrimental impact on the downstream water quality of the Hunter River.

In their submission, Fisheries NSW advised that there were no aquatic habitat issues resulting from the Project.

4.8.4 Cumulative Impacts on Flora and Fauna

This section responds to submissions raised by stakeholders in relation to the potential cumulative impacts on local flora and fauna.

Submission: RA6, RA7, RA12, SIG3, SIG5 and SIG8

The cumulative impacts of vegetation clearing and habitat loss have been assessed in the ecology impact assessment (see Appendix J of the EA) and will be addressed by the provision of compensatory onsite and offsite biodiversity offsets as described in the biodiversity offset package.

Anglo American is committed to minimising its contribution to cumulative ecological impacts in the region through the restoration of creek line vegetation and linkages to existing conservation areas, the retention of ridgeline communities and the staged rehabilitation of forest and woodland across the Drayton South disturbance footprint, which will progressively add to the areas of existing habitat in the Hunter Valley. The medium to long term result will be an increased area of forest and woodland under conservation tenure and ongoing management.

Cumulative habitat loss in the Hunter Valley has been historically caused by a range of factors. Initially the largest and most widespread impacts were from clearing for agriculture and today a high proportion of the locality around the Drayton South disturbance footprint has been heavily modified for agriculture. It is also notable that little in the way of conservation or reafforestation is being done on farms within the upper Hunter Valley. Past mining activities have also had a negative impact upon vegetation; until relatively recently mines were not required to rehabilitated mined areas back to forest or woodland.

By contrast, recent approvals of mines in the Hunter Valley require mining companies to rehabilitate land back to forest and woodland. Such approvals have been granted for Mt Arthur Coal Mine, Drayton Mine, the Mount Pleasant Project and Ravensworth Operations. All such mines have requirements to both create in situ offsets and to link such offsets with forest and woodland rehabilitation.

In the locality, current mining projects have been instrumental in establishing a suite of conservation areas in previously farmed land with proponents required to maintain or improve native vegetation within such reserves. Examples include but are not limited to the Mt Arthur conservation area, the Saddlers Creek conservation area (within Mt Arthur Coal Mine's land) and the Drayton Wildlife Refuge.

Due to modern rehabilitation, requirements to designate conservation areas and biodiversity offsets, the mining industry will significantly increase the area of forest and woodland vegetation within the locality for the long term.

The Project will build upon proximate conservation areas managed by neighbouring mines including Mount Arthur Coal Mine and Drayton Mine. These measures will collectively

increase the total areas of native vegetation that exist in the locality in the future and add to connectivity of habitats.

4.8.5 Adequacy of Biodiversity Offset Package

State Interim Offsetting Policy Assessment

This section responds to submissions raised by stakeholders in relation to assessment of the Project's biodiversity offset package in accordance with the State offsetting policy.

Submission: RA7, SIG1, SIG11 and SIG12

OEH is using the policy framework *NSW OEH Interim Policy on Assessing and Offsetting Biodiversity Impacts of Part 3A, State Significant Development (SSD) and State Significant Infrastructure (SSI) Projects* (OEH, 2011a). This policy framework has a three-tiered approach to the assessment of State significant developments and uses the BioBanking assessment methodology to quantify the development impacts and to assess the adequacy of the proposed biodiversity offset package.

OEH has submitted that the Project could meet the Tier 3 approach of the interim policy, which involves a negotiated *"Mitigated Net Loss"* outcome. To achieve a Tier 3 standard, the BioBanking assessment methodology is used to calculate the offsetting requirements of the Project and then variation criteria are applied to the offsetting requirements. The variation criteria make provision for:

- Converting ecosystem credits for one vegetation type to another vegetation type within the same bioregion when no matching ecosystem credits are available;
- Converting one type of species credit to another type with the same or higher endangered conservation status when the species credit is not available; and
- Converting ecosystem credits to hectares and then hectares to an estimate of land value, to allow approvals to specify either hectares or financial contribution required for offsetting.

Under the Tier 3 approach, the minimum offset to clearing ratio must be 2:1 vegetated area to cleared hectares.

As acknowledged by OEH, Anglo American has not chosen to use this policy in the development of the biodiversity offset package. Although the biodiversity offset package meets the 2:1 ratio requirement, it also includes a substantial offsite component that is predominately located immediately outside the Sydney Basin Bioregion (a very small portion of the Property falls within the Sydney Basin Bioregion). As discussed in further detail in **Section 4.8.6**, opportunities to offset in the Hunter Valley are limited given the lack of available suitable offset land. This makes it difficult to offset within the same bioregion as required by the Tier 3 variation criteria.

State BioBanking Assessment

This section responds to submissions raised by stakeholders in regard to the assessment of the Project's biodiversity offset package using the NSW BioBanking Credit Calculator.

Submission: RA7, SIG1, SIG11 and SIG12

As acknowledged by OEH, BioBanking was not used to formulate the biodiversity offset package for the Project and so the BioBanking credit calculator was not used to assess the Project. Nevertheless, OEH has used BioBanking to assess the adequacy of the biodiversity offset package in a standard manner. OEH's assessment indicated that the biodiversity offset package was able to address approximately 40% of the required number of ecosystem credits and approximately 12% of the required species credits for the Project (see **Table 17**).

Table 17
State BioBanking Assessment Results Summary

Credit	Development Site	Onsite Biodiversity Offset	Offsite Biodiversity Offset	Total Biodiversity Offsets	% of Required Credits Gained
Ecosystem Credits	32,150	804	11,434	12,238	40%
Species Credits	515	0	60	60	12%

OEH was limited to using high level data provided in the EA and benchmark where required information was not available. Benchmark data is data collected from known high quality, relatively undisturbed sites. By contrast, much of the Drayton South disturbance footprint and offset areas have vegetation condition that is well below benchmark values. For this reason, an assessment of the biodiversity offset package using the BioBanking Credit Calculator was prepared by Cumberland Ecology using actual field data collected from the Drayton South area and the offset areas.

The following biodiversity offset package components were assessed using the credit calculator:

- Offsite biodiversity offset property; and
- Onsite biodiversity offsets, comprising the ridgeline conservation, restoration of Saddlers Creek and rehabilitation of the Drayton South disturbance footprint.

Offsetting using mine rehabilitation is recognised in the BioBanking assessment methodology (see Section 3.6.2 of the *BioBanking Assessment Methodology and Credit Calculator* (DECC, 2009)). This has been adopted in this BioBanking assessment, however, only 50% of the total area of rehabilitation has been counted towards the biodiversity offset package.

The results of the BioBanking assessment completed by Cumberland Ecology are summarised in **Table 18**. The full BioBanking assessment report, including the credit profile

reports and an explanation of the assumptions made, are provided in **Appendix D** of this RTS.

Table 18
Project BioBanking Assessment Results Summary

Credits	Development Site	Onsite Offset	Offsite Offset	Rehabilitation Offset (50%)	Total Offset	% of Required Credits Gained
Ecosystem Credits	52,165	1,823	22,553	9,203	33,579	64%
Species Credits	82,618	4,024	32,014	-	36,038	44%

The BioBanking assessment demonstrates that the biodiversity offset package will provide 33,579 ecosystem credits (approximately 64% of the development site credits and thus ecosystem offsetting requirements of the Project) and 36,038 species credits (approximately 44% of the species credits required). Note that this calculation does not factor in the additional protection now proposed for the Drayton Wildlife Refuge in order to provide permanent protection for the threatened orchid populations (*Diuris tricolor*).

Equivalent BioBanking Vegetation Types Used

The vegetation types used in the BioBanking assessment is provided in **Table 19**. Most of the vegetation communities in the offsite biodiversity offset property conform to the definition of White Box - Yellow Box - Blakely's Red Gum woodland (Box Gum woodland) (EEC) as per Schedule 1 of the TSC Act due to the presence of characteristic canopy and groundcover species, and the community is known to occur across a number of bioregions.

Table 19
Vegetation Communities and Equivalent BioBanking Vegetation Types

Catchment Management Area	Vegetation Community[#]	Equivalent BioBanking Vegetation Type	Equivalent Threatened Ecological Community	Common Characteristics*
Hunter	Central Hunter Box-Ironbark Woodland	Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin	Conforms to the TSC listing of Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions (EEC)	Grassy Woodlands; Undulating slopes and rises of the Hunter Valley Floor; Dominant canopy spp - Grey Box (*Eucalyptus moluccana*), Narrow-leaved Ironbark (*Eucalyptus crebra*)
Hunter	Cooba Scrub	Grey Box - Narrow-leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin	Not listed	Secondary community dominated by Cooba (*Acacia salicina*) regeneration, derived from Grey Box - Narrow-leaved Ironbark shrubby woodland woodlands which has Cooba in the midstorey
Hunter	Hunter Valley River Oak Forest	River Oak riparian woodland of the North Coast and northern Sydney Basin	Not listed	Forested wetlands; Along permanent freshwater streams; Dominant canopy spp - River Oak (*Casuarina cunninghamiana*)
Hunter	River Oak riparian woodland, eastern NSW	River Oak riparian woodland of the North Coast and northern Sydney Basin	Conforms to the TSC and EPBC listings of Box Gum woodland (EEC and CEEC)	Forested wetlands; Along permanent freshwater streams; Dominant canopy spp - River Oak (*Casuarina cunninghamiana*), co-dominated by Yellow Box *(Eucalyptus melliodora*) and Blakely's Red Gum-Forest Red Gum intergrade *(Eucalyptus blakelyi x Eucalyptus teretecornis*)
Hunter	Hunter Floodplain Red Gum Woodland Complex	River Red Gum - Yellow Box riparian woodland in the Hunter Valley (Benson 42)	Conforms to the EPBC listing of White Box- Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum woodland) (CEEC). Conforms to TSC listing of Hunter Floodplain Red Gum Woodland	Grassy Woodlands; Flood plains, alluvial flats and terraces along major rivers and creeklines including the Hunter River and its tributaries; Dominant canopy spp - River Red Gum (*Eucalyptus camaldulensis*), Yellow Box (*Eucalyptus melliodora*)

Catchment Management Area	Vegetation Community[#]	Equivalent BioBanking Vegetation Type	Equivalent Threatened Ecological Community	Common Characteristics*
			in the NSW North Coast and Sydney Basin Bioregions (EEC)	
Hunter	Silvertop Stringybark grassy open forests, eastern Nandewar and New England Tablelands	Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest on hills of the upper Hunter Valley, southern North Coast	Conforms to the TSC and EPBC listings of Box Gum woodland (EEC and CEEC)	Dry sclerophyll forest; Hilly areas at intermediate to high altitudes on a variety of geologies (mainly granite or basalt; Dominant canopy spp - Rough-barked Apple (*Angophora floribunda*), Silvertop Stringybark (*Eucalyptus laevopinea*)
Hunter	Silvertop Stringybark - gum open forest on basalts of the Liverpool Range, Brigalow Belt South and Nandewar	Silvertop Stringybark grass/herb forest on hills of the upper Hunter Valley, Brigalow Belt South	Not listed	Grassy Woodlands; Hilly to undulating terrain mainly on the slopes of the Liverpool Range; Dominant canopy spp - Silvertop Stringybark (*Eucalyptus laevopinea*)
Hunter	Narrabeen Footslopes Slaty Box Woodland	Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin	Conforms to the TSC listing of Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion (VEC)	Dry sclerophyll forest (shrubby subformation); Gullies and footslopes on colluvial soils derived from Narrabeen Sandstone; Dominant canopy spp - Slaty Box (*Eucalyptus dawsonii*)
Hunter	Upper Hunter White Box-Ironbark Grassy Woodland	White Box - Yellow Box grassy woodland on basalt slopes in the upper Hunter Valley, Brigalow Belt South	Conforms to the TSC and EPBC listings of Box Gum woodland (EEC and CEEC) This community is dominated by White Box - Grey Box intergrades	Grassy Woodlands; Foothills of the Liverpool Range and large basalt residuals in the upper Hunter Valley; Dominant canopy species - White Box (*Eucalyptus albens*), White Box (*Eucalyptus albens*) x Grey Box (*Eucalyptus moluccana*) intergrades, Yellow Box (*Eucalyptus melliodora*), Kurrajong (*Brachychiton populneus subsp. populneus*)
Hunter	Central Hunter Bulloak Forest Regeneration	Bull Oak Forests of the Central Hunter Valley	Not listed	Undulating slopes and rises of the Hunter Valley Floor; Dominant canopy spp - Bulloak (*Allocasuarina luehmannia*).
Namoi	River Oak riparian woodland, eastern NSW	River Oak riparian woodland of the Brigalow Belt South and	Conforms to the TSC and EPBC listings of Box Gum	Forested wetlands; Sandy loam soils on Quaternary riverine deposits; Dominant canopy spp - River Oak

Catchment Management Area	Vegetation Community[#]	Equivalent BioBanking Vegetation Type	Equivalent Threatened Ecological Community	Common Characteristics*
		Nandewar Bioregions (Benson 84)	woodland (EEC and CEEC)	(*Casuarina cunninghamiana*), Rough-barked Apple (*Angophora floribunda*), Yellow Box (*Eucalyptus melliodora*)
Namoi	Silvertop Stringybark grassy open forests, eastern Nandewar and New England Tablelands	Rough-barked Apple - Silvertop Stringybark - Red Stringybark grassy open forest of south western New England Tablelands	Not listed	Grassy Woodlands; Hilly areas at intermediate to high altitudes on a variety of geologies (mainly granite or basalt); Dominant canopy spp - Rough-barked Apple (*Angophora floribunda*), Silvertop Stringybark (*Eucalyptus laevopinea*)
Namoi	Rough-barked Apple - Blakely's Red Gum riparian grassy woodlands, Brigalow Belt South and Nandewar	Rough-barked Apple riparian forb/grass open forest of the Nandewar Bioregion	Conforms to the TSC and EPBC listings of Box Gum woodland (EEC and CEEC)	Grassy Woodlands; Widespread along stream banks from low to high altitudes on various geologies; Dominant canopy spp - Rough-barked Apple (*Angophora floribunda*), Blakely's Red Gum (*Eucalyptus blakelyi*)
Namoi	Silvertop Stringybark - gum open forest on basalts of the Liverpool Range, Brigalow Belt South and Nandewar	Silvertop Stringybark grass/herb forest of the Brigalow Belt South and Nandewar Bioregions and western New England Tablelands	Not listed	Grassy Woodlands; Hilly to undulating terrain mainly on the western fall of the tablelands and the Liverpool Range; Dominant canopy spp - Silvertop Stringybark (*Eucalyptus laevopinea*)
Namoi	White Box - stringybark shrubby woodlands, Brigalow Belt South and Nandewar	White Box - Silvertop Stringybark - White Cypress Pine shrubby open forest of the southern Nandewar Bioregion	Not listed	Dry Sclerophyll Forests (Shrub/grass subformation); Hilly areas at intermediate altitudes on various geologies; Dominant canopy spp - White Box (*Eucalyptus albens*), Silvertop Stringybark (*Eucalyptus laevopinea*), Rough-barked Apple (*Angophora floribunda*)
Namoi	White Box grassy woodland, Brigalow Belt South and Nandewar	White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	Conforms to the TSC and EPBC listings of Box Gum woodland (EEC and CEEC)	Grassy Woodlands; Creek flats, lower slopes and alluvial plains mainly on sedimentary substrates; Dominant canopy spp - White Box (*Eucalyptus*

Catchment Management Area	Vegetation Community[#]	Equivalent BioBanking Vegetation Type	Equivalent Threatened Ecological Community	Common Characteristics*
				albens) x Grey Box (*Eucalyptus moluccana*) intergrades
Namoi	Box - gum grassy woodlands, Brigalow Belt South and Nandewar	Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion	Conforms to the TSC and EPBC listings of Box Gum woodland (EEC and CEEC)	Grassy Woodlands; Fertile loamy-clay soils on slopes, drainage lines and alluvial plains; Dominant canopy spp - Yellow Box (*Eucalyptus melliodora*), Blakely's Red Gum (*Eucalyptus blakelyi*)

 # Only forest and woodland communities have been compared.

** Vegetation formation; Landscape position/geology; Dominant spp.*

Derived native grassland communities have not been included in this table.

CEEC – Critically endangered ecological community

EPBC – Environment Protection and Biodiversity Conservation Act 1999

Commonwealth Biodiversity Offset Assessment

This section responds to submissions raised by stakeholders in regard to the assessment of the Project's biodiversity offset package using the Commonwealth offsets policy and assessment guide.

Submission: RA14, SIG1, SIG11 and SIG12

SEWPaC released the *EPBC Act Environmental Offsets Policy* in October 2012 . This new environmental offsets policy document is accompanied by an Excel calculator tool that is referred to as the *Offsets Assessment Guide*, which is used to assess the adequacy of biodiversity offsetting measures in addressing development impacts on Matters of National Environmental Significance.

SEWPaC has requested Anglo American use the *Offsets Assessment Guide* to assess the adequacy of the biodiversity offset package for Matters of National Environmental Significance. For this reason, Cumberland Ecology has completed an assessment of the biodiversity offset package using the *Offsets Assessment Guide*. The results of this assessment are summarised in **Table 20**. The full assessment report, including an explanation of the assumptions made, is provided in **Appendix E** of this RTS.

Table 20
Summary of Results of Commonwealth Biodiversity Offset Assessment

Matters of National Environmental Significance	Actual Impact (ha)	Direct Offset Required (ha)	Actual Offset (ha)	Adjusted Offset (ha)	% of Impact Offset	90% Minimum Met
Box Gum Woodland 'Condition B'	107	53.5	898	55.31	103.38	Yes
Box Gum Woodland 'Condition C'	74	44.4	856	83.98	189.14	Yes
Swift Parrot	389	233.4	2253	367.33	157.38	Yes
Regent Honeyeater	389	233.4	2253	367.33	157.38	Yes
Greater Long-eared Bat	389	233.4	2253	407.49	174.59	Yes
Blue-Lobed Grass	107	53.5	898	55.31	103.38	Yes

The results shown in **Table 20** indicate that the biodiversity offset package will address over 90% of the direct offsetting requirements for impacts to all relevant Matters of National Environmental Significance.

The ecology impact assessment has also been issued to the IESC for evaluation. The committee advised that the ecological impact assessment provided for the Project is considered to be thorough and acknowledges the biodiversity offset package consists of onsite and offsite components.

Consistency with Council Land Use Development Strategy

This section responds to the submission raised by MSC in relation to the consistency of the Project with council's Land Use Development Strategy.

Submission: RA6

MSC has released the *Land Use Development Strategy* (2011), which focuses on strategic objectives to ensure coal mining does not adversely affect the natural environment. This document was considered when preparing the biodiversity offset package.

As discussed in preceding sections, the Project includes substantial mitigation measures, such as the rehabilitation of the mined land back to woodland. As rehabilitation proceeds, it will link to the onsite biodiversity offset areas.

In the medium to long term, regeneration of onsite biodiversity offsets and rehabilitation of mined land will combine to form a larger area of forest and woodland than the areas that currently exist. Woodland habitats will link to sizeable areas of habitat at Mt Arthur, along Saddlers Creek and along the Hunter River.

As such, the Project would fulfil many of the key vegetation and revegetation objectives listed in the *Land Use Development Strategy* (MSC, 2011). Specifically, it complies through the rehabilitation of the Drayton South disturbance footprint, instigation of rehabilitation trials at Drayton Mine to investigate vegetation community establishment, maintaining and improving connectivity corridors (such as along Saddlers Creek and with existing proximate conservation areas) and the preservation of remnant vegetation on the primary ridgeline.

4.8.6 Provision of "Like for Like" Offsets

This section responds to submissions raised by stakeholders regarding the adequacy of the biodiversity offset package to meet "like for like" requirements with a particular focus on the offsite biodiversity offset property given it is situated in another bioregion.

Submission: RA6, RA7, RA17, SIG1, SIG5, SIG8, SIG11, SIG12, P14, P18, P22 and P31

Onsite Biodiversity Offsets within the Same Bioregion

Anglo American has undertaken detailed surveys to establish a biodiversity offset package that is appropriate to compensate for the ecological impacts generated by the Project. While this includes a substantial offsite biodiversity offset, it also includes onsite or in situ offset areas within the Drayton South area (see **Section 4.8.7**). The rehabilitation and restoration works to be undertaken in the Drayton Complex will contribute significantly to the maintenance and improvement of habitat in the locality of the Project for the long-term.

The onsite biodiversity offset component will provide for:

- Rehabilitation of the Drayton South disturbance footprint with approximately 777 ha of Central Hunter Box-Ironbark Woodland (EEC) and 626 ha of Narrabeen Footslopes Slaty Gum Woodland (VEC);
- Conservation of 50 ha of Central Hunter Box-Ironbark Woodland (EEC) along the primary ridgeline;

- Conservation and restoration of 82 ha of Hunter Floodplain Red Gum Woodland (EEC) and 4 ha of Central Hunter Box-Ironbark Woodland (EEC) along Saddlers Creek;
- Conservation of a small patch of Hunter Floodplain Red Gum Woodland (EEC) that exists within the Drayton Wildlife Refuge. This patch is not currently protected and Anglo American is reviewing options to permanently secure some or all of the Drayton Wildlife Refuge and thus the EEC woodland; and
- Habitat for threatened species that are known to occur in the Drayton South area, including the Swift Parrot.

Offsite Biodiversity Offset Outside of the Sydney Basin Bioregion

As discussed in the ecological impact assessment (see Appendix J of the EA), land of suitable size that contains areas of *"like for like"*, high quality ecological communities analogous to that to be impacted by the Project is not available on the Hunter Valley floor, where the Project is located. Such communities have been extensively cleared and acquiring such land for conservation purposes is near impossible. This problem is acknowledged by OEH and DP&I, who are developing strategic and regionally-focussed offset policies to allow major projects to meet their offsetting requirements.

OEH is currently working with 10 mining companies that own mining leases and land in the upper Hunter Valley to develop a strategic offsetting scheme for mines that will use land outside the valley and outside the Sydney Basin Bioregion. Land for offsetting will include broad areas in the Namoi catchment management area where forest and woodland communities and threatened species assemblages are similar but not identical to those of the central and upper Hunter Valley. The method for assessment of this is referred to as the Biodiversity Certification Assessment Methodology.

As demonstrated with the approval of other NSW mine projects (Mount Pleasant Project and Maules Creek Coal Project), the inclusion of strategically located offsite biodiversity offsets that are not *"like-for-like"* is permitted in NSW. This is considered appropriate in areas such as the central and upper Hunter Valley where substantial areas of fertile valley floor vegetation have historically been cleared and there is limited scope to acquire such land for offsetting purposes.

Due to such difficulties in finding suitable proximate offsets, the offsite biodiversity offset property evolved to become a strategic offset that took regional value and movement corridors into greater consideration, taking into account documents such as the *Upper Hunter Strategic Biodiversity Assessment Interim Policy* (DP&I, 2012c). Large-scale conservation corridors are also advocated by the NSW National Parks Association to mitigate the future impacts of climate change on native species. For example, the *Eastern Highlands Conservation Blueprint* (Macris, 2006) proposes a landscape-scale corridor across the eastern seaboard, built upon on a network of protected areas, private land and linkages along river systems.

The development of the biodiversity offset package was thus influenced by the availability of land for purchase and special emphasis was placed on finding large properties that are

located outside of existing mining authorities with the potential to link existing conservation areas. Further to these key considerations, the offsite biodiversity offset property was selected based on the provision of extensive areas of moderate-high quality remnant and regenerating Box Gum woodland similar to that affected by the Project, provision of suitable habitat for threatened species that will potentially be affected by the Project, internal connectivity, important habitat features, and management and regenerative potential.

Although not located entirely within the same bioregion as the Project, the offsite biodiversity offset property is located immediately outside of the Sydney Basin Bioregion and shares the same general characteristics of the Drayton South area. It also provides habitat for a wide range of species whose distribution extends beyond the Hunter Valley.

Benefits and Value of the Offsite Biodiversity Offset

As far as is feasible and practical, the offsite biodiversity offset property meets key requirements, such as:

- Bioregional context;
- Provision of flora and fauna habitat (including habitat for threatened species) through existing high quality and condition forest and woodland (principally Box Gum woodland);
- High regeneration or revegetation potential to enhance biodiversity values; and
- Connectivity or proximity to landscape-scale wildlife corridors and enhancement of existing conservation areas.

The offsite biodiversity offset is *"like-for-like or similar"* in that it provides vast areas of medium to high quality Box Gum woodland, the same over-arching ecological community that is to be cleared by the Project. The offsite biodiversity offset property was also chosen to compensate for the impacts to threatened and migratory species and provides habitat for a wide range of flora and fauna. The offsite biodiversity offset property, includes important habitat features such as ground cover, leaf litter, fallen timber and rocky outcrops, understorey vegetation, tree hollows, and blossom-producing and feed trees.

The offsite biodiversity offset property includes land that can be regenerated, where possible, to higher condition. This will mean that areas of grassland and partially cleared woodland will be targeted and managed for regeneration. Given that a multiplier effect was sought by means of the ratio of offset lands to impact area, having broad areas with substantial habitat that can be regenerated is considered likely to lead to a net increase in the total area of habitat. This is consistent with the principles of the latest *EPBC Act Environmental Offsets Policy* (SEWPaC, 2012).

4.8.7 Rehabilitation and Revegetation as Part of the Biodiversity Offset Package

This section responds to submissions raised by stakeholders regarding the rehabilitation and restoration components of the biodiversity offset package. A key focus of this section responds to the likely success of mine rehabilitation, time lags and whether the mine rehabilitation is supplementary to post-mining activities required as part of the mining operations plan.

Submission: RA6, RA7, RA17, SIG11, P3, P14, P18 and P22

Likelihood of Success of Mine Rehabilitation Works

As acknowledged in the ecological impact assessment (see Appendix J of the EA), there are few areas of mature mine rehabilitation in Australia, which means that there is little information currently available on the long-term success of mine rehabilitation programs. While this makes it difficult to predict the composition and structure of vegetation beyond 10 years with absolute certainty, rehabilitation of post-mining landscapes for biodiversity conservation is important and is capable of delivering ecological benefits. This is the case for the Drayton South area, which is capable of providing habitat for local flora and fauna populations.

In consideration of the above, Anglo American has committed to carrying out mine rehabilitation within a conservation framework that will involve rehabilitation objectives, completion criteria, measurable indicators and rigorous monitoring aimed at biodiversity outcomes. Furthermore, Anglo American acknowledges that there is a level of risk associated with mine rehabilitation. In recent times a discount of 50% has been applied to mine rehabilitation used as a biodiversity offset for other mining projects in NSW. Therefore, only 50% of the total area of mine rehabilitation will contribute towards the biodiversity offset package for the Project.

Anglo American is committed to carrying out rehabilitation consistent with best practice guidelines and to applying the most current knowledge to improve the performance of rehabilitation works. For instance, Anglo American commenced rehabilitation trials a year ago at Drayton Mine to investigate the effectiveness of various mine rehabilitation techniques (GSS, 2012). This investigation will be ongoing and is intended to inform the future mine rehabilitation within the Drayton South area to improve the likelihood of rehabilitation success.

The results of other available studies and the most current information will also be considered and applied throughout the life of the Project to improve the likelihood of rehabilitation success. For example, experimental revegetation studies of Kurri Sand Swamp Woodland and Central Hunter Box Ironbark Forest, conducted by Cole et al. (2010) from the Centre for Sustainable Ecosystem Research at the University of Newcastle, reported high survival rates of seedlings under specific treatments.

Another example includes the Mt Owen Mine and Ravensworth State Forest Vegetation Complex (Cole, 2009). After fourteen years, substantial progress has been made; "*the forest remnants have shown significant natural regeneration after removal of grazing*

pressure and the 2007 flooding rains that have caused a pulse of regeneration likely to change forest structure. The New Forest has maturing upper middle and canopy species that are producing viable seed and in the offset areas plantings are becoming well established and even producing fruit. The understanding of the forest and associated remnant vegetation has led to the development of a restoration site both with considerable ecological value for the region and highly significant experimental outcomes".

Anglo American is a participant in the NSW Minerals Council's working group on rehabilitation. The key objectives of the working group are to:

- Decrease the time that disturbed areas are left without final or temporary cover, recognising that different mining operations are at different points in rehabilitation; and
- Achieve a consistent level of best practice, quality, and integrated rehabilitation across the Upper Hunter.

Lag Time in Rehabilitation and Restoration Works

It is acknowledged that there will be a substantial time lag before mine rehabilitation within the Drayton South area will mature and develop critical habitat features (e.g. hollows, ground debris and flowering resources) that will provide sustained forage and shelter habitat for threatened species. Where possible, these processes will be artificially enhanced through the installation of nest boxes, salvaged timber and salvaged hollows in remnant vegetation to be retained in the Drayton South area and Drayton Wildlife Refuge. As rehabilitation progresses, salvaged timber and other habitat features will be emplaced in the rehabilitation areas to encourage the return of native fauna.

The Project will progressively clear vegetation in strips over 27 years. This means that areas of mature, remnant woodland will be maintained in the Drayton South disturbance footprint for the majority of the life of the Project. Rehabilitation will also be implemented on a progressive basis behind the mining activities and will be undertaken as soon as these areas have achieved a stable final landform. Following the cessation of mining, the majority of the rehabilitation will have progressed significantly.

The retention of mature, remnant woodland on the primary ridgeline (50 ha) and enhancement of existing forest and woodland along Saddlers Creek (20 ha existing and 62 ha to be restored) will continue to provide important forage and shelter habitat for locally occurring fauna while clearing and rehabilitation take place. Proximate conservation areas, including the Drayton Wildlife Refuge, Mt Arthur conservation area and Saddlers Creek conservation area will also continue to provide areas of woodland that support resources for threatened species.

In the short to medium-term, the majority of the Drayton South area will remain vegetated. The rehabilitated vegetation will play an important role in maintaining habitat in the Drayton South area as the Project progresses.

Rehabilitation as a Supplementary Offset

Anglo American is required, under the *Mining Act 1992*, to rehabilitate land affected by the Project. This is defined as "*the treatment or management of disturbed land or water for the purpose of establishing a safe and stable environment*". It is not mandatory for rehabilitation to be directed to the establishment of self-sustaining endemic communities and habitat for forest and woodland flora and fauna. Current site rehabilitation standards and completion criteria often focus on effective covers or treatment of hazardous or contaminated material, long-term stability of the final landform and establishment of a compatible post-mining land use.

Since the Project's rehabilitation is intended to be improved and protected in perpetuity specifically for biodiversity conservation, it will need to meet completion criteria aimed at improving biodiversity values of the land, and this will influence the nature and outcomes of the rehabilitation. In this regard, Anglo American has made an additional commitment that goes substantially beyond the requirements of the *Mining Act 1992* and as such it is maintained that the rehabilitation of the land is supplementary and hence a valid biodiversity offset.

Saddlers Creek Restoration and Conservation

OEH has recommended Anglo American work collaboratively with Mt Arthur Coal Mine since the section of Saddlers Creek immediately upstream of the Drayton South area is covered by the Saddlers Creek conservation area. Anglo American have been and will continue to consult with Mt Arthur Coal Mine to ensure that the Saddlers Creek restoration in the Drayton South lease is consistent with and complimentary to the work being carried out in the Saddlers Creek conservation area.

Ongoing Monitoring and Management

OEH has recommended statistical analysis of data from the monitoring of the rehabilitation and restoration works so that results could improve future efforts. It is agreed that statistical analysis of monitoring data will be an important tool to compare the progress of rehabilitation and restoration against reference sites. Data will be added to a database so that it will form a data matrix that is amenable to appropriate analysis, for example, using classification and ordination techniques, parametric statistics, or Analysis of Similarity.

IESC has noted in their submission that a monitoring regime for the Green and Golden Bell Frog should be established as part of the biodiversity action plan for the Project.

The Green and Golden Bell Frog is believed to be restricted to four meta-populations in the Hunter Valley, including Sandgate on the margins of Hexham Swamp, Kooragang Island in the delta of the Hunter River, Gillieston Heights/East Maitland and the Ravensdale areas (Wentworth Swamp and Ravensworth/Liddell/Bayswater area). These observations support the notion that the species is present across this area of the Hunter Valley but that it occurs as a diffuse population (DEC, 2005b).

The Ravensworth/Liddell/Bayswater area meta-population includes several sightings recorded since 1995. However, the Green and Golden Bell Frog has not been recorded

within the Drayton South area. The aquatic habitat provided by Saddlers Creek is sub-optimal and there is no suitable winter shelter habitat. Elements such as bull-rushes or spike-rushes, rocks and other sheltering vegetation are generally lacking. Furthermore, there is significant competition along this watercourse from *Gambusia holbrooki*, which is the dominant fish in Saddlers Creek and is generally known to occur in the Hunter River system. In this regard, the Green and Golden Bell Frog is unlikely to be present in the Drayton South area and as such a monitoring regime for this species is not deemed necessary.

4.8.8 Determination of Box Gum Woodland

This section responds to submissions raised by OEH suggesting that inadequate information has been supplied in the ecology impact assessment (see Appendix J of the EA) to explain how the vegetation communities were determined to conform to Box Gum woodland (EEC). In particular, OEH has requested that these determinations are explained in relation to the NSW Scientific Committee Determination for Box Gum woodland and that further explanation and data be supplied to support the allocation of derived native grassland on the offsite biodiversity offset property.

Submission: RA7

Comparison of Vegetation Communities against Box Gum Woodland Final Determination

Box Gum woodland is a widespread ecological community that occurs across a large latitudinal and climatic range and hence across a number of different bioregions. As such, Box Gum woodland is highly variable across its range as a result of such environmental gradients and encompasses a number of vegetation community types recognised by regional or local vegetation mapping.

A number of vegetation types in the Drayton South area and the offsite biodiversity offset property classified as Box Gum woodland (EEC) were systematically compared against the *NSW Scientific Committee Determination for Box Gum Woodland* (Threatened Species Scientific Committee, 2006). The communities that were examined with respect to the determination included:

- Box Gum grassy woodlands, Brigalow Belt South and Nandewar;
- Hunter Floodplain Red Gum woodland complex;
- River Oak riparian woodland, eastern NSW;
- Rough-barked Apple-Blakely's Red Gum riparian grassy woodlands, Brigalow Belt South and Nandewar;
- Silvertop Stringybark grassy open forests, eastern Nandewar and New England Tablelands;
- Upper Hunter White Box-Ironbark grassy woodland; and
- White Box grassy woodland, Brigalow Belt South and Nandewar.

This comparison demonstrates that the communities listed above are consistent with the determination on a number of points, including:

- Occur within the Nandewar or Sydney Basin Bioregions;
- Occur on relatively fertile soils;
- Dominated or co-dominated by one or more of the following species in varying proportions and combinations (note that intergrades are recognised in the determination):
  - White Box;
  - Yellow Box; and
  - Blakely's Red Gum;
- Characterised by a grassy understorey supporting a number of the species listed in the determination;
- Typically shrubby, or contain localised areas of shrubs; and
- Due to the occurrence on relatively fertile soils, are typically reduced in area and highly fragmented due to clearance for cropping and pasture improvement.

Example – River Oak Riparian Woodland

River Oak riparian woodland was cited by OEH as an example of a vegetation community that does not appear to meet the definition of Box Gum woodland given it is a riparian community that occurs along class 3 drainage lines when compared to Box Gum woodland, which is noted to occur on undulating midslopes and lower slopes. OEH also commented that the composition of this community does not seem to be consistent with the species listed in the *NSW Scientific Committee Determination for Box Gum Woodland* (Threatened Species Scientific Committee, 2006).

River Oak riparian woodland typically occurs as a narrow gallery forest along drainage lines within and surrounding Box Gum grassy woodlands that are associated with creeks and floodplains of larger drainage lines. In the ecology impact assessment (see Appendix J of the EA), River Oak riparian woodland on the offsite biodiversity offset property was considered to conform to the Box Gum woodland (EEC) determination given it is generally co-dominated by either *Eucalyptus melliodora* (Yellow Box) or *Eucalyptus blakelyi* x *Eucalyptus tereticornis* (Blakely's Red Gum-Forest Red Gum intergrade) and has an open grassy understorey. **Plate 1** shows Yellow Box in the foreground and grassy woodland graduates into the gallery forest of River Oak as it approaches the creek in the background.

While the determination acknowledges that forms of Box Gum woodland, such as those with *Eucalyptus albens* (White Box) are most common on slopes in undulating country, other areas dominated by *Eucalyptus blakelyi* (Blakely's Red Gum) and *Eucalyptus melliodora* (Yellow Box) are described as occurring in moist situations (NSW Scientific Committee, 2004). The determination does not exclude riparian woodlands from the Box Gum woodland (EEC).

The floristic assemblage of River Oak riparian woodland on the offsite biodiversity offset property also contains a number of species that appear in the determination for Box Gum woodland and include:

- *Eucalyptus tereticornis x blakelyi;*
- *Brachychiton populneus;*
- *Acacia implexa;*
- *Wahlenbergia communis;*
- *Geranium solanderi;*
- *Sida corrugate;*
- *Plantago debilis;*
- *Rumex brownie;*
- *Aristida ramose;*
- *Austrodanthonia racemosa;*
- *Chloris ventricosa;*
- *Echinopogon caespitosus;*
- *Poa labillardierei;*
- *Cheilanthes sieberi;* and
- *Glycine tabacina.*

The determination for Box Gum woodland (EEC) acknowledges that many species listed are present in only some sites or in very small quantity. It also acknowledges that in any particular site not all of the assemblage listed may be present. In this regard, it is considered that the landscape position and the species composition of River Oak riparian woodland on the offsite biodiversity offset property are not inconsistent with the determination for Box Gum woodland (EEC).

Plate 1
River Oak Riparian Woodland on the Offsite Biodiversity Offset Property

Derived Native Grassland on the Offsite Biodiversity Offset

OEH raised concerns about the nature and extent of derived native grassland and low diversity native grassland on the offsite biodiversity offset property. In response, Anglo American commissioned a study of grasslands at the offsite biodiversity offset property during February and March 2013. The response below explains how the grassland areas were re-evaluated against Box Gum woodland (EEC) criteria for the TSC Act and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Box Gum woodland (EEC) includes areas where the woody vegetation has largely been cleared and only a grassy understorey remains. These areas of grassy understorey are typically referred to as derived native grasslands. The *NSW Scientific Committee Determination for Box Gum Woodland EEC* (OEH, 2004) is reproduced below and includes some descriptions of the nature of derived native grasslands. The items highlighted in bold are of particular importance in the case of the Project and its biodiversity offsets.

> *"8. White Box Yellow Box Blakely's Red Gum Woodland has been drastically reduced in area and highly fragmented because of clearance for cropping and pasture improvement. Austin et al. (2000) found the community had been*

reduced to less than 1% of its pre-European extent in the Central Lachlan region. Comparable degrees of reduction have been documented for NSW south western slopes and southern Tablelands (estimated <4% remaining, Thomas et. al. 2000), and for the Holbrook area (estimated <7% remaining, Gibbons and Boak (2000). Gibbons and Boak (2000) found remnants of woodlands dominated by Eucalyptus albens, E. melliodora and E. blakelyi were severely fragmented. Further remnants of the community are degraded as a consequence of their disturbance history. ***Some remnants of these communities survive with the trees partly of wholly removed by post European activities****, and conversely, often remnants of these communities survive with these tree species largely intact but with the shrub or ground layers degraded to varying degrees through grazing or pasture modification. Remnants are subject to varying degrees of threat that jeopardise their viability. These threats include: further clearing (for cropping, pasture improvement or other development); deterioration of remnant condition (caused by firewood cutting, increased livestock grazing, weed invasion, inappropriate fire regimes, soil disturbance and increased nutrient loads); degradation of the landscape in which remnants occur (including soil acidification, salinity, and loss of connectivity between remnants).*

9. ***The understorey may be highly modified by grazing history and disturbance****. A number of native species appear not to tolerate grazing by domestic stock and are confined to the least disturbed remnants (Dianella revoluta, Diuris dendrobioides, Microseris lanceolata, Pimelea curviflora, Templetonia stenophylla (Prober & Thiele 1995).* ***Dominant pasture species typically change from Themeda australis, Austrostipa aristiglumis and Poa spp. to Austrostipa falcata, Austrodanthonia spp. and Bothriochla macra as grazing intensity increases*** *(Moore 1953a). This may reflect differences in palatability of these species and their ability to tolerate grazing pressure.* ***Light grazing and burning may also be a problem and lead to Aristida ramosa dominance*** *(Lodge & Whalley 1989).*

10. The condition of remnants ranges from relatively good to highly degraded, such as ***paddock remnants with weedy understories and only a few hardy natives left.*** *A number of less degraded remnants have survived in Travelling Stock Routes, cemeteries and reserves, although because of past and present management practices understorey species composition may differ between the two land uses. Some remnants of the community may consist of only an intact overstorey or an intact understorey, but may still have high conservation value due to the flora and fauna they support. Other sites may be important faunal habitat, have significant occurrences of particular species, form part of corridors or have the potential for recovery. The conservation value of remnants may be independent of remnant size.*

11. Disturbed remnants are still considered to form part of the community including remnants where the vegetation, either understorey, overstorey or both, ***would, under appropriate management, respond to assisted natural***

> ***regeneration,*** *such as where the natural soil and associated seed bank are still at least partially intact."*

In mapping the grassland of the offsite biodiversity offset property, Cumberland Ecology used the above descriptors as a guide to determining the areas that conform to the determination.

The approach to assessing the grasslands involved determining which woodland community was once present prior to clearing and whether the grassland was in a condition that was likely to respond to natural assisted regeneration. The original community that was once present in the grassland was determined in consideration of a number of factors, such as:

- History of clearing of the land;
- Topography of the land;
- Soil and underlying geology;
- Surrounding woody vegetation; and
- Residual paddock trees and stands of regrowth.

Based on these factors, most of the grassland on the offsite biodiversity offset property was allocated to woodland or open forest communities, most of which conform to Box Gum woodland (EEC). In many areas, it is evident that historically, the land was preferentially cleared and maintained for grazing in those parts of the property containing grassy and open vegetation communities. Many areas of shrubby woodland and forest have not been maintained as grazing land, especially as these latter vegetation types are typically present on upper slopes.

The grassland areas of the offsite biodiversity offset property were noted in the ecology impact assessment (see Appendix J of the EA) as having high regenerative potential. Evidence of prolific regrowth of eucalypt species and ringbarking of regrowth to maintain grazing lands was noted across large areas of grassland. Although the sampling effort was focussed on the woody areas at the time of survey for the preparation of the impact assessment, grasslands were observed to be commonly dominated by native perennial grasses with various mixtures of native perennial and annual herbaceous plants. It was acknowledged that a number of weed species were also present and would need to be actively managed in future to improve the condition of the grasslands for conservation.

As recommended by OEH, 31 additional quadrat samples were collected from the offsite biodiversity offset property in February 2013, specifically to obtain data from grassland areas. This data was used to refine the vegetation map of the grassland on the offsite biodiversity offset property and confirms that the most of the grassland areas are dominated by native grass species such as *Bothriochloa* spp., *Aristida* spp., *Austrostipa* spp., *Eragrostis leptostachya* and *Poa labillardieri*; and contains a number of native non-grass species such as *Desmodium varians*, *Dichondra repens*, *Glycine tabacina, G. clandestina*, *Wahlenbergia* spp., *Calotis lappulacea*, *Geranium solanderi* and *Cheilanthes sieberi*. This indicates that a reasonably intact soil seed bank is present and that there is a capacity for assisted natural regeneration.

For the reasons above, there is a high degree of confidence in the grassland mapping of the offsite biodiversity offset property. In this regard it is maintained that most of the derived native grassland on the offsite biodiversity offset property conforms to Box Gum woodland (EEC).

4.8.9 Securing Biodiversity Offsets

This section responds to submissions raised by OEH in relation to the long-term security of the proposed biodiversity offsets for the Project.

Submission: RA7

Several options were put forward in ecology impact assessment (see Appendix J of the EA) to secure biodiversity offsets, however, OEH has stated that they no longer support the rezoning of land or the application of conservation covenants under Section 88 of the *Conveyancing Act 1919*. OEH has instead recommended the consideration of conservation measures listed in Section 126L of the TSC Act that are applicable to a major project and that cannot be readily removed. These include:

a) The adoption or continuation of development controls under the Planning Act that limit or prohibit development on land or the taking of any other measures under that Act that conserve or enhance the natural environment;

b) The entering into of a biodiversity certification agreement under this Part;

c) The entering into of a planning agreement under the Planning Act that makes provision for development contributions to be used or applied towards the conservation or enhancement of the natural environment;

d) The making of a State infrastructure contribution under the Planning Act for the conservation or enhancement of the natural environment;

e) The entering into of a conservation agreement under the Environment Protection and Biodiversity Conservation Act 1999 of the Commonwealth;

f) The reservation of land under Part 4 of the National Parks and Wildlife Act 1974;

g) The entering into of a conservation agreement under the NPW Act in relation to land;

h) The entering into of a trust agreement under the Nature Conservation Trust Act 2001;

i) The entering into of a BioBanking agreement under Part 7A of this Act;

j) The acquisition or retirement of biodiversity credits under Part 7A of this Act;

k) The adoption of a plan of management for a reserve under Division 6 of Part 5 of the Crown Lands Act 1989;

l) The adoption of a plan of management for land under Division 2 of Part 2 of Chapter 6 of the Local Government Act 1993;

m) The dedication or setting apart of any land as a flora reserve under section 16 of the Forestry Act 2012;

n) Consent to a property vegetation plan for land under the Native Vegetation Act 2003 (not being a plan that proposes broadscale clearing of native vegetation within the meaning of that Act); and

o) Any other measure that the Minister determines to be a conservation measure.

The best option for the permanent protection of the Project's biodiversity offsets for conservation will be determined by Anglo American in consultation with OEH and other relevant agencies.

4.8.10 Management Plans

This section responds to submissions raised by stakeholders in relation to the preparation of detailed landscape, rehabilitation and offset management plans.

Submission: RA6 and SIG12

Anglo American has committed to preparing a rehabilitation plan (as required by DRE) and a biodiversity offset management plan. These plans will be prepared in consultation with the relevant government agencies following Project Approval.

4.9 ABORIGINAL ARCHAEOLOGY AND CULTURAL HERITAGE

This section responds to the submissions raised by stakeholders in relation to Aboriginal cultural heritage within the Drayton South area and interactions with the Project. It also summarises Anglo American's ongoing commitment to managing Aboriginal cultural heritage in consultation with relevant stakeholders.

Submission: RA7, SIG12 and P13

An Aboriginal archaeological and cultural heritage impact assessment was undertaken for the Project (Appendix K of the EA) and prepared in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010a). The impact assessment identified a significant archaeological resource within the Drayton South area. A total of 205 discrete sites were recorded within the Drayton South disturbance footprint and associated buffer lands (as defined in Appendix K of the EA), including 143 artefact scatters, 59 isolated finds and three stone quarries. These sites are of cultural importance given that they attest to the previous occupation and use of the land by Aboriginal people.

As a result of the Project, a total of 175 archaeological sites will be directly impacted by mining operations. All remaining sites within the Drayton South area will be conserved. To manage the impacts of the Project on Aboriginal cultural heritage, Anglo American has committed to preparing an Aboriginal cultural heritage management plan for the Drayton Complex. The plan will include:

- Detailed salvage methodologies to be carried out prior to commencement of the Project;

- Measures for the protection and conservation of archaeological sites that are not impacted by the Project, where required; and
- Identification of a storage location (keeping place) and procedure for the care of salvaged artefacts in accordance with the *Code of Practice for Archaeological Investigation for Aboriginal Objects in New South Wales* (DECCW, 2010b).

The plan will be prepared in consultation with registered Aboriginal stakeholders, OEH and DP&I and in accordance with any new requirements of the NP&W Act, where applicable.

As the authorising agency, OEH has found that the Project and its interactions with Aboriginal cultural heritage have been adequately addressed by the Aboriginal archaeological and cultural heritage impact assessment and has recommended conditions for Project Approval applicable to this aspect.

4.10 NON-ABORIGINAL HERITAGE

This section responds to the submissions raised by stakeholders in relation to non-Aboriginal heritage within and adjacent to the Drayton South area and interactions with the Project. It also summarises Anglo American's commitment to managing non-Aboriginal heritage in accordance with the recommendations proposed by the NSW Heritage Council.

Submission: RA5, SIG12, P13, P29 and P41

A non-Aboriginal heritage impact assessment was undertaken for the Project (Appendix L of the EA). A total of 10 non-Aboriginal heritage items were identified within and adjacent to the Drayton South area, including a fence, Nissan hut with stockyard, Bowfield Homestead, Plashett Homestead, Edderton Homestead Complex, stockyard, Strowan Homestead, Arrowfield Cottage, Woodlands Homestead and Randwick Homestead. These items are of non-Aboriginal historical significance given they provide an indication of the past land use of the region and how it has been developed.

The Project will result in direct impacts to the fence and Nissan hut with stockyard, which are situated within the Drayton South disturbance footprint. Given their age and limited historical significance, Anglo American has committed to a photographic archival recording and the preparation of scaled drawings of both items in accordance with *How to Prepare Archival Records of Heritage Items* (Heritage Council, 1998) and *Photographic Recording of Heritage Items using Film or Digital Camera* (Heritage Council, 2006) prior to disturbance. Copies of the archival recordings will be submitted to the NSW Heritage Council, MSC and Singleton Shire Council (SSC).

Ground vibration and overpressure associated with blasting has the potential to impact the structural integrity of heritage items. However, findings from the acoustics impact assessment undertaken for the Project (Appendix G of the EA) concluded that the vibration and overpressure will not exceed the recommended amenity criteria at any of the identified non-Aboriginal heritage items.

The Project has the potential to modify the existing visual environment surrounding identified heritage items. The visual impact assessment undertaken for the Project (Appendix I of the

EA) describes the likely variations in the aesthetics of the landscape, including views from non-Aboriginal heritage items.

Views will be available to the Project from the Edderton Homestead Complex and Bowfield Homestead during the early stages of construction. High visual impacts will be experienced at both items until Year 10 when the northern extent of the overburden emplacement areas (OEA) are rehabilitated and mining advances further south thereby reducing the impact to moderate and then low.

Views will also be available to the Project from Strowan Homestead and Arrowfield Cottage during the 16 month construction period of the Houston visual bund. High visual impacts will be experienced until progressive rehabilitation is completed and the bund is integrated with the surrounding landscape thereby reducing the visual impacts to moderate and then low.

An existing hill shields the majority of the views from Plashett Homestead and as such the visual impacts will be low throughout the life of the Project. Similarly, all other identified heritage items, including the stockyard, Woodlands Homestead and Randwick Homestead, will be shielded from the Project by existing topography.

To manage the impacts of the Project on non-Aboriginal heritage, Anglo American has committed to preparing a non-Aboriginal heritage management plan prior to the construction phase. The plan will include:

- A list and map indicating the location of non-Aboriginal heritage items identified within the Project Boundary;
- A significance assessment and statement of significance for each identified non-Aboriginal heritage item;
- Procedures for managing any unexpected non-Aboriginal heritage finds during the construction or operations phase of the Project; and
- Management and mitigation measures for visual and blasting impacts, including:
    - Tree screening; and
    - Ongoing risk-based dilapidation surveys to assess and monitor the structural integrity of identified non-Aboriginal heritage items.

Anglo American will consult with MSC, SSC and Muswellbrook Historical Society regarding the inclusion of unlisted non-Aboriginal heritage items identified in the EA on the local environmental plans. Following Project Approval, Anglo American will continue to consult with MSC and SSC regarding content of the non-Aboriginal heritage management plan.

As the authorising agency, the NSW Heritage Council has found the non-Aboriginal impact assessment to have sufficiently investigated any known or potential non-Aboriginal heritage items within and adjacent to the Project Boundary and as such adequately address the Director-General's EARs.

4.11 SURFACE WATER

4.11.1 Assessment Approach

This section responds to submissions raised by stakeholders in relation to the adequacy of the water balance model and its input assumptions.

Submission: RA17, SIG12, SIG13 and SIG15

Water Balance Model Method

The water balance model method and inputs comply with current industry best practice. It dynamically simulates the operation of the proposed water management system over the life of the Project and in doing so keeps complete account of all site water volumes and representative water quality on a daily time step. The model is based on the proposed changes in the mine plan over the life of the Project and has been simulated under 88 different climatic sequences, taken from the historical record of climate data associated with the local area. This assessment method ensures that the proposed water management system for the Project is robust and can withstand extended wet and dry periods. The inputs to the water balance model are described further in the surface water impact assessment (see Appendix M of the EA).

Climatic data between 2007 and 2012 has not been included as part of the water balance model to properly incorporate the HRSTS rules. Hunter River stream flow data was required for the calculation of HRSTS releases. The most appropriate Hunter River stream flow data set is the IQQM model output provided by NOW, which only extended from 16 September 1892 to 30 June 2007. The IQQM model was used to prepare and test the *Water Sharing Plan for the Hunter Regulated River Water Source* and as such is the most appropriate data set to use for modelling of the Project's proposed water management system. In this regard, the 114 full years of IQQM data from 1893 to 2006 were adopted. It should be noted that the modelled simulation period includes years much wetter and drier than has occurred between 2007 and 2012. For example, at the Jerrys Plains Post Office (Station No. 061086), 1950 was 34% wetter than 2007 (the year in which the *"Pasha Bulker flood"* occurred) and 1957 had 27% less rainfall than 2011, which only had 431.4 mm. As such, it can be deemed that the data set used for the simulation includes weather events that are representative of the five year period between 2007 and 2012.

The water balance model was used to assess the performance of the proposed water management system (base case) against a number of potential impacts, including:

- Mine complex storage inventory;
- Offsite raw water requirements;
- Uncontrolled spills from the mine water storages;
- Controlled releases under the HRSTS; and
- Behaviour of the final void upon cessation of mining.

The forecast modelling approach used to assess the above impacts is the most statistically valid method as it effectively accounts for the change in mine plan and weather over the life

of the Project. The provision of the results as probabilities gives an insight into the likelihood of an occurrence over time.

The IESC has advised that an adequate site water balance for the Project has been presented in the EA using the adopted water balance method.

Water Balance Model Assumptions

The assumptions adopted for the water balance model are credible and in line with industry best practice, having been based on:

- Runoff and salinity parameters calibrated to existing monitoring data at Drayton Mine;
- Projected changes in mine plans, land use and catchment areas;
- Projected daily demands on water, such as dust suppression and CHPP makeup requirements;
- Historical climatic and Hunter River flow data; and
- Predicted groundwater inflows (from modelling undertaken for the groundwater impact assessment (see Appendix N of the EA)).

Surface water monitoring data will be collected to update and validate the water balance model as mining progresses. The updated model results will be reported as part of the Annual Review to ensure the assumptions made in the surface water impact assessment (see Appendix M of the EA) remain valid and appropriate. The model will be used to continually improve the water management system, predict mine water inventories and water quality, minimise the capture of clean water and maximise the use of mine affected water to mitigate downstream impacts.

4.11.2 Local Watercourse Values

This section responds to the submissions raised by stakeholders regarding the values of local watercourses within the vicinity of the Project.

Submission: SIG15, P13, P24 and P30

The values of the local water courses in the vicinity of the Project, including the Hunter River, Saddlers Creek and Saltwater Creek, have been considered in the EA.

The *Using the ANZECC Guidelines and Water Quality Objectives in NSW* (DEC, 2006b) defines the environmental values of receiving waters as those values or uses of water that the community believes are important for a healthy ecosystem. The environmental values of the receiving waters of the Hunter River are regarded as:

- Aquatic ecosystem;
- Irrigation water supply;
- Livestock water supply;
- Primary and secondary contact recreation; and
- Visual amenity.

The ecology impact assessment undertaken for the Project (see Appendix J of the EA) found that the ecological integrity of Saddlers Creek was severely to extremely degraded due to historic land use practices. The habitat value was found to be low with little or no in-stream vegetation or rocks and snags for aquatic life found. The existing salt concentrations in Saddlers Creek also frequently exceed that suitable for livestock to drink.

Saltwater Creek is already heavily impacted by the construction of Plashett Dam, which captures almost 77% of the total catchment. The creek downstream of Plashett Dam, similar to Saddlers Creek, is degraded as a consequence of previous land use practices.

Anglo American has also been involved in a range of ongoing management programs with the CMA since 2005 to improve the quality of watercourses on their properties, including those of Saddlers Creek and Saltwater Creek.

4.11.3 Loss of Catchment

This section responds to submissions raised by stakeholders regarding the loss of catchment flows draining to local watercourses as a result of the Project. It also discusses the potential impacts on the broader catchment having regard to final voids associated with other mining operations in the Hunter Valley.

Submission: RA17, SIG3, SIG5, SIG8, SIG12 and SIG15

During and after the life of the Project, there will inevitably be a reduction of catchment flows to surrounding waterways, including the Hunter River, Saddlers Creek and Saltwater Creek.

Under existing conditions, Drayton Mine and Mt Arthur Coal Mine have already reduced the Saddlers Creek catchment by 13%. It is understood that operations as approved at Mt Arthur Coal Mine will continue to extend in a south-westerly direction taking up a further 8% of the catchment between Saddlers Creek and Edderton Road.

The greatest loss of the Saddlers Creek catchment will occur at approximately Year 10 of the Project. At this time, the catchment currently contributing runoff to Saddlers Creek will reduce by 1,345 ha (14%). At the end of the Project life, the final void will permanently reduce the Saddlers Creek catchment by 989 ha (10%).

There are several gullies that are associated with Saddlers Creek. At the completion of mining, three gullies will no longer exist and the catchment draining to the most western gully, on which Blakefield Dam is constructed (Blakefield Gully), will increase from 224 ha to 678 ha.

The Saltwater Creek catchment is already highly impacted as a result of Plashett Dam, which captures 77% of the existing catchment. Further loss of catchment resulting from the Project will not cause significant impacts. A loss of 594.1 ha (11%) from the catchment is predicted following construction of the Houston Dam and the Houston mining area. This loss is generally consistent across the life of the Project. The catchment lost will be reduced by 190.8 ha (4%) when Houston Dam is removed at the end of the Project life.

The Project will have an insignificant impact on the broader Hunter River catchment flows. Under mining conditions, the Project will reduce the overall catchment draining to the Hunter

River at Liddell by a maximum of 0.14%. For post-mining conditions the final void will reduce the Hunter River catchment at Liddell by less than 0.1%.

The take of catchment flows during and post mining will be accounted for by means of water access licences (WALs) for each applicable water source in accordance with the relevant water sharing plan (see **Section 4.13**). These regulations are enforced to manage the cumulative impacts of water users, including the mining industry, on the take of catchment flows and as such have been considered in the surface water impact assessment for the Project (see Appendix M of the EA).

The majority of mining operations in the Hunter Valley are located upstream of Singleton. If it is assumed that there are 20 mining operations that will have similar final void to that of the Project (within the Drayton South area), the cumulative percentage loss of catchment draining to Singleton would be 1.4%. The loss of catchment flows is likely to be less than this value given that many of the mines are located in a lower rainfall area of the catchment. As such, the cumulative impacts are not deemed to be significant.

4.11.4 Unregulated Stream Flows

This section responds to submissions raised by stakeholders regarding the potential for the Project to reduce unregulated flows and its associated impacts on existing water users and their harvestable rights.

Submission: SIG5, SIG13, SIG15, P12 and P13

The Project will not impact on the ability of other users, including agricultural enterprises, to take unregulated flows from surface water sources. The majority of catchments removed by the Project during its operation would have previously drained to Saddlers Creek, upstream of Edderton Road. The remainder of the affected area would have previously drained to Saltwater Creek. The Project does not remove any catchment that drains directly to the Hunter River or any catchment that drains directly to Saddlers Creek downstream of Edderton Road (to the immediate south of the Project).

The majority of runoff from Coolmore Stud and Woodlands Stud and all of Arrowfield Estate drain directly to the Hunter River or to Saddlers Creek downstream of Edderton Road. As stated above, these catchment areas are not affected by the Project. Therefore, surface runoff from the catchment area draining onto Coolmore Stud, Woodlands Stud and Arrowfield Estate that could be captured under their harvestable right will not be impacted.

4.11.5 Regulated Stream Flows

This section responds to submissions raised by stakeholders regarding the potential for the Project to impact on existing licensed water users that access the Hunter Regulated River Water Source.

Submission: SIG5, SIG10, SIG13, SIG15, P12 and P13

Based on the results of the water balance model, there is at least a 99% chance that no offsite water supplies will be required during the Project life (i.e. no water is expected to be extracted from the Hunter River). In this regard, there is not anticipated to be any impact on

other regulated licensed water users, including agricultural enterprises such as Coolmore Stud, under the *Water Sharing Plan for the Hunter Regulated River Water Source*.

Should the Project require water from the Hunter River, a WAL will be required for any extraction that exceeds basic landholder rights. **Section 4.13** discusses water licensing in further detail.

4.11.6 Final Void

This section responds to the submissions raised by stakeholders in relation to increases in salt concentration within the water body of the final void.

Submission: SIG5 and SIG13

The water balance model was reconfigured to replicate the final void behaviour estimated by from the groundwater model and assess the long term build up of salts in the final void. The water balance model was run as a static simulation using the historical rainfall data sequence from 1889 to 2010 and predicted groundwater inflows.

The salinity of water can be categorised based on Total Dissolved Solids (TDS) concentrations as follows:

- Fresh water <500 mg/litre (L);
- Slightly Brackish 500 to 1,000 mg/L;
- Brackish 1,000 to 3,000 mg/L;
- Moderately saline 3,000 to 7,000 mg/L;
- Saline 7,000 to 14,000 mg/L;
- Highly saline 14,000 to 35,000 mg/L; and
- Brine >35,000 mg/L

The water balance model predicted that TDS concentrations within the final void gradually increase to 7,000 mg/L (moderately saline) towards the end of the simulation period (122 years). The TDS concentrations are likely to continue to increase over time as water evaporates from the surface of the water body causing the salt load to increase towards 14,000 mg/L. This result is similar to other studies undertaken for final void water quality in the Hunter Valley region (Mackie, 2009; Hancock, 2005).

Interactions of the final void with the surrounding environment are discussed in **Section 4.12.4** and **4.12.5**.

4.11.7 Hunter River and the Salinity Trading Scheme

This section responds to submissions raised by stakeholders regarding the impact of the Project's discharge events on the salinity of the Hunter River and its existing water users.

Submission: RA4, RA17, SIG1, SIG2, SIG3, SIG10, SIG11, SIG12, SIG13, SIG15, SIG16, P4, P5, P6, P10, P12, P13, P14, P18, P20, P21, P22, P23, P24, P25, P26, P31, P34, P37, P40 and P41

The proposed water management system has been developed to minimise or mitigate the impact of the Project on the downstream water quality. The water management system includes a mine water management system to collect and reuse water that may contain high TDS (salt) concentrations. Mine affected water in excess of site water requirements will only be released to the Hunter River under the HRSTS rules.

The water balance model suggests that there is a 50% chance that releases will exceed 740 megalitres (ML)/annum on average and a 10% chance they will exceed 1,140 ML/annum on average. The average volume per release day will range between 25 ML and 31 ML.

The HRSTS has been designed by the EPA as a measure to control the localised and cumulative impacts of salt water releases from industrial and mining development in the Hunter River. The EPA website states:

> *"The NSW Government's Hunter River Salinity Trading Scheme leads the world in using economic instruments for the effective protection of waterways. The scheme has been responsible for restoring the waters of the Hunter to an unprecedented level of freshness. Water salinity is more stable and lower and the river is now as fresh as many bottled mineral waters."*

The aim of the HRSTS is to manage salt concentrations and minimise the impact of industry in the catchment by allowing the scheduling of saline industrial discharges at times of high river flows and low background salinity levels. The rules of the HRSTS ensure that sufficient dilution of salts is achieved and that target salinity levels at Singleton (900 µS/cm) are not exceeded. Salinity levels are managed through sharing the total allowable discharge according to licensed holdings of tradeable salinity credits.

Anglo American proposes to participate in the HRSTS to manage the cumulative impacts of the Project and other sources. Releases of water from the Project will only occur at times of high or flood flow in the Hunter River (i.e. times when salinity levels in the Hunter River are likely to already be reduced). The discharge schedule prohibits discharges during low flow periods. The HRSTS rules incorporated in the water balance model are detailed further in the surface water impact assessment (see Appendix M of the EA).

Given that the water quality of the Hunter River is governed by the HRSTS, the Project and other mining operations considered cumulatively will not impact on existing license holders that rely on water from the river, including agricultural enterprises.

As the authorising agency, the EPA acknowledges the requirement for the Project to discharge mine affected water into the Hunter River and as such has recommended conditions for Project Approval, which will relate to Anglo American's participation in the HRSTS.

Impact on Nearfield Water Users

Coolmore Stud operates nine pump stations along the Hunter River. Six of these pump stations are located upstream of the Project's proposed discharge point and will not be affected by releases under the HRSTS. The remaining three pump stations are located

within 3.3 km of the discharge point, with the closest pump station located approximately 750m downstream on the opposite bank. It is possible that salinity concentrations will be elevated immediately downstream of the discharge point until the releases are fully mixed with the river flows. During high flow periods, in which discharges occur, pumps are commonly removed from the river to prevent damage.

Modelling predicts that HRSTS releases from Houston Dam will have a median TDS concentration of 2,600 mg/L and a 10th percentile concentration of 3,735 mg/L (i.e. 90% of all releases will be below 3,735 mg/L). Given the geometry of the Hunter River bed, it is expected that the releases will be fully mixed with river flows prior to reaching the first Coolmore Stud pump station thereby reducing the salinity concentration to the HRSTS target. Anglo American commits to installing a monitoring station 900 m downstream of the discharge point to record the near field impact of the releases.

Of course it is highly unlikely that any one would wish to draw water from the Hunter River for the purposes of irrigation when mines are discharging water under the HRSTS as discharges can only ever occur in times of high river flow during or immediately following heavy rainfall.

Anglo American proposes to notify Coolmore Australia and other near neighbours prior to releases being made from the Houston Dam.

Impact on Far Field Water Users

When releases are made under the HRSTS, the minimum river flow rate at which releases are allowed is 1,800ML/day upstream of the Glennies Creek confluence. In this regard, discharges from the Houston Dam will therefore be significantly diluted. **Figure 29** shows the modelled dilution ratios (Hunter River flow rate divided by Project release rate) for release days in each stage (with each stage of mining simulated over the full period of available stream flow data). The median modelled volumetric dilution ratio is 300 and the minimum is 60. The maximum discharge is 100 ML/day during flood flows (above 6,000 ML/day); however, most discharge events typically average 30 ML/day.

The resultant downstream contamination concentrations will be dependent on the concentration of the mine affected water released from the Project and the upstream river water. **Figure 30** shows the percentage increase of the resultant downstream Hunter River concentration relative to the upstream concentration for a range of release concentration ratios (concentration of release divided by the upstream Hunter River concentration).

Figure 30 shows that at the minimum volumetric dilution ratio (when the Hunter River flow is 6,000ML/day and discharges from the Project are 100 ML/day), the impact of releasing mine affected water with a concentration four times greater than the Hunter River upstream concentration, will increase downstream concentration by approximately 7%. For broader scale Hunter River flows, the general trend is that when the volumetric dilution ratio is greater the concentration and hence impact is less.

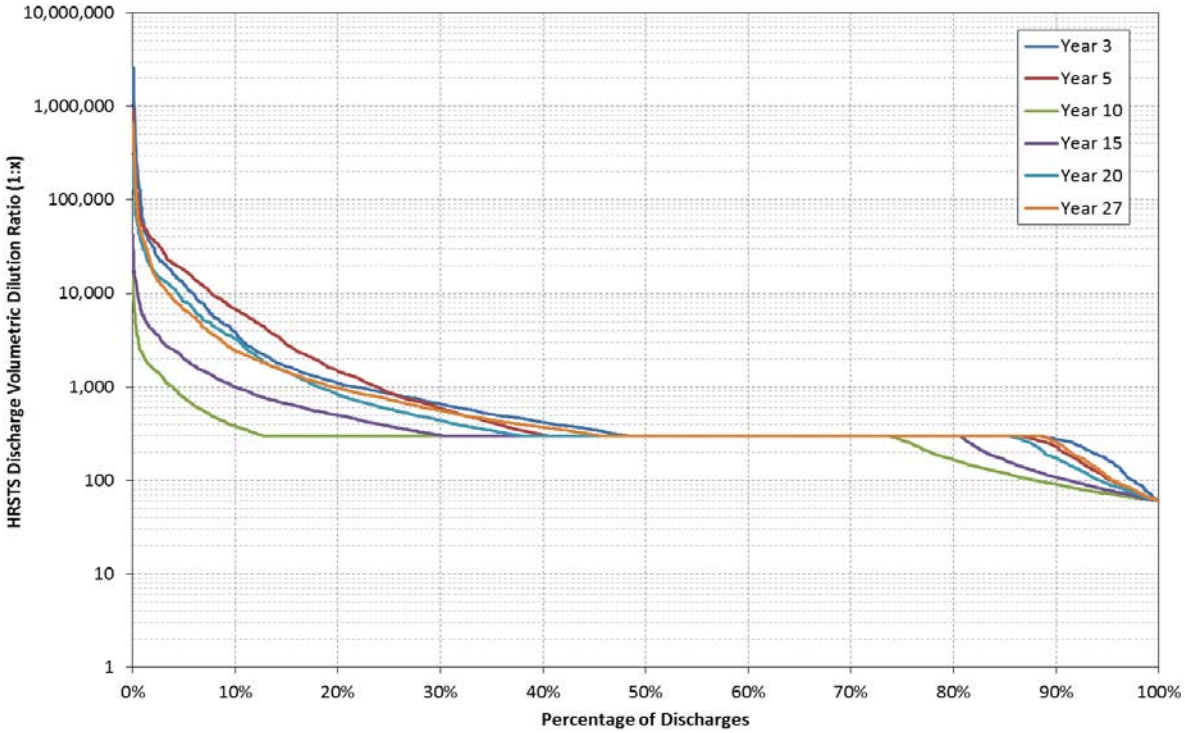


Figure 29
Volumetric Dilution Ratio to Hunter River at Glennies Creek

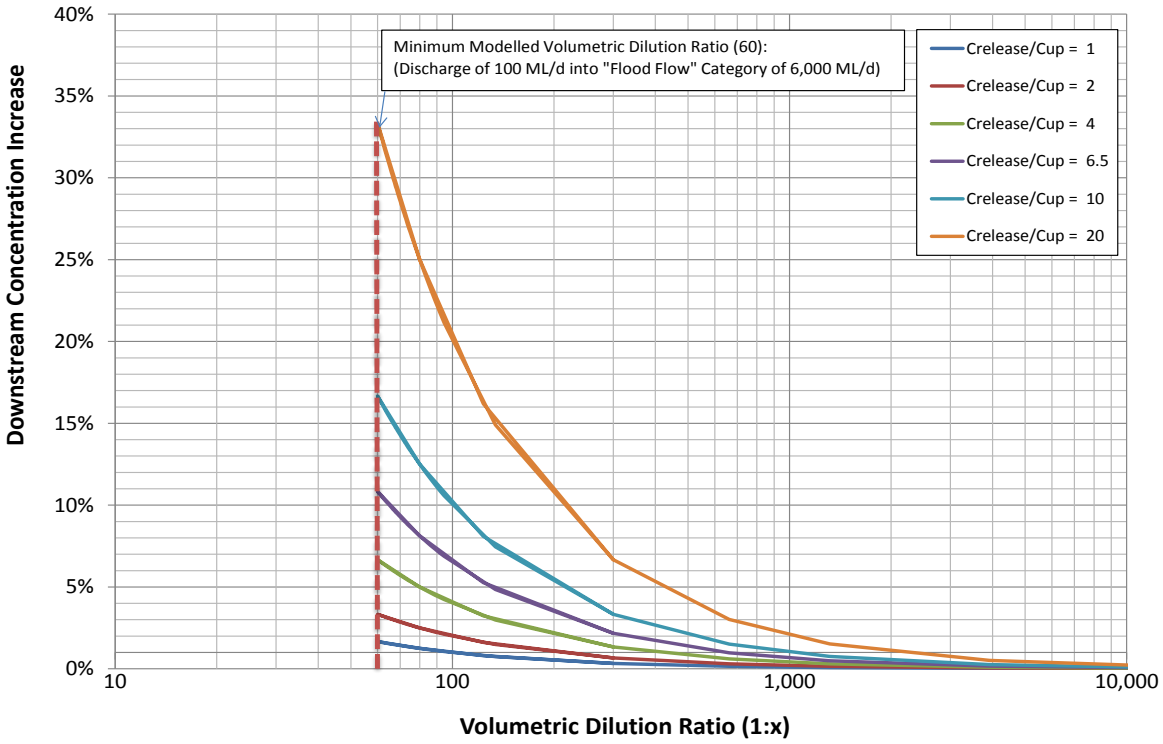


Figure 30
Resultant Hunter River Concentration Increase Downstream of the Discharge Mixing Zone

Metals

The geochemistry impact assessment (see Appendix P of the EA) confirmed that the concentration of total metals detected in overburden materials are well below applied guideline criteria for soils. In this regard, the runoff and seepage generated by most overburden and coal reject material are anticipated to have concentrations of dissolved trace metals below that of applied water quality guideline criteria. These concentrations are unlikely to present any significant impacts to water quality through regulated discharges in accordance with the HRSTS.

4.11.8 Water Supply

This section responds to submissions raised by stakeholders regarding water supply requirements, options and implications for the Project in the event of extended dry periods.

Submission: RA13, P13, P20 and P24

Under dry conditions, there is a 10% chance that there will be a build-up of water of at most 4,860 ML in the out-of-pit storages over the life of the Project. In the event that very dry conditions are experienced, there is a 1% chance that there will be a build-up of water of at most 3,830 ML in the out-of-pit storages over the life of the Project. Even under these very dry conditions, the water management system is not in equilibrium from approximately 2030 and is accumulating water. This indicates that inflows to the water management system, including groundwater and surface runoff, are exceeding the combined outflows, such as evaporation, controlled releases under the HRSTS, dust suppression, industrial use and CHPP demands.

The water balance model predicts that there is less than a 1% chance that offsite supplies will be required for the Project. That is, runoff from Drayton Mine catchments and dewatered groundwater can supply the Project for the life of operations (unless drier than the 99th percentile conditions).

In the event conditions are drier than predicted, water shortages may impact on mining operations. As such, Anglo American has identified potential water supply options should the water management system inventory appear to be approaching a deficit, including:

- Implement water use efficiencies measures across the operation, such as reducing evaporation from water storages;
- Purchasing additional WAL units on the open market;
- Approaching other WAL holders for a term transfer; or
- Sourcing water from neighbouring operations, such as Macquarie Generation or Mt Arthur Coal Mine, through a commercial agreement as per previous or future arrangements.

4.11.9 Runoff and Sediment Dam Releases

This section responds to submissions raised by stakeholders regarding the onsite and offsite management of dirty water and potential impacts on the water quality of the receiving environment.

Submission: SIG12, SIG15 and P12

A dirty water management system has been developed as part of the Project (see Appendix M of the EA for further details). Dirty water is considered to be surface runoff water from areas that are disturbed by mining operations, including OEAs and haul roads. This runoff does not come into contact with coal, other contaminated material or high salt concentrations, and is separated from clean area runoff and collected in sediment dams for settling.

Dirty water will only be released from sediment dams on site if water quality meets the relevant criteria outlined in *Managing Urban Stormwater Guidelines* (Landcom, 2004) and *Managing Urban Stormwater Soils and Construction – Volume 2E Mines and Quarries,* (DECC, 2008). These guidelines require sediment dams to be drained and pumped out within a five-day period following rainfall to ensure there is sufficient storage volume for the next rainfall event. Uncontrolled overflows from sediment dams following rainfall events exceeding the five-day management period, will by definition occur at times when there is sufficient dilution of sediment loads by runoff in local watercourses.

The recommended Total Suspended Solids (TSS) concentration criterion is 50 mg/L (DECC, 2008). Releases of captured dirty water will be made into the downstream environment if it is less than the TSS concentration criterion. If the quality of the water does not comply, it will be pump into the water management system for reuse. It is predicted that the sediment dams will provide sufficient treatment of runoff to meet limits and therefore releases are expected following most rainfall events. Sediment dam sizes and locations will be confirmed during detailed design.

The mine plan has been developed such that the largest catchment area within the dirty water management system occurs within the first five to seven years of operation. The majority of the dirty water catchments are proposed to be rehabilitated by Year 10. Should the water quality of the captured runoff in the sediment dams not meet relevant criteria during this period, it will be pumped back into the water management system for reuse. The water balance model has shown that there is adequate storage on site to cater for these flows, if necessary.

4.11.10 Runoff Sensitivity Analysis

This section responds to submissions raised by stakeholders regarding the requirement for a sensitivity analysis on the adopted runoff parameters to understand variations in the predicted impacts of the Project.

Submission: SIG5, SIG13 and SIG15

The water balance model has been calibrated to previously recorded runoff volumes and salt concentrations measured on the Drayton Mine from 2007 to 2011. Given that the model was

calibrated against existing data, the adopted runoff and salinity parameters should therefore provide a good representation of runoff from the Drayton South operational area. However, a sensitivity analysis has been undertaken to test the scenario where runoff parameters are higher or lower than that currently adopted in the surface water impact assessment (Appendix M of the EA).

Water Balance Model Calibration

The water balance model uses the Australian Water Balance Model (AWBM) (Boughton and Chiew, 2003) to estimate runoff from rainfall. The AWBM is a saturated overland flow model which allows for variable source areas of surface runoff.

The water balance model developed for the Project was calibrated to the runoff volumes and salt concentrations measured on the Drayton Mine from 2007 to 2011 by adjusting the AWBM parameters.

The sensitivity analysis tested the adopted AWBM parameters in the surface water impact assessment (see Appendix M of the EA). The effect of increased or decreased runoff was undertaken by adjusting surface stores by ±10%. The resultant long term volumetric runoff coefficient for each land type with a comparison to the base case is shown in **Table 21**. All data inputs to the sensitivity model, excluding the AWBM parameters, are described for the base case scenario in the surface water impact assessment (see Appendix M of the EA).

Table 21
Adopted AWBM Model Parameters for Various Catchment Types

Long Term Runoff Coefficient	Mine Site	Industrial/ Hardstand	Unrehabilitated Overburden	Rehabilitated Overburden	Mining Area	Cleared/ Prestrip
Base Case	4.8%	31.2%	13.8%	8.5%	34.8%	34.4%
High Runoff Scenario	5.5%	33.0%	15.1%	9.3%	36.5%	36.1%
Low Runoff Scenario	4.0%	29.8%	12.5%	7.5%	33.5%	33.1%

Interpretation of Results

The water balance simulation provides a statistical analysis of the proposed water management system's performance over the 27 year Project life, based on 88 realisations with different climatic sequences from the historical data set.

In interpreting the results, the 50th percentile represents the median value, the 1st and 10th percentiles represent wet conditions and the 90th and 99th percentile results represent dry conditions. A percentile trace shows the percentile chance of a particular value on each day and does not represent continuous results from a single model realisation (e.g. the 50th percentile trace does not represent the model time series for median climatic conditions).

Impact Assessment

High Runoff Scenario

The results of the high runoff sensitivity analysis, compared to the base case (see Appendix M of the EA) indicate that for the in-pit storage inventory there remains a 50% chance there will be no build-up of water in the active mining areas.

There is a 10% chance that inundation in the combined mining areas would reach a maximum of at least 520 ML over the life of the Project, compared to 335 ML for the base case. It remains likely that this amount could be redistributed around the site or pumped directly to Houston Dam for release to the Hunter River under the HRSTS and not significantly impact on mining operations.

There is a 1% chance that inundation of the mining areas would reach at least 3,010 ML in 2024 (compared to 2,440 ML for the base case), with the risk of inundation increasing from approximately Year 7 (2020). This would be expected to significantly impact mining operations but would not impact on the downstream environment. During these periods an active mining area may need to be temporarily sacrificed for water storage. The current production schedule has the flexibility to cater for such scenarios. Therefore there are not likely to be any economic impacts from such an event.

The forecast results for the in-pit water storage inventory under the high runoff scenario are provided in **Figure 31**.

For the out-of-pit storage inventory there is a 50% chance that the total inventory will rise by approximately 10,460 ML (390 ML/annum on average) over the Project life, compared to a build-up of 8,510 ML (315 ML/annum on average) for the base case.

There is a 10% chance that at least 11,200 ML will accumulate in the out-of-pit storages over the life of the Project, compared to 10,750 ML for the base case. There remains a 1% chance that the out-of-pit storages will reach the threshold at which water cannot be pumped in after Year 7 of operations and would remain at that threshold for the entire Project Life.

The forecast results for the out-of-pit water storage inventory under the high runoff scenario are provided in **Figure 32**.

Requirements to discharge under the HRSTS are predicted to increase in range between 7% and 15% (associated with range between 1st and 99th percentiles) on an average annual basis when compared to the base case. However, there still remains a less than 1% chance that offsite supplies will be required for the Project.

Similar to the base case, no modelled spills occur from the mine affected storages except for the Rail Loop Dam (with a 10% chance over the Project life of three spill days and an average spill volume of 16.2 ML/day) and the ROM Dam (with a 10% chance over the Project life of 27 spill days, and an average spill volume of 3 ML/day). Modifications are currently being implemented to divert overflows from the Rail Loop Dam into the North Pit for storage. For the ROM Dam (if required for the conveyor option), it is likely that adaptive management of the mine water management system would result in these spills being avoided through the redistribution of water on site, in a similar manner to the base case.

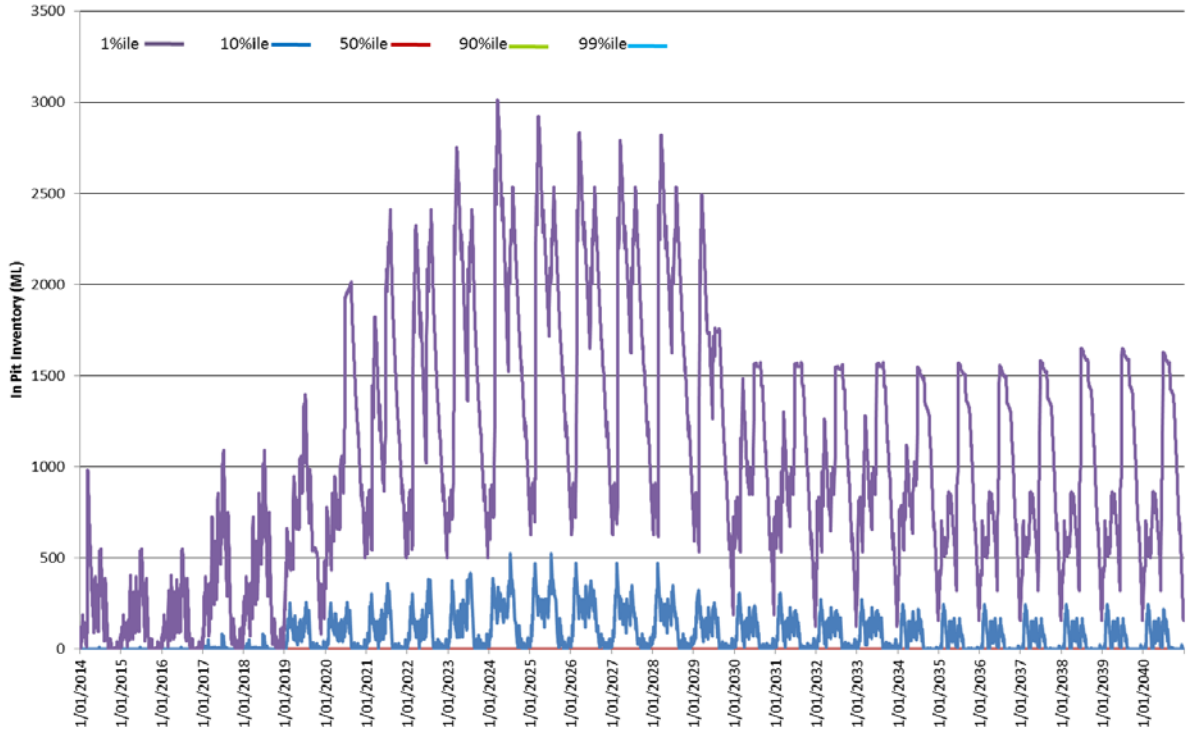


Figure 31
Forecast In-pit Storage Inventory – High Runoff Scenario

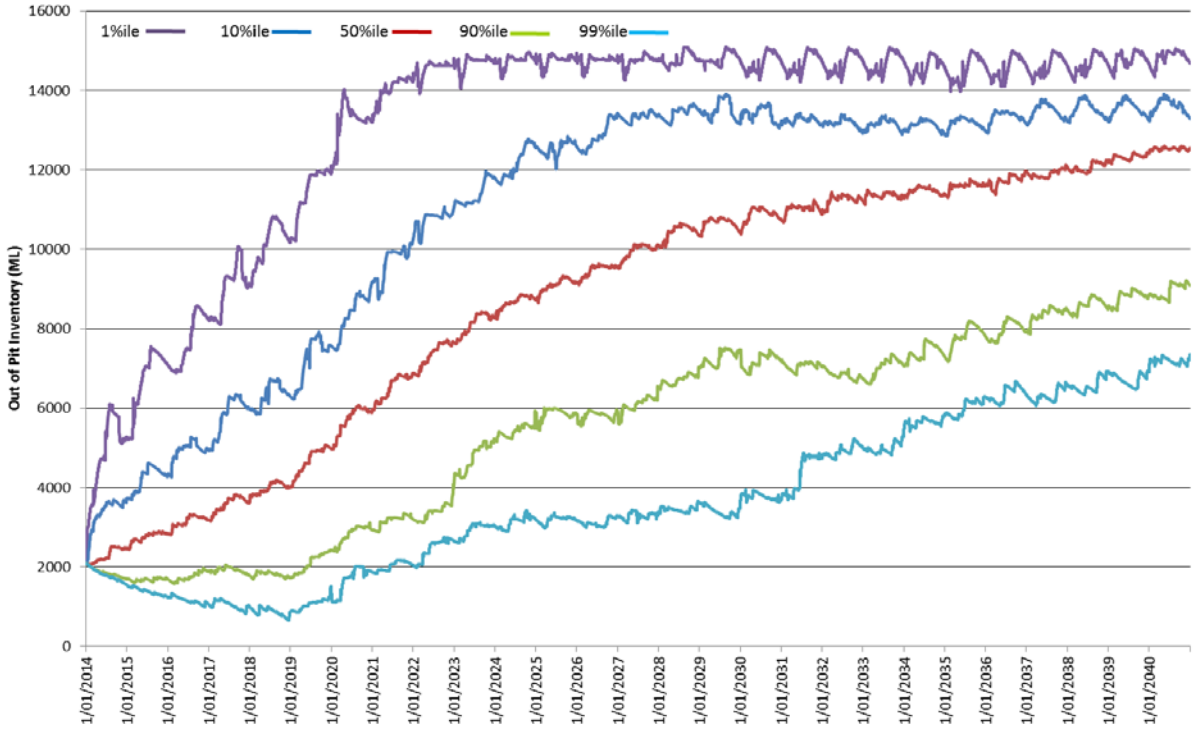


Figure 32
Forecast Out-of-pit Storage Inventory – High Runoff Scenario

Low Runoff Scenario

The results of the low runoff sensitivity analysis, compared to the base case (see Appendix M of the EA) indicate that for the in-pit storage inventory there remains a 50% chance there will be no build-up of water in the active mining areas.

There is a 10% chance that inundation in the combined mining areas would reach a maximum of at least 280 ML over the life of the Project, compared to 335 ML for the base case. It remains likely that this amount could be redistributed around the site or pumped directly to Houston Dam for release to the Hunter River under the HRSTS and not significantly impact on mining operations.

There is a 1% chance that inundation of the mining areas would reach at least 2,200 ML in 2024 (compared to 2,440 ML for the base case), with the risk of inundation increasing from approximately Year 7 (2020). This would be expected to significantly impact mining operations. During these periods an active mining area may need to be temporarily sacrificed for water storage. The current production schedule has the flexibility to cater for such scenarios. Therefore there are not likely to be any economic impacts from such an event.

The forecast results for the in-pit water storage inventory under the low runoff scenario are provided in **Figure 33**.

For the out-of-pit storage inventory there is a 50% chance that the total inventory will rise by approximately 7,080 ML (260 ML/annum on average) over the Project life, compared to a build-up of 8,510 ML (315 ML/annum on average) for the base case. There is a 10% chance that at least 10,300 ML will accumulate in the out-of-pit storages over the life of the Project, compared to 10,750 ML for the base case. On any day after approximately Year 8 (2021), there is 1% chance that the out-of-pit storages will be between approximately 13,000 and 14,000 ML.

The forecast results for the out-of-pit water storage inventory under the low runoff scenario are provided in **Figure 34**.

Requirements to discharge under the HRSTS are predicted to increase in range between 5% and 12% (associated with range between 1st and 99th percentiles) on an average annual basis when compared to the base case.

There remains a less than 10% chance that offsite supplies will be required for the Project. However, there is a 1% chance that at least 140 ML will be required over the life of the Project. The majority of this offsite demand would be required in Year 5 (2018). The WALs currently owned by Anglo American are likely to satisfy this supply shortfall under this scenario.

The forecast results for cumulative offsite water requirements under the low runoff scenario are provided in **Figure 35**.

Similar to the base case, no modelled spills occur from the mine affected storages except for the Rail Loop Dam (with a 10% chance over the Project life of three spill days and an average spill volume of 15.2 ML/day) and the ROM Dam (with a 10% chance over the

Project life of 14 spill days and an average spill volume of 3.8 ML/day). As stated previously, modifications are currently being implemented to divert overflows from the Rail Loop Dam into the North Pit for storage. For the ROM Dam (if required for the conveyor option), it is likely that adaptive management of the mine water management system would result in these spills being avoided through the redistribution of water on site, in a similar manner to the base case.

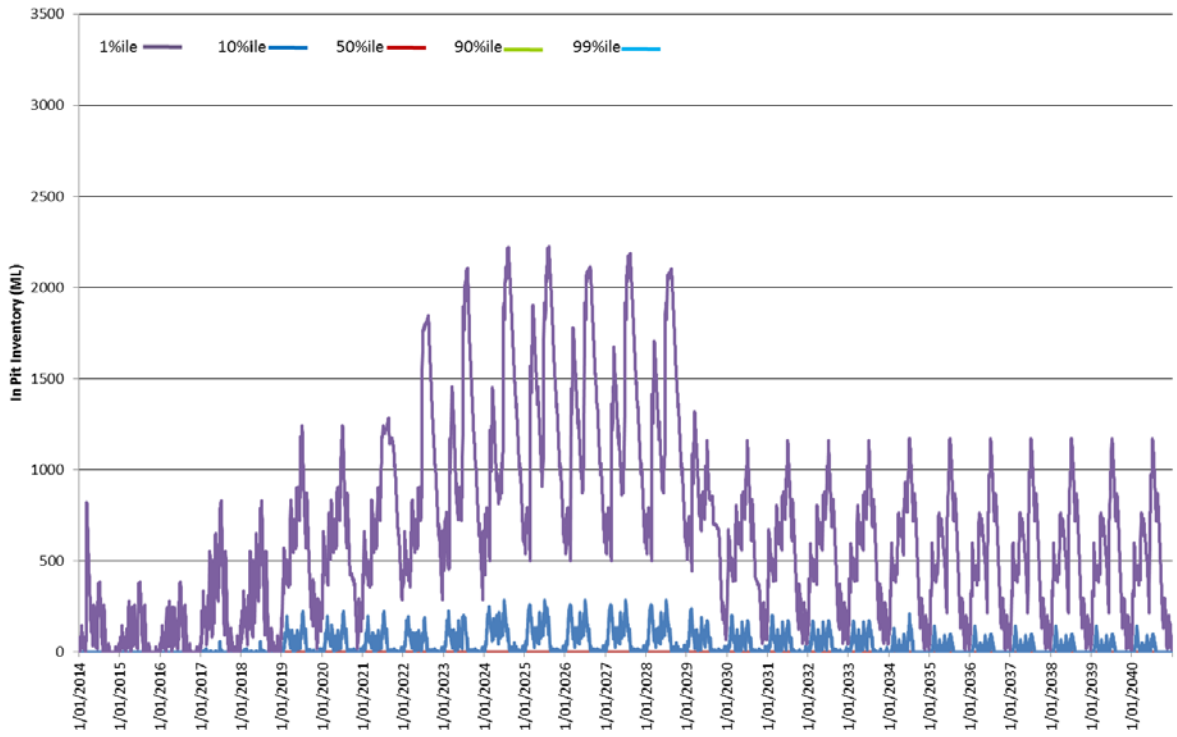


Figure 33
Forecast In-pit Storage Inventory – Low Runoff Scenario

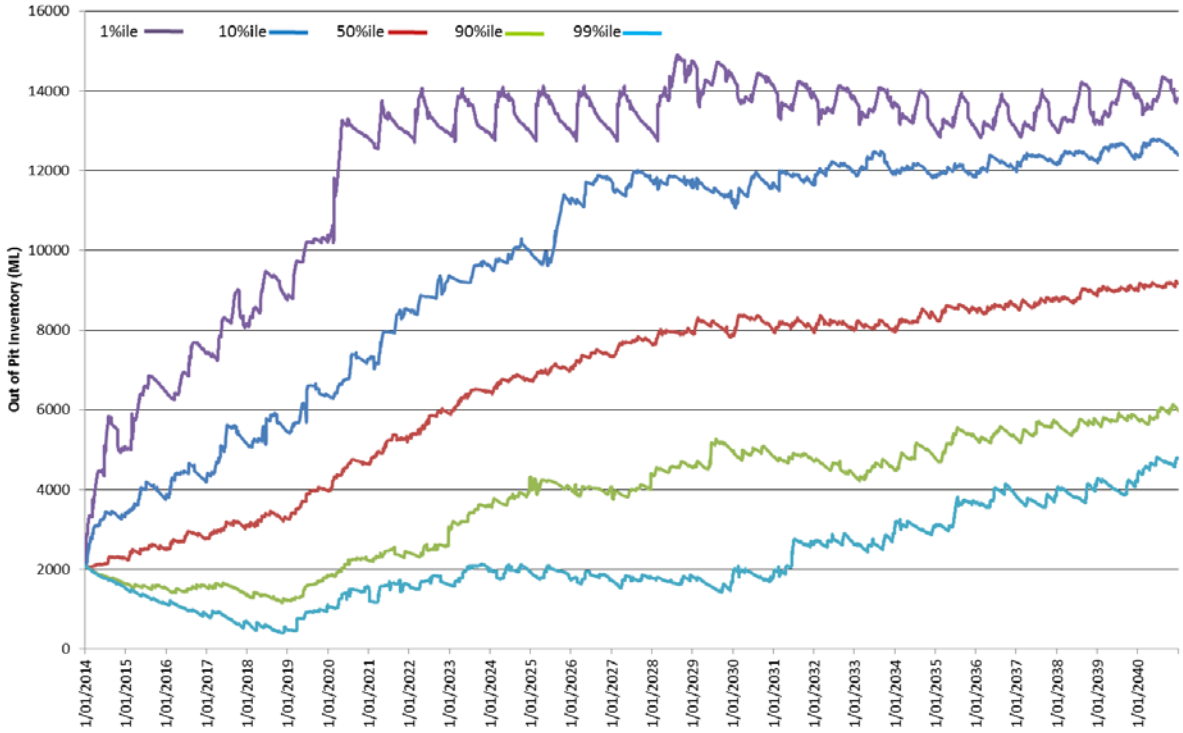


Figure 34
Forecast Out-of-pit Storage Inventory – Low Runoff Scenario

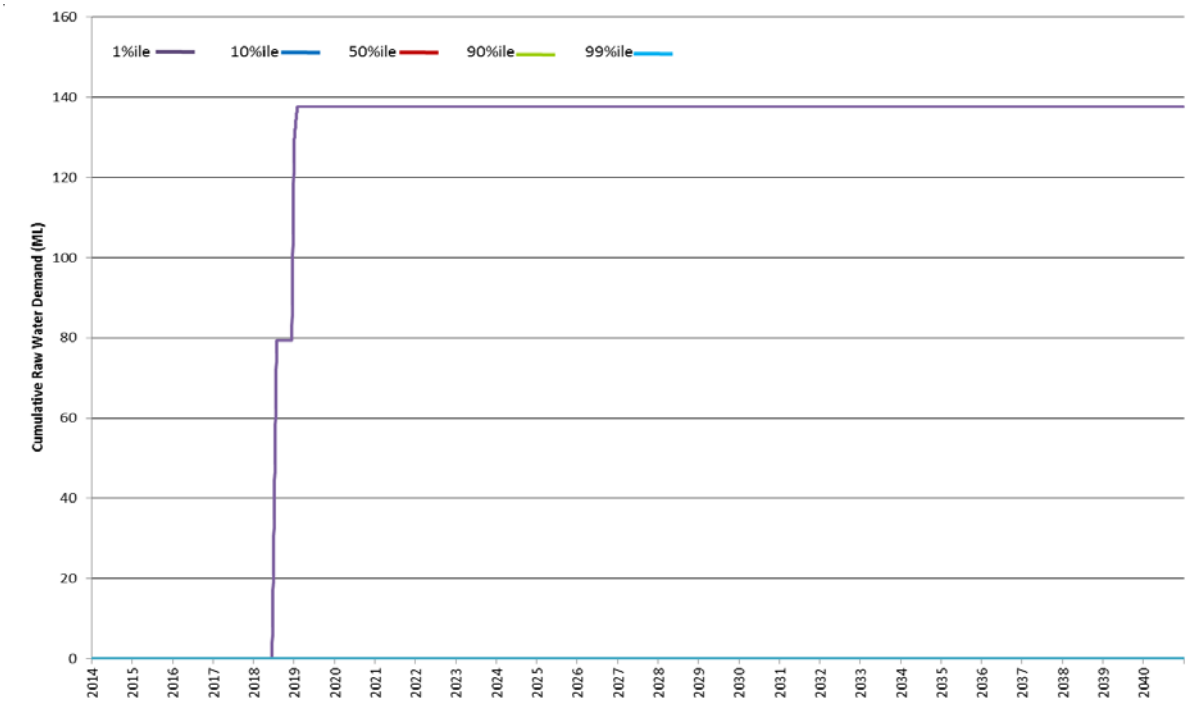


Figure 35
Cumulative Offsite Water Requirements – Low Runoff Scenario

4.11.11 Existing Drayton Mine Water Impacts

This section responds to the submission raised by a member of the public in relation to the impact of water runoff from the existing operations at Drayton Mine onto a private property.

Submission: P17

One Antiene area resident noted that surface water runoff from the existing operations at Drayton Mine flow onto their property as a result of a faulty septic system, which has in turn affected the quality of an onsite dam. This complaint was investigated and compared against Drayton Mine's environmental performance records for surface water management as outlined in the recent Annual Review (Anglo American, 2012). It was confirmed that the septic system was in good working order with no operational faults and was not responsible for any offsite contamination. The findings from the investigation were reported to the resident.

4.11.12 Mitigation and Management

This section responds to the submission raised by stakeholders regarding the management of surface water onsite at the Drayton Complex and offsite releases.

Submission: RA2 and SIG12

Anglo American commits to preparing a water management plan for the Drayton Complex to encompass new water management system components, procedures and targets required to avoid impacting on receiving waters. The water management plan will include:

- Regular review and validation of water balance model;
- Measures to manage, minimise and reuse onsite water within the management system;
- Erosion and sediment controls for the construction and operation of the Project;
- Surface water monitoring and reporting requirements for onsite and offsite water resources;
- Establish trigger levels and response procedures to be implemented in the event of significant variations from the predicted water balance results; and
- Measures to regulate offsite releases of dirty and mine affected water (HRSTS) into the receiving environment.

4.12 GROUNDWATER

4.12.1 Aquifer Interference Policy

This section responds to the submission raised by NOW in relation to the assessment of the Project against the Aquifer Interference Policy and the associated minimal impact considerations.

Submission: RA13

NOW asserts that the groundwater impact assessment (see Appendix N of the EA) only references the *Draft Aquifer Interference Policy* (NOW, March 2012) as opposed to the final

Aquifer Interference Policy (AIP) (NOW, September 2012). NOW recommends that the groundwater impact assessment be considered having regard to the requirements of the AIP.

The groundwater impact assessment undertaken for the Project and placed on public exhibition as part of the EA was assessed against the requirements of the final AIP. A detailed assessment against the final AIP is provided in **Appendix F**. As specified in NOW's submission, a summary of this assessment is provided below and in **Section 4.12.2**, **4.12.7** and **4.13**.

Minimal Impact Considerations

The minimal impact considerations of the AIP require:

- *"The cumulative water table and pressure head decline not more than 2 m at any water supply work."* Groundwater modelling undertaken for the Project indicates that the drawdown at all private bores is less than the 2 m trigger in the AIP;
- *"Less than or equal to a 10% cumulative variation in the water table, allowing for typical climatic post-water sharing plan variations, 40m from any high priority groundwater dependent ecosystem or high priority culturally significant site listed in the schedule of the relevant water sharing plan."* The *Water Sharing Plan for the Hunter River Unregulated and Alluvial Water Sources 2009* does not define any high priority groundwater dependent ecosystem or high priority culturally significant sites within the Drayton South area or its immediate surrounds; and
- For highly productive groundwater that:
    - *"Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity;*
    - *No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity. Redesign of a highly connected surface water source that is defined as a "reliable water supply" is not an appropriate mitigation measure to meet considerations 1(a) and 1(b);*
    - *No mining activity to be below the natural ground surface within 200 m laterally from the top of high bank or 100 m vertically beneath (or the three dimensional extent of the alluvial water source - whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply"; and*
    - *Not more than 10% cumulatively of the three dimensional extent of the alluvial material in this water source to be excavated by mining activities beyond 200 m laterally from the top of high bank and 100 m vertically beneath a highly connected surface water source that is defined as a "reliable water supply"."*

  As mining activities required by the Project will not occur near the Hunter River alluvium during mining and post mining, the final void will remain a sink to groundwater in the long term. In this regard, no impact on the beneficial use category of the Hunter River alluvium or the long term average salinity of the Hunter River is considered likely.

Furthermore, no mining activity will occur within 200 m laterally from the top of high bank of the Hunter River, and no alluvial material will be excavated.

4.12.2 Assessment Approach

Groundwater Model Peer Review

This section responds to the submissions raised by stakeholders regarding the requirement for the groundwater model adopted for the groundwater impact assessment (see Appendix N of the EA) to be peer reviewed.

Submission: RA13, RA17, SIG13 and SIG15

The groundwater impact assessment undertaken for the Project has been peer reviewed by Dr Noel Merrick (Heritage Computing Pty Ltd), a leading Australian groundwater modelling expert.

The peer review of the groundwater model was conducted in accordance with the principles of the *Australian Groundwater Modelling Guidelines* (Barnett et al., 2012) issued by the National Water Commission and structured according to the checklists of the *Murray Darling Basin Commission Groundwater Flow Modelling Guideline* (MDBC, 2001).

The peer review found that *"Overall, the groundwater assessment has been conducted to a very high level of competence and there has been a very thorough examination of the pertinent outputs and uncertainties of the modelling simulations. The stated project objectives have been addressed in full"* (Heritage Computing, 2013). The groundwater model peer review is provided in **Appendix G**.

The groundwater impact assessment has also been issued to the IESC for evaluation. As part of their review they did not raise any points of concern with the groundwater impact assessment that was undertaken for the EA.

Groundwater Model Uncertainty

This section responds to the submissions raised by HTBA regarding the level of uncertainty in the groundwater model.

Submission: SIG13

The predictive simulations from any groundwater model are based on available data characterising the groundwater system under investigation. It is not possible to collect all of the data characterising the whole aquifer system in detail and therefore various assumptions have to be made during the development of the groundwater model. The impact of these assumptions on the simulation results are outlined further in the groundwater impact assessment (see Appendix N of the EA).

Where an assumption was necessary, a conservative approach was taken, such as adopting model parameters from reasonable ranges so that the model would be representative of the worst case scenario. For example, no hydraulic barriers such as faults have been incorporated within the model domain thus allowing the predicted zone of depressurisation to develop unrestricted.

To account for uncertainty within parameters, a sensitivity analysis was undertaken to quantify the likely range of impacts on the groundwater regime. The parameters with the highest uncertainty and those most likely to affect the magnitude of the predictions are the un-calibrated storage parameters and the adopted recharge rates. The following perturbations were assessed in the sensitivity analysis for the life of the Project and post-mining recovery:

- A ±50% change in the rainfall recharge rate across the model domain;
- A ±50% change in the specific yield for all model layers;
- A ±50% change in the specific storage for all model layers; and
- A ±50% change in the horizontal and vertical hydraulic conductivity values for all model layers.

The sensitivity analysis indicated limited change in the model outputs, therefore increasing the degree of certainty in the predicted results.

The groundwater model peer review (see **Appendix G**), deemed that the uncertainty in the model findings is illustrated sufficiently through the outputs of the sensitivity simulations and that a conservative approach has been adopted in the case of uncertain assumptions.

Baseline Monitoring

This section responds to the submissions raised by stakeholders regarding the adequacy of the baseline groundwater monitoring data presented in the groundwater impact assessment (see Appendix N of the EA).

Submission: SIG13 and SIG15

Groundwater levels and chemistry have historically been recorded within the Drayton South area by a monitoring network comprising a total of 28 monitoring bores and vibrating wire piezometers.

Monitoring of pH and electrical conductivity has been undertaken from all monitoring bores on a regular basis since 2000 with laboratory analysis of ionic speciation recorded since 2009. Groundwater levels have also been regularly recorded from all monitoring bores since their installation between 1998 and 2011.

Fourteen of the monitoring bores and vibrating wire piezometers were installed with the aim, in the short term, to provide information regarding the hydraulic connectivity between the alluvium of Saddlers Creek and the Hunter River with the underlying Permian coal measures. The water level data collected from these monitoring bores and vibrating wire piezometers confirmed an upward hydraulic gradient exists between the coal measures and the overlying alluvial units. This data was used to confirm head gradients within the groundwater model.

The groundwater model peer review (see **Appendix G**), deemed that there is substantial monitoring data recorded since 1998 with sufficient new data obtained from monitoring bores and vibrating wire piezometers installed for the purpose of supporting the groundwater impact assessment undertaken for the Project.

Calibration Hydrographs

This section responds to the submission raised by NOW regarding the requirement to present calibration hydrographs.

Submission: RA13

Figures 10, 11 and 15 to 26 of the groundwater impact assessment (see Appendix N of the EA) presents hydrographs of the groundwater systems in the Drayton South area and its immediate surrounds, including the Saddlers Creek and Hunter River alluviums, Saddlers Creek regolith and the Jerrys Plains Subgroup Coal Measures. This information has been used to calibrate the groundwater model.

4.12.3 Final Void

Recovery Predictions

This section responds to the submissions raised by stakeholders regarding the long term recovery behaviour of the final void and its interactions with the surrounding groundwater environment.

Submission: SIG5, SIG8, SIG12, SIG13, P14, P28 and P37

The water balance of an open void is typically controlled by ongoing evaporative losses. Direct rainfall and runoff from surrounding areas assist the recovery of the water level in the final void. As the lake area increases, the evaporative losses increase and prevent further recovery. This process ultimately progresses towards an equilibrium where the volume of water input is balanced by the volume of water lost through evaporation. The water level within the void thus attains a steady state.

During early stages of recovery, a steep hydraulic gradient is predicted to exist between the water level of the final void and the surrounding aquifers. This gradient is expected to result in groundwater contribution to the final void. However, as the water level within the final void rises the hydraulic gradient becomes shallower resulting in reduced groundwater inflow.

Groundwater contribution from the Permian coal measures is predicted to decrease from less than 1 ML/day to zero over a period of approximately 700 years after mining. Therefore, no outflow of water into the surrounding aquifers is anticipated whilst a hydraulic gradient exists towards the final void.

The hydraulic gradient is predicted to be slightly reversed away from the final void after 700 years as the groundwater heads continue to recover toward equilibrium. The loss of water from the final void back into the coal measures is predicted to rise from 0.001 ML/day up to 0.02 ML/day during the period between 700 and 1000 years after mining.

To predict the time taken for water to move from the final void to the Hunter River alluvium, a hydraulic gradient towards the Hunter River of 0.016 and an average coal seam hydraulic conductivity of 0.02 m/day was adopted. The length of time for a water particle to migrate towards the Hunter River alluvium is calculated to be approximately 200 years after the hydraulic gradient towards the river was established (700 years after mining).

The existing or pre-mining hydraulic gradient already promotes upward leakage of Permian coal measure (basement) water into the Hunter River alluvium. Evidence of this process has been confirmed by groundwater head measurements and the occasional occurrence of moderate salinity levels within in the alluvial aquifers. The existing upward leakage of basement water into the Hunter River alluvium is estimated to be approximately 0.5 ML/day for the section of river located immediately south of the Project. To place the predicted impact into context, the maximum rate of water to potentially migrate from the final void into the Hunter River alluvium (0.02 ML/day) is calculated to be approximately 4% of the existing upward leakage.

Furthermore, the total volume of existing upward leakage of basement water into the Hunter River alluvium (0.5 ML/day) is a minor component of the overall water budget. The volume of groundwater discharge (as baseflow) into the Hunter River is simulated to be 54.7 ML/day of which the upward leakage of basement water accounts for approximately 1%.

To place the predicted impact of final void water seepage into context, a discharge rate of 0.02 ML/day is equivalent to approximately 0.04% of the total volume of groundwater that discharges into the Hunter River (as baseflow) along the section of river located immediately south of the Project.

The parameters with the highest uncertainty and those most likely to affect the magnitude of the predictions for the recovery of the final void are the adopted hydraulic conductivity and recharge rates. The sensitivity analysis indicated that even when a ±50% change in parameters were analysed the overall impact trend remains the same as the adopted base case.

Water Quality

This section responds to the submissions raised by HTBA regarding the water quality of the final void.

Submission: SIG13

The long term build-up of TDS (salts) in the final void was assessed in the surface water impact assessment (see Appendix M of the EA) using a water balance model, which was configured to replicate the final void behaviour. The water balance model was run using a historical rainfall data sequence from 1889 to 2010.

As outlined in **Section 4.11.6**, the water balance model predicted that TDS concentrations within the final void gradually increase to 7,000 mg/L (moderately saline) towards the end of the simulation period (122 years). The TDS concentrations are likely to continue to increase over time as water evaporates from the surface of the water body causing the salt load to increase towards 14,000 mg/L.

Groundwater within the existing Permian coal measures is known to be moderately saline with a mean TDS concentration of approximately 3,500 mg/L. In this regard, the quality of the water in the final void is comparable to the existing background concentrations of groundwater sourced from the Permian coal measures. Given the quality of the final void

water, it is considered suitable for primary industry with the principal use being stock watering.

Interactions of the final void with the surrounding groundwater environment are discussed in **Section 4.12.4** and **4.12.5**.

4.12.4 Hunter River Alluvial Aquifer

Groundwater Depressurisation and Leakage

This section responds to the submissions raised by stakeholders regarding the impact of the Project on groundwater levels, baseflow and upward leakage from the Permian coal measures associated with the Hunter River alluvial aquifer.

Submission: SIG3, SIG5, SIG8, SIG10, SIG11, SIG12, SIG13, SIG15, SIG16, P4, P14, P18, P20, P22, P31, P33, P37 and P41

The groundwater model predicted that the zone of depressurisation is not predicted to extend into the Hunter River alluvial aquifer at cessation of mining (Year 27). The zone of depressurisation is then predicted to gradually migrate towards the Hunter River upon reaching 1,000 years after mining but not measurably beneath the alluvial lands.

Under natural conditions, water from the coal measures is discharged under pressure into the basal sections of the Hunter River alluvium and colluvium along drainages. The current hydrogeological regime favours elevated groundwater levels and pressures within the coal measures, which dissipate regionally through upward leakage into the low lying alluvial systems along the Hunter River.

The rate of upward groundwater leakage from the coal seams into the Hunter River alluvium is predicted to remain unchanged for approximately 50 years after mining. However, given that the zone of depressurisation is predicted to expand with time this will result in the upward leakage being gradually reduced by a maximum of 0.01 ML/day at approximately 400 years after mining.

To place the predicted impact into context, the maximum reduction in the upward leakage is equivalent to a rate of about 0.0005 L/m^2/day (0.2 mm/annum) at approximately 400 years after mining. The rainfall recharge into the alluvial aquifer is predicted to be approximately 0.09 L/m^2/day (34 mm/annum). This will more than adequately compensate for any reduction in upward leakage from the coal measures.

Coolmore Australia asserts from the groundwater impact assessment (see Appendix N of the EA) that "*…the model is likely to under-predict the amount of upward leakage into the Hunter River alluvium*". This extract has been taken out of context and misinterpreted. The supporting paragraph outlined in the impact assessment attempts to explain that the model only calculated the volume of existing (pre-mining) upward leakage from the northern side of the Hunter River and did not include leakage from the southern side.

The model calculated a total (natural) upward leakage rate of approximately 0.27 ML/day to occur from the coal measures into the Hunter River alluvium, this being sourced only from the northern side of the river. An assumption was therefore made that a similar volume of

upward leakage would be provided to the Hunter River alluvium from the coal measures on the southern side of the river. If the Permian coal measures located on the southern side of the Hunter River alluvium provide a comparable flux, it is appropriate to assume that the Hunter River alluvium will receive a seepage flux in the order of approximately 0.5 ML/day.

Seepage fluxes determined at the cessation of mining indicate that the Hunter River alluvium will continue to receive seepage flux at a rate comparable to pre-mining conditions. However, as described above, the zone of depressurisation expands over time and the seepage flux to the Hunter River alluvium will be reduced by approximately 0.01 ML/day (i.e. 0.1 L/s) upon reaching 400 years after mining. This equates to approximately 2% of the total basement upward leakage volume and approximately 0.004% reduction of flow within the Hunter River during average flow conditions.

Assuming that all groundwater that recharges the alluvium, derived from rainfall or upward leakage, is eventually discharged into the Hunter River as baseflow, then it is predicted that the base flow into the Hunter River will be reduced by 0.01 ML/day at 400 years after mining. The resultant impact on baseflows in the Hunter River would be undetectable. To place this impact into context, the maximum reduction of baseflow into the Hunter River is about 0.04% of the 1% minimum flow (i.e. the flow rate that is exceeded 99% of the time) and is predicted to occur after many hundreds of years following the cessation of mining.

Existing Groundwater Users

This section responds to the submission raised by stakeholders regarding the potential reduction in water away from the Hunter River alluvial aquifer and the lagoon on Coolmore Stud as a result of the Project.

Submission: SIG10, SIG15, SIG16, P21 and P40

Coolmore Australia and other stakeholders identify that their operations are heavily reliant on groundwater from the Hunter River and that any significant reduction in these sources would cause implications for their enterprises.

It is acknowledged that the Hunter River alluvial aquifer plays an important role in the operation of many agricultural enterprises in the locality of the Project. As described in subsection *"Groundwater Depressurisation and Leakage"* the zone of depressurisation is predicted to extend towards the Hunter River but not measurably beneath the alluvial lands after many hundreds of years following the cessation of mining. This results in a very small reduction of the total basement upward leakage volume and flow within the Hunter River during average flow conditions. However, rainfall recharge into the alluvial aquifer will more than adequately compensate for any reductions. In this regard, the Project is not anticipated to impact on existing users of the Hunter River through a reduction in groundwater resources.

The estimation of evaporative losses from an existing lagoon located on Coolmore Stud provides a comparable example of a process that takes water from the Hunter River alluvium. The lagoon has a length of approximately 800 m and a width of 40 m, and is located approximately 170 m west (and parallel) to the Hunter River. Aerial mapping

suggests that the majority of the lagoon is located within the Hunter River alluvium. The evaporative loss of water from the lagoon has been calculated by applying an evaporation rate of 1080 mm/annum (approximately 70% annual pan evaporation) over the surface water area of the lagoon. This equates to a loss through evaporation of approximately 0.09 ML/day, which is nine times greater than the predicted maximum rate of loss from the Hunter River alluvium attributable to the Project. This indicates that natural processes will have a greater impact on the Hunter River alluvial aquifer than that predicted for the Project.

Water Quality

This section responds to the submissions raised by stakeholders regarding the movement of water from the final void to the Hunter River alluvial aquifer and the impacts on its water quality.

Submission: SIG2, SIG8, SIG10, SIG13, SIG15, SIG16, P4, P5, P6, P10, P12, P13, P14, P18, P20, P21, P22, P23, P24, P25, P26, P31, P33, P34, P37, P40 and P41

The Hunter River alluvial aquifer generally exhibits higher groundwater quality when compared to the Permian coal measures (approximately 3,500 mg/L). TDS concentrations typically range from approximately 400 mg/L to approximately 4,000 mg/L (fresh to moderately saline). The salinity range across the system reflects the variable recharge sources. Under natural conditions, saline water from the coal measures is discharged under pressure into the basal sections of the alluvium and colluvium along drainages. This process can result in pockets of variably saline water quality.

The flow rate within the Hunter River is approximately 250 ML/day (Station No. 210083, Hunter River at Liddell) during average flow conditions. In comparison, the volume of water predicted to migrate from the final void is 0.02 ML/day (see **Section 4.12.3**, subsection *"Water Quality"*), which is approximately 0.008% of the flow.

Furthermore, the historical average TDS concentration of water within the Hunter River (Station No. 210083, Hunter River at Liddell) is 507 mg/L. The TDS concentration within the final void after 122 years is predicted to range between 7,000 mg/L and 14,000 mg/L (see **Section 4.12.3**, subsection *"Water Quality"*).

To place the predicted impact into context, a hypothetical mixture between Hunter River water (250 ML/day at 507 mg/L) and final void water (0.02 ML/day at 7,000 to 14,000 mg/L) equates to an increase of approximately 0.02% to 0.1% to existing TDS concentrations. This hypothetical mixture represents a worst case scenario as it does not account for the significant dilution that would occur as the final void water migrates through the Permian and alluvial aquifers. Furthermore, the natural variability of TDS concentrations of the water in the Hunter River (standard deviation) is greater than any predicted increase. In this regard, water migrating from the final void will not have a measurable impact on the water quality of the Hunter River and the users that rely on its supply, including agricultural enterprises.

4.12.5 Saddlers Creek Alluvial Aquifer

Groundwater Depressurisation and Leakage

This section responds to the submissions raised by stakeholders regarding the impact of the Project on the Saddlers Creek alluvial aquifer.

Submission: RA13, RA17, SIG5, SIG8, SIG11, SIG12, SIG13, SIG16, P4, P14, P18, P20, P22, P31, P33, P37 and P41

The groundwater model predicted that at the cessation of mining the upward leakage from the Permian coal measures to the Saddlers Creek alluvium will be reduced to approximately 0.19 ML/day. The upward leakage will continue to decline to approximately 0.1 ML/day, over a period of 150 years after the cessation of mining, which equates to a total reduction of approximately 0.2 ML/day. The continuing decline in upward leakage to Saddlers Creek is predicted to be in response to depressurisation of the coal measures and adjacent regolith following mining. When considering the impact of the Project in conjunction with other mining operations, the upward leakage from the Permian coal measures is predicted to reduce even further (see **Section 4.12.6**).

Water Quality

This section responds to the submission raised by stakeholders regarding the movement of water from the final void to the Saddlers Creek alluvial aquifer and the impacts on its water quality.

Submission: RA17, SIG2, SIG8, SIG12, SIG13, SIG16, P4, P5, P6, P10, P12, P13, P14, P18, P20, P21, P22, P23, P24, P25, P26, P31, P33, P34, P37 and P41

The Saddlers Creek alluvial aquifer generally exhibits comparable groundwater quality to the Permian coal measures (approximately 3,500 mg/L). TDS concentrations typically range from approximately 5,700 mg/L to 6,100 mg/L (moderately saline). The salinity range across the system reflects the variable recharge sources. Under natural conditions, saline water from the coal measures is discharged under pressure into the basal sections of alluvium and colluvium along drainages. This process can result in pockets of variably saline water quality, especially in areas distant from the Hunter River.

Seepage flux contributing to the Saddlers Creek alluvium is predicted to be reduced to approximately 0.1 ML/day over a period of 150 years after the cessation of mining. The continuing decline in flux is in response to depressurisation of the coal measures and adjacent regolith. During this time, the groundwater quality may improve in the Saddlers Creek alluvium as the flux of higher salinity groundwater into the alluvium is predicted to be significantly reduced. This may result in a freshening of groundwater from the downward migration of rainfall and creek recharge.

At 1,000 years following the cessation of mining, the Saddlers Creek alluvial aquifer remains at a higher elevation to the final void water level and separated by material, which does not promote a hydraulic gradient. Given that a higher head exists within the overburden to the north and west of the final void, any water migration into the Permian coal measures will typically be in a southerly direction away from the Saddlers Creek alluvial aquifer.

The higher head within the overburden creates a pressure mound, which will promote some migration of groundwater towards the Saddlers Creek alluvium via the Permian coal measures. The geochemistry impact assessment undertaken for the Project (see Appendix P of the EA) confirms that the seepage generated by most overburden is anticipated to have concentrations of dissolved trace metals below that of applied water quality guideline criteria. These concentrations are unlikely to present any significant impacts to groundwater quality. The predicted salinity of the water held within the overburden will also be of a higher quality than the surrounding Permian coal measures, which may result in a freshening of the Saddlers Creek alluvial aquifer.

4.12.6 Cumulative Impacts

This section responds to the submissions raised by stakeholders regarding the cumulative impact of the Project on the surrounding groundwater environment.

Submission: RA17, SIG1, SIG3, SIG5, SIG8, SIG11, SIG12, SIG13, SIG15, SIG16, P4, P10, P14, P18, P20, P22, P24, P31, P33, P37 and P41

Groundwater models have previously been used to predict the potential impact associated with many mining projects within the Hunter Valley, including those existing operations surrounding the Project. Numerous impact assessments involving finite element modelling have been undertaken for Mount Arthur Coal Mine (AGE, 2006a; AGE, 2006b; AGE, 2009), Drayton Mine (AGE, 2006c) and Bengalla Mine (AGE, 2007). Finite difference modelling has also been adopted for the Mount Arthur Underground Project (MER, 2007).

Given the proximity of Mt Arthur Coal Mine to the Project, the groundwater impact assessment undertaken for the Mount Arthur Consolidation Project (AGE, 2009), which includes Mount Arthur North, Mount Arthur South Pit Extension, Saddlers Pit, Bayswater No.3 Pit, and Mount Arthur Underground, is relevant for the assessment of cumulative impacts.

The existing Drayton Mine is located to the east of the Mount Arthur Consolidation Project and north-east of the Project. Previous assessment of Drayton Mine (AGE, 2006c) has confirmed that the groundwater system surrounding the operation is hydraulically isolated by structural geological features. Therefore, potential cumulative impacts to groundwater arising from Drayton Mine are not likely. For this reason, the Drayton Mine was not included in the groundwater model domain for the Project.

Re-modelling of Mount Arthur Coal Mine, with the aim of replicating the previous predictive results, was not attempted for the Project as the predictive results of each previous model are still relevant, reliable and fit for purpose. That is, each model was designed to meet the objectives required for each individual project, which included a detailed appraisal of mine plans and geological structure. Furthermore, each previous model includes a unique set of qualitative and subjective interpretations, which would make replicating the results of each model (using a single cumulative model) very difficult. As such, the predictive results of each previous model were quantitatively incorporated into the assessment of cumulative impacts for the Project.

The groundwater model peer review (see **Appendix G**) acknowledged that the cumulative groundwater level and flux impacts of neighbouring mines had been assessed by discussion of the findings of previous (approved) modelling studies rather than independent simulation. Dr Noel Merrick deemed that this approach was sufficient and sensible for addressing the difficult and demanding requirements for cumulative impact assessment.

As mining proceeds, drawdown will occur at a greater rate than the recharge of the coal measures due to groundwater seepage into the mining area during extraction. A drawdown of up to 2 m is predicted to occur along a portion of the Saddlers Creek alluvial aquifer as a result of cumulative impacts associated with the Project and the adjoining Mt Arthur Coal Mine.

The vertical leakage fluxes between the alluvial deposits associated with Saddlers Creek and the underlying coal measures will be affected due to the proximity of the Project. The pre-mining net upward seepage flux to the Saddlers Creek alluvium is in the order of 0.31 ML/day. Operations at Mt Arthur Coal Mine are predicted to result in a maximum reduction in net flux of 0.19 ML/day along a 6 km section of the Saddlers Creek alluvium at the cessation of mining. The remaining flux to the Saddlers Creek alluvium (approximately 0.12 ML/day) may therefore be reduced to zero as a result of the Project.

Groundwater seepage from the coal seams is anticipated to continue recharging the lower portion of Saddlers Creek as it approaches the Hunter River, even during peak mining activities associated with the Project and Mt Arthur Coal Mine. In this regard, it is unlikely that the Hunter River will experience impacts from cumulative mining operations associated with the Project and Mt Arthur Coal Mine.

4.12.7 Mitigation and Management

This section responds to the submission raised by stakeholders regarding the management of groundwater at the Drayton Complex and offsite.

Submission: RA2 and SIG12

Anglo American commits to preparing a water management plan for the Drayton Complex to encompass new procedures and targets required to avoid impacting on receiving waters. The water management plan will include:

- Regularly assess and validate water balance assumptions based on groundwater monitoring results;
- Groundwater monitoring and reporting requirements for onsite and offsite water resources, including tailings and reject emplacement areas; and
- Established trigger levels and response procedures to be implemented in the event of significant variations from the predicted groundwater modelling results.

Monitoring Program

This section responds to submissions raised by stakeholders regarding the adequacy of the groundwater monitoring program.

Submission: RA13 and SIG15

NOW has advised that the groundwater monitoring and reporting program presented in the EA is satisfactory.

Trigger Levels

This section responds to the submissions raised by NOW regarding the requirement for a trigger action response plan.

Submission: RA13

A water management plan will be developed for the Drayton Complex, which will include a trigger action response plan. This will outline the response and investigation procedures which are to be implemented in the event of significant variations from the predicted results, as presented in the EA, on the surrounding groundwater environment.

Trigger levels for water quality will be developed only for the monitoring bores installed in the Hunter River and Saddlers Creek alluvial aquifers. A unique trigger for each bore will be required due to the variability of groundwater quality in the alluvial aquifers. Trigger levels will be developed after a minimum of two years of baseline data has been collected. The baseline monitoring period will allow the natural fluctuations in alluvial water levels due to variability in rainfall recharge and surface water flow to be assessed, and a method for separating mining induced water level fluctuations to be developed. Trigger levels for the monitoring bores installed in the Permian coal measures are not considered appropriate as the aquifer within and immediately surrounding the proposed mining area will be depressurised.

The trigger action response plan will incorporate, but not be limited to:

- Annual assessment of departures from identified monitoring data trends. If consecutive six monthly monitoring campaigns exhibit departure from the established or predicted trend then such variations should initiate a detailed review. This may include a need to conduct more intensive monitoring or to seek professional advice to compare against model predictions and/or instigate mitigative measures;
- An annual review of depressurisation in the coal measures and alluvial aquifers by a suitably qualified hydrogeologist. The validity of the model predictions will be reassessed every five years. If the data indicates significant divergence from the model predictions an updated or new groundwater model will be developed for simulation of mining. If future modelling predictions indicate losses from the alluvial water sources could exceed previous predictions, mitigation measures including purchase and retirement of existing water licences will be evaluated; and
- Reporting (including all water level and water quality data) as part of the Annual Review.

NOW wish to review and endorse the proposed trigger levels once established.

Replenishment of Saddlers Creek

This section responds to the submission raised by stakeholders in relation to the replenishment of groundwater to the Saddlers Creek alluvial aquifer to assist in rehabilitation efforts.

Submission: RA13 and RA17

NOW has recommended replenishment of groundwater to the Saddlers Creek alluvial aquifer as part of the restoration program. Replenishment of the alluvial aquifer along Saddlers Creek, by injection methods, is not considered feasible for the following reasons:

- The alluvium has a poor capacity to store and transmit water;
- The alluvium does not form a single, well-connected aquifer; and
- The alluvium is thin and has low to moderate permeability.

Alternatively, Anglo American will consider prioritising the release of good quality water (captured on site) within Saddlers Creek to offset the loss of base flow and encourage diffuse recharge to the alluvial aquifer via creek bed leakage.

Further details regarding the restoration of Saddlers Creek is outlined in **Section 4.17**.

4.13 WATER LICENSING

4.13.1 Maximum Predicted Water Take During Mining

This section responds to the submission raised by NOW in relation to the requirement to hold appropriate licenses to account for the "maximum predicted water take" from each water source as a result of the Project under the Water Act 1912 (Water Act) and Water Management Act 2000 (WM Act).

Submission: RA13

As indicated by NOW in their submission, WALs with sufficient water allocation (derived from share component) must be held under the WM Act to account for all water taken by the Project from a water source in any one *"water year"* (1 July to 30 June). Similarly, a groundwater licence under Part 5 of the Water Act with sufficient annual entitlement must be held to account for the maximum amount of water taken by the Project from outside a water sharing plan area (i.e. the Permian coal measures).

In this regard **Table 22** demonstrates the maximum predicted annual water take that would occur from surface and alluvial water sources (under the WM Act) while **Table 23** demonstrates the maximum predicted annual water take that would occur from groundwater (under the Water Act) as a result of the Project.

Anglo American already hold WALs with sufficient share component to account for the maximum predicted take from Management Zone 1B of the Hunter Regulated River Water Source, which is a minimal amount potentially attributable to alluvial drawdown.

Water will not be taken from the Jerrys Water Source until Anglo American has secured a WAL(s) with sufficient share component to authorise that take. Details with regard to the

requirement to obtain WALs for the Jerrys Water Source are provided below in the subsection "*Jerrys Water Source*".

Subject to further consultation with NOW, an application will be made for a licence under Part 5 of the Water Act with sufficient megalitres to authorise the maximum amount of groundwater taken by the Project at any one point during its life (see **Table 23**).

Table 22
Licences Under Water Management Act 2000

Water Source	Maximum Predicted Annual Water Take (During Mining)	Maximum Predicted Annual Water Take (After Mining)	Total Share Component Requirement for Project	Share Component Already held by Anglo American	Water Available in Water Source*
Hunter Regulated River Management Zone 1B	2 ML (during each year of Project)	4 ML (at 400 years post mining)	4 units	198 units	801 general security WALs with total share component of 128,544 unit and 159 high security WALs with total share component of 21,740 units
Hunter Unregulated and Alluvial Water Sources – Jerrys Water Source (Jerrys Management Zone) – Aquifer Take	45 ML (at Year 27 of Project)	76 ML (at 150 years post mining)	76 units	Nil	11 aquifer WALs with total share component of 1,246 units
Hunter Unregulated and Alluvial Water Sources – Jerrys Water Source (Jerrys Management Zone) – Unregulated River Take	67 ML	730 ML	730 units	Nil	18 unregulated river WALs with total share component of 2,097 units

** Water licence statistics are based on searches of the NOW water access licence conditions and statistics registers carried out in April 2013*

Table 23
Licences Under Water Act 1912

Water Source	Maximum Predicted Annual Water Take (During Mining)	Maximum Predicted Annual Water Take (After Mining)	Total Water Requirement for Project
Groundwater (Permian coal measures)	878 ML (at Year 10 of Project)	124 ML	878 ML

Jerrys Water Source

The necessary WAL(s) and share component must be held to authorise the peak annual take of water from the Jerrys Water Source under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*, including displacement of water from the Saddlers Creek alluvium and capture of surface water flows, before that take occurs.

The NOW submission notes that in determining long term access to the necessary entitlement regard must be had to the existing over-allocation of water for the Jerrys Water Source.

The predicted maximum take of water from the Jerrys Water Source is shown in **Table 22**. With regard to surface water flows in the Jerrys Water Source, these figures are based on the 90th percentile of rainfall years from a 122 year data set and exclude harvestable rights for the Project landholding.

The harvestable rights for the Project landholding have been calculated to be 185 ML during mining and 314 ML after mining. This was calculated in accordance with the relevant Harvestable Rights Order, on the basis of a landholding of 2,928 ha during mining (which excludes the area of the mine plan extent) and 4,776 ha after mining, a harvestable rights multiplier value of 0.07 ML/ha for the relevant area and subtracting the existing total farm dam capacity of approximately 20 ML. Subject to compliance with the requirements of the Harvestable Rights Order, this will be available to partially account for the predicted maximum annual surface water take from the Jerrys Water Source during mining and after mining.

NOW identifies that there are currently 4,198 unit shares in the Jerrys Water Source as a whole, whereas at the commencement of the water sharing plan the number within the water source was estimated to be 2,573 shares. Anglo American acknowledges that as a result of this potential over-allocation, it is unlikely that new licences will become available in the Jerrys Water Source, whether by *"controlled allocation"* under section 65 of the WM Act or otherwise and that any necessary entitlement will need to be purchased from the market.

Water will not be taken from the Jerrys Water Source (or any other source) until Anglo American has secured any necessary WALs with relevant allocation. In the Jerrys Water Source these licences will be:

- Category aquifer WAL(s) in respect of the displacement of water from the Saddlers Creek alluvium; and
- Category unregulated river WAL(s) in respect of surface water flows.

With regard to obtaining the necessary water licensing for the take of water from the Jerrys Water Source during mining it is noted that:

- A search of the NOW access license conditions register in April 2013 shows that there are 11 aquifer WALs with total share component of 1,246 units and 18 unregulated river WALs with a total share component of 2,097 units;

- Clause 72(2) of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* permits the conversion of an unregulated river WAL to an aquifer WAL and vice versa in the Jerrys Water Source;
- Clause 56 of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* makes provision for the carrying over of 1 ML per unit of share component for aquifer and unregulated river access licenses in the Jerrys Management Zone of the Jerrys Water Source from one year to the next, with the maximum volume taken in any three consecutive water years not to exceed the sum of water allocations accrued under the license from available water determinations during those years;
- Under clause 54(1) of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*, available water determinations for category aquifer WALs in the Jerrys Management Zone of the Jerrys Water Source are to be equal to 1 ML per unit of share component (subject to any revisions made after year 6 of the plan);
- Under clause 52 of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*, available water determinations for category unregulated river access licenses in the Jerrys Water Source (after the first year of the plan) are to be equal to 1 ML per unit of share component where possible or such lower amount resulting from clause 47. From 2010 to 2012, the available water determination for unregulated river WALs in the Jerrys Water Source has been 1 ML per unit of share component; and
- There are some restrictions on license dealings under clause 70(2) of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*.

It is considered that WALs with sufficient share component to authorise the predicted maximum take of water during mining from the Jerrys Water Source are able to be obtained, with depth in the market, relatively stable available water determinations and carryover provisions available for the Jerrys Management Zone of the Jerrys Water Source.

To the extent (if any) that water entitlements cannot be purchased to account for the take of water from the Jerrys Water Source, this is a commercial risk for the Project and would need to be addressed by variations to the mine plan to reduce the amount of water taken.

4.13.2 Post Mining Take

The predicted take of water from each water source affected by the Project during the post mine closure period will need to be the subject of appropriate licences. **Table 22** includes provision for the maximum predicted annual take of water from each relevant water source after mining.

Anglo American is required to hold all relevant licences, share component and allocation required to comply with the WM Act and the Water Act at all times water is taken or intercepted, whether during or after the life of the Project.

Further work will be undertaken as part of the detailed design and throughout the operational phase of the Project to divert water back to natural catchment in order to reduce as much as practicable water draining to the final void.

In respect of that water which will be taken or intercepted after mining, Anglo American will investigate (in conjunction with NOW) appropriate surrender of entitlements in lieu of holding licences indefinitely.

4.14 STYGOFAUNA

This section responds to the submission raised by Coolmore Australia regarding the sampling method adopted for the stygofauna impact assessment (see Appendix O of the EA) and the potential for the Project to impact on groundwater quality through the removal of stygofauna.

Submission: SIG15

4.14.1 Sampling Method

A stygofauna sampling program targeting the Hunter River and Saddlers Creek alluvial aquifers, and the underlying Permian aquifer was conducted within the vicinity of the Project.

The specifications described in the *Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia* (WA EPA, 2007) were used as a guideline for the sampling program. These guidelines stipulate that bores selected for sampling should not take place until at least three months after construction. This is to provide stygofauna with sufficient time to colonise the immediate vicinity of the bore following the disturbance of the area during construction.

A total of 24 bores in the vicinity of the Drayton South area were sampled in September 2011. Nine of the 24 bores were sampled within three months of construction. These nine bores were resampled in October 2011 to ensure compliance with the guidelines. At completion of the program, a total of 33 samples were collected.

For all cased bores with an internal diameter of 50 mm to 150 mm, samples were collected using the combined net and pump method (Hancock and Boulton, 2009). For wells and unlined bores, samples were collected with a net only. The water level at each bore was recorded prior to sampling followed by the measurement of pH, electrical conductivity, temperature and dissolved oxygen concentration after pumping 10 L, 50 L and then every 50 L thereafter.

4.14.2 Contribution to Groundwater Quality

Despite their small size, the cumulative effect of stygofauna metabolism and movement can play an important part in maintaining groundwater quality. This process is evident in alluvial aquifers where water flowing though sediment particles is cleaned during transit, in much the same way as water moving through slow sand filters or trickle filters in water and sewage treatment (Hancock et al. 2005). It is likely that through their movement and grazing of sediment-bound microbes, stygofauna also help prevent aquifer sediments from clogging (Hancock et al. 2005).

With regard to the sampling program undertaken for the Project, stygofauna were only detected at a single monitoring bore location in the alluvium of Saddlers Creek. The sample contained two stygofauna taxa, namely Ostracoda and *Diacyclops* sp., neither of which are endemic to the Saddlers Creek alluvial aquifer.

It is predicted that the Project will reduce the input from upwelling Permian water and cause depressurisation along parts of the Saddlers Creek alluvial aquifer as a result of mining. Given that this aquifer appears to be only sparsely populated, the Project is unlikely to impact the existing groundwater quality of its alluvial aquifer through the removal of stygofauna.

Beyond the Saddlers Creek alluvial aquifer, the Project is not anticipated to pose a threat to stygofauna within the region. As such, the Project will not impact the existing groundwater quality of other alluvial aquifers, as a result of the removal of stygofauna, including the Hunter River upon which Coolmore Stud relies on for irrigation water. Coolmore Stud's pumping stations on the Hunter River are a significant distance (approximately 6 km) from the Saddlers Creek alluvium.

4.15 SOIL AND LAND CAPABILITY

4.15.1 Soil Survey and Mapping

Drayton South Area

This section responds to the submission raised by DPI in relation to the scale adopted for the soil survey and the associated mapping of the Drayton South area.

Submission: RA2

The soil and land capability impact assessment undertaken for the Project (see Appendix Q of the EA), focussed on a detailed assessment of the Drayton South disturbance footprint. For this assessment, the Drayton South disturbance footprint was a defined area of 1,902 ha.

The soil survey of the Drayton South disturbance footprint was undertaken at a scale of 1:50,000 (medium intensity), which is considered suitable for strategic planning of more intensive land use development (McKenzie et al., 2008). According to the *Guidelines for Surveying Soil and Land Resources* (McKenzie, et al., 2008), a 1:50,000 scale survey requires a total of between 38 and 76 locations across the extent of the area of interest. These locations can include both soil profile exposures and surface observations.

A total of 26 soil profile exposures were collected within the Drayton South disturbance footprint. Due to the current condition of the land and its surrounds, numerous surface exposures are readily visible and identifiable. As such, a total of 22 surface observations were recorded thereby fulfilling the density requirements of a 1:50,000 scale survey. This approach provides a high degree of certainty of accurately identifying the soil types from the samples collected.

The remainder of the Drayton South area (2,695 ha), outside of and surrounding the disturbance footprint, will not be significantly impacted by the Project. In this regard, the land

was surveyed at a scale of 1:100,000 (medium to low intensity), which is considered suitable for characterisation of major land use types and for regional and local planning (McKenzie et al., 2008). According to the *Guidelines for Surveying Soil and Land Resources* (McKenzie, et. al., 2008), a 1:100,000 scale survey requires a total of between 13 and 27 locations across the extent of the area of interest.

A total of 11 soil profile exposures were collected and 17 surface observations were recorded within the remainder of the Drayton South area, thereby fulfilling the location density requirements of a 1:100,000 scale survey.

Photographs of the soil profile exposures sampled within the Drayton South area are shown in **Appendix H**.

In their submission, DPI noted that a soil survey scale of 1:5,000 was required to accurately characterise the land within the Drayton South disturbance footprint. However following further consultation and discussions with regard to the submission and an inspection of the Drayton South area on 26 February 2013, DPI officers advised that additional samples to achieve a soil survey scale of 1:5,000 as initially indicated in their submission was not necessary. As such the soil mapping presented in the soil and land capability impact assessment was considered by DPI to be adequate for purpose.

While it was agreed that the current density of sampling was adequate additional samples from the existing test pit locations were requested by DPI to accurately characterise and confirm the available topsoil resource within the Drayton South area. Further details with regard to this work as undertaken are provided in **Section 4.15.2**.

Offsite Biodiversity Offset Property

This section responds to the submission raised by DPI in relation to the assessment of soil types within the offsite biodiversity offset property.

Submission: RA2

As part of the biodiversity offset strategy for the Project an offsite biodiversity offset property has been acquired to compensate for any residual impacts generated by the Project on ecological values that cannot otherwise be offset within the Drayton South area. This will allow for a significant, intact and self-sustaining area of remnant vegetation and its associated habitat values to be protected in perpetuity.

The offsite biodiversity offset property is not mapped as SAL nor will it be directly impacted by means of surface disturbance through mining or any other activities. In this regard, the inherent agricultural land resource and its productivity will not be reduced by means outlined in Table 2 of the SRLUP. Rather the offset will be subject to a change in land use as a result of the Project. As such, a detailed soil and land capability impact assessment and associated mapping was not deemed necessary. This approach was discussed and agreed with DPI officers following further consultation and discussions with regard to their submission.

Based on the *Soil Landscapes of Murrurundi* (McInnes-Clarke, 2002), the offsite biodiversity offset property is predominantly represented by Slippery Rock. This soil landscape is

characterised by well to poorly drained brown and red dermosols on crests and side slopes. Well-drained, brown earths and lithosols on upper slopes, and poorly to imperfectly drained black dermosols are occasionally formed in this landscape. Poorly drained, black kandosols (alluvial soils) are also known to occur in drainage lines.

4.15.2 Topsoil Resource

This section responds to the submission raised by stakeholders in relation to the level of sampling data available to accurately characterise the quality of the topsoil for rehabilitation within the Drayton South area.

Submission: RA2 and P13

In order to adequately address this issue as raised by two submissions Environmental Earth Sciences conducted a round of additional soil samples at the existing test pit locations to accurately characterise the available topsoil resource within the Drayton South area. Additional samples were taken from each of the existing 38 soil profile sites and analysed for pH, electrical conductivity, chloride, cation and exchange capacity with 12 of the exposures analysed for Emerson Aggregate Test. All exposures were collected from the top 0.5 m of the soil profile.

The topsoil across the Drayton South area is generally slightly acidic to slightly alkaline, with pH measurements typically ranging from 5 to 7.5, and non-saline to slightly saline. The exchangeable sodicity percentage, calculated from cation exchange capacity concentrations, indicate that only a small proportion of the soil profile exposures are sodic. The key characteristics of each soil type identified within the Drayton South area are provided below. The pertinent soil survey field and laboratory results and associated transcripts are presented in **Appendix H**.

In consideration of the data presented in the soil and land capability impact assessment (see Appendix Q of the EA) and in this RTS, the risk of sodicity in the topsoil is low across the majority of the Drayton South area, however, it remains a limiting factor in the subsoil. As such, the topsoil is deemed suitable for retention and use in rehabilitation.

Mottled and Pedaric Brown Sodosol Complex (Soil Type 1)

The Mottled and Pedaric Brown Sodosol Complex exhibits sodic and saline subsoil, which has a tendency to slake when exposed to moisture. Due to the nature of the subsoil, it is not recommended for reuse in rehabilitation. This is consistent with the original findings of the soil and land capability impact assessment.

The additional surveyed exposures indicate that the top 0.2 m of the profile is generally non-sodic (exchangeable sodicity percentage of <5%). The topsoil varies between slightly acidic to slightly alkaline and is generally non-saline to slightly saline, which suggests it is suitable for reuse in rehabilitation. This is consistent with the original findings of the soil and land capability impact assessment.

Pedaric Brown Dermosol Complex (Soil Type 2)

The Pedaric Brown Dermosol Complex exhibits some sodic and moderately saline subsoil, which has a tendency to slake when exposed to moisture, although no dispersion has been noted. Due to the nature of the subsoil, it is not recommended for reuse in rehabilitation. This is consistent with the original findings of the soil and land capability impact assessment.

The additional surveyed exposures indicate that the top 0.25 m of the profile is generally non-sodic (exchangeable sodicity percentage of <5%). The topsoil varies between slightly acidic to alkaline and is generally non-saline to slightly saline, which suggests it is suitable for reuse in rehabilitation. This is consistent with the original findings of the soil and land capability impact assessment.

Brown Vertosol Complex (Soil Type 3)

The Brown Vertosol Complex exhibits sodic and saline subsoil, which has a tendency to slake when exposed to moisture, although no dispersion has been noted. Due to the nature of the subsoil, it is not recommended for reuse in rehabilitation. This is consistent with the original findings of the soil and land capability impact assessment.

The additional surveyed exposures indicate that the top 0.3 m of the profile is generally non-sodic (exchangeable sodicity percentage of <5%). The topsoil varies between slightly acidic to slightly alkaline and is generally non-saline to slightly saline, which suggests it is suitable for reuse in rehabilitation. This is consistent with the original findings of the soil and land capability impact assessment.

Orthic Tenosol Complex (Soil Type 4)

The Orthic Tenosol Complex exhibits some sodic and saline subsoil, which has a tendency to slake when exposed to moisture. Due to the nature of the subsoil, it is not recommended for reuse in rehabilitation. This is consistent with the original findings of the soil and land capability impact assessment.

The additional surveyed exposures indicate the top 0.2 m of the profile is generally non-sodic (exchangeable sodicity percentage of <5%). The topsoil varies between acidic to slightly alkaline and is generally non-saline to moderately saline, which suggests it is suitable for reuse in rehabilitation. This is consistent with the original findings of the soil and land capability impact assessment.

Topsoil Balance

Given that the additional soils assessment has only served to confirm the original findings of the soil and land capability impact assessment, the topsoil balance has not changed.

The recommended stripping depth and topsoil balance for the Project is outlined in **Table 24**. The estimated total volume of suitable topdressing material within the Drayton South disturbance footprint is approximately 4,151,000 m^3. Allowing for a 10% handling loss, approximately 3,735,900 m^3 of suitable topdressing is considered to be available.

Table 24
Topsoil Balance

Soil Type	Recommended Stripping Depth (m)	Disturbance Footprint (ha)	Volume Available (m^3)	Volume Available at 10% Loss (m^3)
1	0.20	1,124	2,248,000	2,023,200
2	0.25	450	1,125,000	1,012,500
3	0.30	122	366,000	329,400
4	0.20	206	412,000	370,800
Total Area (m^3)		**1,902**	**-**	-
Total Volume (m^3)		**-**	**4,151,000**	**-**
Total Volume (10% Handling Loss Allowance)		**-**	**-**	**3,735,900**

4.15.3 Land Capability

Drayton South Area

This section responds to submissions raised by stakeholders requiring further clarity of the land capability classes and associated mapping rationale within the Drayton South area having regard to criteria for BSAL.

Submission: RA2, P13, P30 and P41

The soil and land capability impact assessment undertaken for the Project (see Appendix Q of the EA) verified the land capability within the Drayton South area as ranging from Class IV to Class VII, with Classes VI and VII dominating the existing landscape (see **Figure 36**) . A comparison of the pre and post-mining land capability within the Drayton South area and the Drayton South disturbance footprint is provided in **Table 25**.

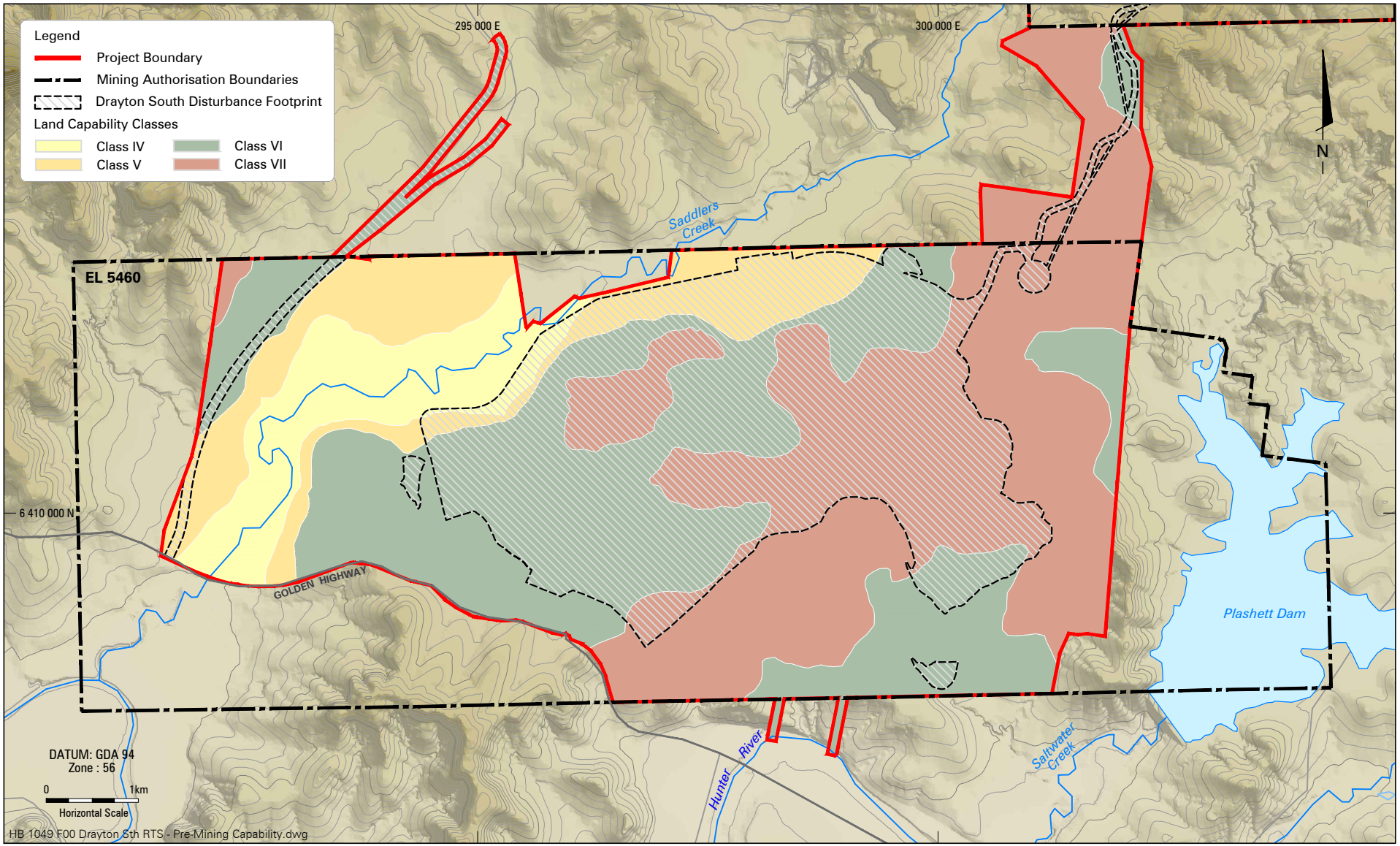
In their submission, DPI noted that the land capability rationale provided in the soil and land capability impact assessment was not clear in presenting the potential hazards and limiting factors of the land as per *The Land and Soil Capability Assessment Scheme: Second Approximation* (OEH, 2012b).

Appendix I provides a revised land capability rationale. This highlights that the key constraining factor limiting the land capability within the Drayton South area relates to slope. Salinity and sodicity are regarded as secondary constraining factors; however, this is only applicable at select sites within the Drayton South area.

Land capability is only one component of determining if land represents BSAL. **Section 4.16.2** provides an assessment of the land within the Drayton South disturbance footprint against the mapping and criteria for BSAL as stipulated by the SRLUP. This supports the mapping contained in the SRLUP and verifies that the land within the Drayton South area does not represent BSAL.

Table 25
Pre and Post-Mining Land Capability Classes

Land Class	Pre-mining			Post-mining		
	Drayton South Area		Disturbance Footprint (ha)	Drayton South Area		Disturbance Footprint (ha)
	Area (ha)	Area (%)	Area (ha)	Area (ha)	Area (%)	Area (ha)
Class I	0	0.0	0	0	0.0	0
Class II	0	0.0	0	0	0.0	0
Class III	0	0.0	0	0	0.0	0
Class IV	420	9.1	28	409	8.9	17
Class V	565	12.3	205	413	9.0	53
Class VI	1,749	38.1	920	1,892	41.2	1,080
Class VII	1,863	40.5	749	1,811	39.4	683
Class VIII	0	0.0	0	72	1.6	69
Total	**4,597**	**100.0**	**1,902**	**4,597**	**100.0**	**1,902**



DRAYTON SOUTH COAL PROJECT
RESPONSE TO SUBMISSIONS

Existing Land Capability

FIGURE 36

Offsite Biodiversity Offset Property

This section responds to the submission raised by DPI in relation to the assessment of land capability within the offsite biodiversity offset property.

Submission: RA2

As part of the biodiversity offset strategy for the Project an offsite biodiversity offset property has been acquired to compensate for any residual impacts generated by the Project on ecological values that cannot otherwise be offset within the Drayton South area. This will allow for a significant, intact and self-sustaining area of remnant vegetation and its associated habitat values to be protected in perpetuity.

The offsite biodiversity offset property is not mapped as SAL nor will it be directly impacted by means of surface disturbance through mining. In this regard, the inherent agricultural land resource and its productivity will not be reduced by means outlined in Table 2 of the SRLUP. Rather the offset will be subject to a change in land use as a result of the Project. In this regard, a detailed soil and land capability impact assessment and associated mapping was not deemed necessary.

4.15.4 Management and Mitigation

This section responds to the submission raised by DPI in relation to the treatment and management of topsoil.

Submission: RA2

The topsoil resource within the Drayton South area is generally non-sodic. Only a small proportion of the recommended topsoil to be stripped is predicted to display sodic characteristics. To manage this material, gypsum will be adopted as a treatment prior to stockpiling. For moderately sodic soils, gypsum will be applied at a rate of 1.25 to 2.5 t/ha. Although highly sodic soils are not predicted to contribute to the topsoil balance, gypsum will be applied at a rate of greater than 5 t/ha, in the event such material is encountered. On further assessment of the stockpile after treatment, if dispersion and crusting is occurring inhibiting aeration and infiltration of water gypsum will be applied at a rate of 0.6 t/1000 m^3.

Mulch may also be blended into the topsoil balance for the purpose of improving and consolidating soil structure, reducing crust formation and improving water infiltration. Organic matter binds soil aggregates together and helps resist physical breakdown of soil. Rates of mulch are varied within the literature as it depends on the type, moisture content and method of application. If mulch is used it must be mixed in conjunction with gypsum at a rate of 1.25 to 2.5 t/ha for highly sodic soils.

A range of other measures will be implemented for the management of the topsoil balance, including:

- Where topsoil must be stockpiled, efforts will be made to reduce compaction by keeping soil in as coarsely textured a condition as possible;

- Stockpiles will be a maximum of 3 m in height and if stored for greater than 12 months will be shaped to be free draining, seeded, fertilised and treated for weeds prior to respreading;
- Stockpiles will be monitored throughout the life of the Project. Records of observations will be retained and if required corrective action will be undertaken;
- Thorough seedbed preparation will be undertaken to ensure optimum establishment and growth of vegetation with all topsoiled areas lightly contour ripped to create a "*key*" between the soil and the overburden. Ripping will be undertaken on the contour, preferably when soil is moist. The respread topsoil surface will be scarified prior to, or during seeding, to reduce runoff and increase infiltration via tilling with a fine tyned plough or disc harrow; and
- An inventory of designated areas and volumes of topsoil will be maintained to ensure adequate material is available for planned rehabilitation activities.

The above management and mitigation measures will be included in the land management measures as a component of the broader rehabilitation plan (as required by DRE) for the Drayton South area.

4.16 AGRICULTURE

4.16.1 Project-Related Agricultural Enterprises

This section responds to the submissions raised by stakeholders in relation to the agricultural characteristics of the Drayton South area and the enterprises it supports.

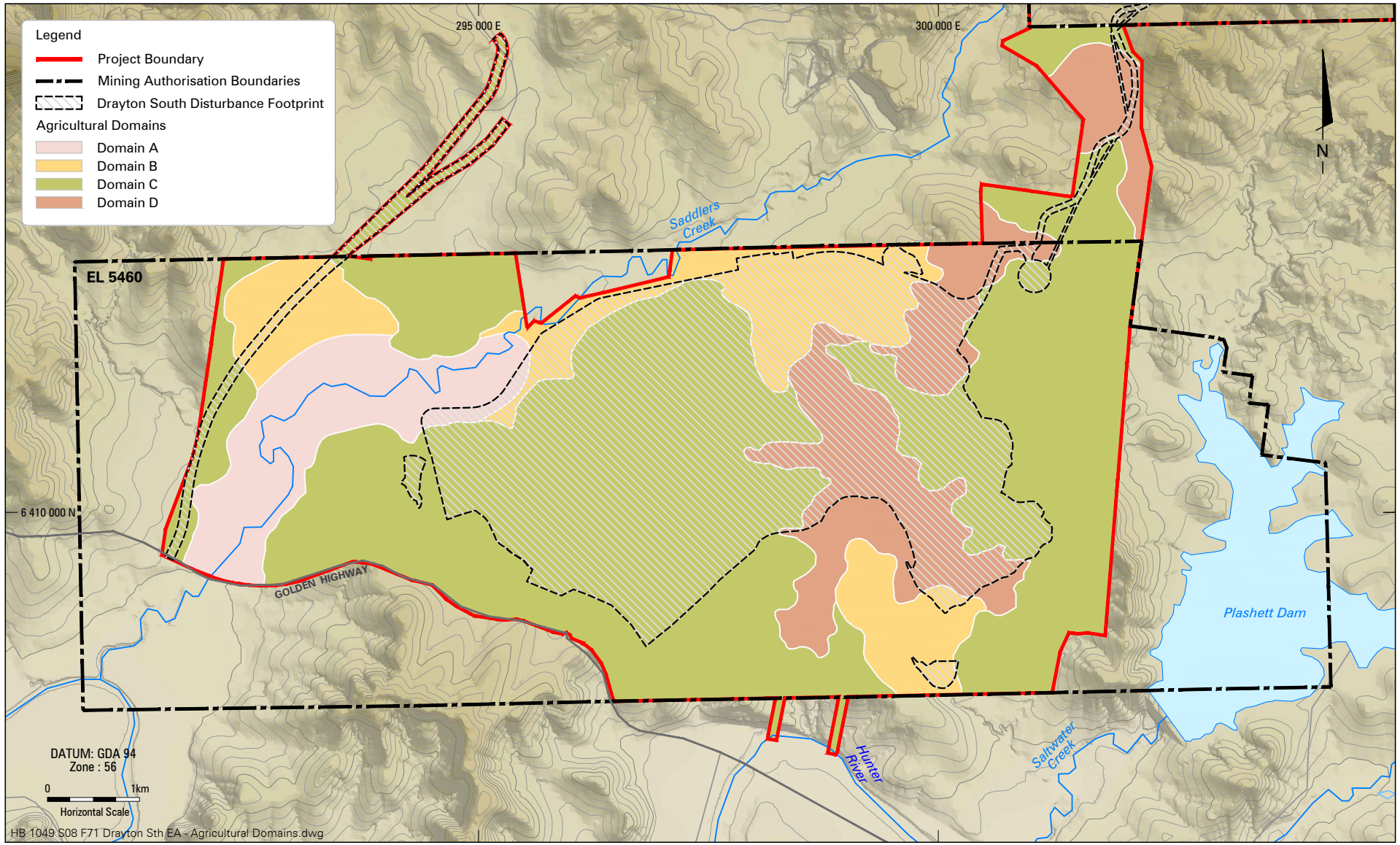
Submission: RA2 and SIG15

The Drayton South area is represented by four agricultural domains based on soil type, land capability and agricultural suitability. The domains are as follows:

- Domain A: Area being the creek flats of Saddlers Creek and lower slopes, dryland country suited to fodder cropping as part of a fodder cropping improved pasture rotation or grazed as unimproved pasture;
- Domain B: Area being creeks flats and lower slopes suited to occasional fodder cropping or pasture improvement or grazed as unimproved pasture;
- Domain C: Area being lower to mid slopes, requiring soil conservation works/minimum tillage techniques to establish improved pastures or grazed as unimproved pasture; and
- Domain D: Area being steeper slopes, not suited to any cultivation due to erosion risk, restricted to native pasture or aerial semi-improved pasture improvement.

The distribution of each domain within the Drayton South area is illustrated in **Figure 37**.

The soil and land capability characteristics of the Drayton South area are presented in **Section 4.15**.



DRAYTON SOUTH COAL PROJECT

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Drayton South Agricultural Domains

FIGURE 37

The predominant agricultural land use within the Drayton South area is associated with cattle grazing with the major enterprise being beef cattle breeding for weaner and domestic markets. Under current farming practices and land conditions, the Drayton South area is capable of carrying 1,140 head of cattle/annum. This equates to a gross value of $0.7 M/annum when sold to market.

In 2010, the lessee operating within the Drayton South area undertook opportunistic horse agistment for a single breeding season given the overflow of mares in the area. The mares were contained within temporary yards constructed of steel star posts and electric fencing tape. The majority of the yards were dismantled at the end of the season; however, a small area was retained for the upkeep of the lessee's riding horses. This short term agistment operation has no relationship with the premier thoroughbred horse breeding operations of neighbouring horse studs.

Drayton South Disturbance Footprint

This section responds to the submissions raised by stakeholders in relation to the onsite scheduling, quantum and value of the land and agricultural production foregone as a result of the Project and its effect on relevant supporting industries. It also describes the proposed final land use upon cessation of mining and a justification for this change.

Submission: RA2, P5, P8, P10, P12, P13 and P41

Agricultural land situated within the Drayton South disturbance footprint will be progressively removed from production as a result of the Project. This will occur in parallel with the staged mine plans, as shown in Figure 14 to 17 of the EA, until approximately Year 10. From this time onwards, the entire Drayton South disturbance footprint will be excluded from agriculture for safety purposes. Measures to manage the removal of agricultural land are outlined in **Section 4.16.9**.

Following the cessation of mining, land within the Drayton South disturbance footprint will no longer be available for agricultural purposes. The affected land will be rehabilitated to establish Narrabeen Footslopes Slaty Box Woodland and Central Hunter Box-Ironbark Woodland communities and protected in perpetuity as an onsite biodiversity offset for the Project.

The biodiversity offset strategy for the Project adopts a "*maintain and improve*" approach and aims to offset the impacts on threatened ecological communities, MNES and habitat for threatened fauna firstly on site within the Drayton South area. This will ultimately create connectivity between larger remnant patches of vegetation in the locality and retain vegetation on the Hunter Valley floor. In this regard, the improvement of ecological values within the Drayton South disturbance footprint and the broader Drayton South area justifies the change in land use from agricultural production to biodiversity conservation. The biodiversity offset package for the Project is discussed further in **Section 4.8**. The justification for land use amendments is further supported in the accompanying subsection "*Economics*".

The Drayton South disturbance footprint is capable of carrying 432 head of cattle. Once this area is exclusively dedicated for mining purposes, the agricultural production foregone equates to a gross value of $0.3 M/annum. Conservatively assuming that agricultural production from the entire Drayton South disturbance footprint ceases at the commencement of the Project, the agriculture foregone equates to a gross value of $3.7 M (present value using a 7% discount rate).

The loss of 432 head of cattle/annum from total production on site will result in secondary impacts on related supporting industries. The two closest regional sale yards with weekly prime sales are at Scone and Singleton. The *National Livestock Reporting Service NSW Cattle Saleyard Survey* for the financial year ended 30 June 2011 (MLA, 2011a) indicates that the Scone and Singleton sale yard had a throughput of 76,402 and 56,903 head, respectively.

If it is assumed that all cattle from the Drayton South disturbance footprint are sold through the Scone and Singleton sale yards, the expected number to be turned off represents 0.6% of Scone's throughput or 0.8% of Singleton's throughput. Based on the Upper Hunter Shire Council's yard charges of $8.18/head, the Scone sale yard would be set to forego $3,534 of income per annum from the loss of 432 head of cattle that could be produced from the Drayton South disturbance footprint (if all were sold through Scone). Yard charges for Singleton are not available; however, a similar figure to Scone would be expected.

The agricultural output from the Drayton South disturbance footprint represents a relatively small contribution to local supporting industries. In this regard, it is unlikely that the loss of income will significantly impact the economic viability of these industries.

Agricultural Land Reserve

This section responds to the submissions raised by stakeholders in relation to the land to be reserved in the Drayton South area for agricultural purposes. It provides clarification of available land, intended enterprises, sustainability of continued agricultural production and an assessment of potential impacts of the Project on this production.

Submission: RA2 and P8

During the life of the Project, the majority of the land situated outside of the Drayton South disturbance footprint owned by Anglo American will be reserved for agricultural purposes. Land to be considered for continued agricultural use includes the area to the west near Saddlers Creek (western sector), to the east towards Plashett Dam (eastern sector) and to the south beyond the existing ridgeline (southern sector) as shown on **Figure 38**. **Table 26** outlines the soil types, agricultural domains and land capability predominantly associated with each sector. The majority of the land associated with Domain A and B has been set aside for continued agricultural production.

Table 26
Agricultural Land Reserve Characteristics

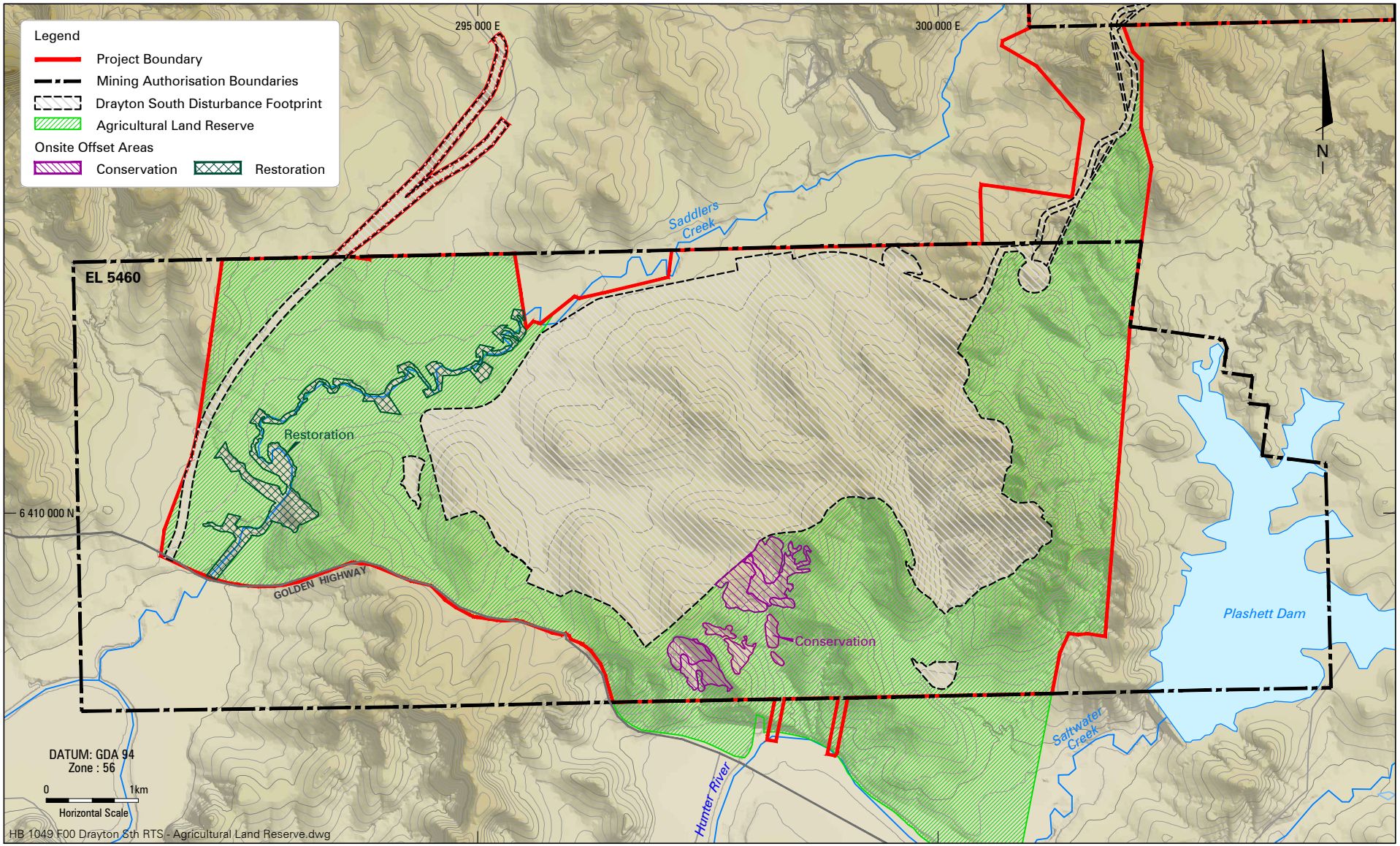
Sector	Domain	Soil Type*	Land Capability
Western sector	A, B, C	1, 2, 3	IV, V, VI
Eastern sector	C	1, 2	VI, VII
Southern sector	B, C, D	1	VI, VII

** See **Section 4.15** for soil types.*

Given the availability and characteristics of the agricultural land reserve, the majority of this area will continue to be dedicated to beef cattle production for weaner and domestic markets. The land will be managed as a contiguous unit with cattle grazing rotated between the three sectors. Sustainable farming practices to be adopted are discussed further in **Section 4.16.9**.

The agricultural land reserve still retains the capacity to sustain a viable beef cattle enterprise with approximately 605 head of cattle/annum predicted to be produced in conjunction with the operations of the Project. This agricultural production equates to a gross value of $0.4 M/annum when sold to market.

With continued operations on this land still capable of producing 605 head of cattle, this will generate an income of $4,949/annum to the Scone sale yard (based on the Upper Hunter Shire Council's yard charges of $8.18/head). This figure would be similar for the Singleton sale yard.



DRAYTON SOUTH COAL PROJECT
RESPONSE TO SUBMISSIONS

Agricultural Land Reserve

FIGURE 38

Predicted Air Quality Impacts on Agricultural Production

Feed (grassland) and cattle run on the agricultural land reserve will be subject to dust generated by the Project. In consideration of the revised air quality modelling (see **Section 4.2**), the Project is predicted to generate dust deposition concentrations of approximately 2 g/m^2/month over the three sectors, which is within the human amenity cumulative criterion of 4 g/m^2/month.

Doley and Rossato (2010) reported that "*Deposition of mining, quarry and road dust on vegetation canopies has been observed to inhibit plant growth when dust burdens exceed 7 g/m^2*". Based on the research undertaken by Doley and Rossato (2010), the predicted dust deposition concentrations generated by the Project (alone or cumulatively) is not considered to reduce the growth and hence productivity of the feed over the three sectors of the agricultural land reserve.

A study undertaken by Andrews and Skriskandarajah (1992) investigated the effects of dust generated from coal mines on cattle production. It was found that cattle did not find feed unpalatable nor did it affect the amount eaten at a dust concentration of 4,000 mg/m^2/day, which is equivalent to a monthly dust deposition concentration of 120 g/m^2. This is substantially greater than the concentrations predicted over the three sectors of the agricultural land reserve. Furthermore, Kannegieter (2006) reported that there is little scientific evidence which demonstrates a definitive adverse effect on the increase in dust levels on grazing animals.

Based on the revised air quality modelling and the research undertaken by Andrews and Skriskandarajah (1992) and Kannegieter (2006), the predicted dust deposition concentrations generated by the Project (alone or cumulatively) is not anticipated to impact on the health and hence productivity of cattle to be run on the agricultural land reserve. In support of this conclusion, Mt Arthur Coal Mine has demonstrated (through existing operations) that it is capable of undertaking mining activities in conjunction with the Angus and Wagyu beef cattle enterprise run on the neighbouring Edderton property without causing notable impacts on agricultural production (NSW Minerals Council, 2012b).

Predicted Noise Impacts on Agricultural Production

Cattle run on the agricultural land reserve will be subject to noise generated by the Project of 40 dBA on average under worst case meteorological and operating conditions over the three sectors (see **Section 4.4**). This represents a 5 to 10 dBA increase above rating background levels (pending the receiver location).

Heffner and Heffner (1983) documented that cattle showed a gradual increase in sensitivity as frequency increased to the point of best hearing at 8 kHz. This was followed by a rapid decrease in sensitivity until reaching the upper limit of audibility, which at an intensity of 60 dBA extends from 23 Hz to 35 kHz.

At an intensity of 40 dBA, audiograms (Heffner and Heffner, 1983) correlate with a frequency of approximately 0.062 kHz and 32 kHz, which is within the range of hearing for cattle. However, given that these frequencies are not close to the best point of hearing in cattle the

Project is not anticipated to have any significant impact on the health or productivity of cattle run on the agricultural land reserve. In support of this conclusion, Mt Arthur Coal Mine has demonstrated (through existing operations) that it is capable of undertaking mining activities in conjunction with the Angus and Wagyu beef cattle enterprise run on the neighbouring Edderton property without causing notable impacts on agricultural production (NSW Minerals Council, 2012b).

Offsite Biodiversity Offset Property

This section responds to the submissions raised by stakeholders in relation to the quantum and value of the land and agricultural production foregone on the offsite biodiversity offset as a result of the Project and its effect on relevant supporting industries. It also describes the proposed final land use upon cessation of mining and a justification for this change.

Submission: RA2

To achieve the required outcomes of the Project's biodiversity offset package, the offsite biodiversity offset property has been acquired to compensate for any residual impacts generated by the Project on ecological values that cannot otherwise be offset on site. The property retains approximately 2,000 ha of existing "*like for like*" threatened ecological communities listed under the EPBC Act and TSC Act. This will allow for a significant, intact and self-sustaining area of remnant vegetation and its associated habitat values to be protected in perpetuity. In this regard, the conservation of existing ecological values within the offsite biodiversity offset area justifies the change in land use from agricultural production to biodiversity conservation. The biodiversity offset package for the Project is discussed further in **Section 4.8**. The justification for land use amendments is further supported in the accompanying subsection "*Economics*".

Anglo American is committed to managing part of the offsite biodiversity offset property for agricultural purposes, where current land practices apply, in conjunction with conservation efforts to improve ecological values and outcomes.

The offsite biodiversity offset is capable of carrying 192 head of cattle, 940 head of wethers and 43,766 kg of wool per annum. Once this area is exclusively dedicated for ecological conservation, the agricultural production foregone equates to a gross value of $0.5 M/annum. Conservatively assuming that agricultural production from the entire offsite biodiversity offset property ceases at the commencement of the Project in perpetuity, the agriculture foregone equates to a gross value of $7.2 M (present value using a 7% discount rate).

The loss of 192 head of cattle, 940 head of wethers and 43,766 kg of wool per annum will result in secondary impacts on related supporting industries.

If it is assumed that all cattle from the offsite biodiversity offset property are sold through the Scone sale yards, the expected number to be turned off represents 0.3% of its throughput. Based on the Upper Hunter Shire Council's yard charges of $8.18/head, the Scone sale yard would be set to forego $1,570 of income per annum from the loss of 192 head of cattle that could be produced from the offsite biodiversity offset property.

The *National Livestock Reporting Service NSW Sheep Saleyard Survey* for the financial year ended 30 June 2011 (MLA, 2011b) indicates that the Tamworth sale yard had a throughput of 173,555 head. The 940 wethers from the offsite biodiversity offset property represents 0.54% of its throughput. Based on the Tamworth Regional Livestock Exchange yard charges of $0.70/head, the Tamworth sale yard would be set to forego $658 of income per annum from the loss of 940 head of wethers that could be produced from the offsite biodiversity offset property.

Yennora is the closest auction facility for wool to the offsite biodiversity offset. Assuming an average bale weight of 176.8 kg (Australian Wool Exchange, 2012) the total wool clip from the offsite biodiversity offset property would be 156 bales/annum. Based on $1.50/bale, the Yennora sale facility would be set to forego $234 of income per annum from the loss of 156 bales that could be produced from the offsite biodiversity offset property.

The agricultural output from the offsite biodiversity offset property represents a relatively small contribution to local and regional supporting industries. In this regard, it is unlikely that the loss of income will significantly impact the economic viability of these industries.

Cumulative Impacts

This section responds to the submissions raised by stakeholders in relation to the cumulative impacts of agricultural land resources and enterprises foregone in the region.

Submission: RA2 and SIG3

DPI has requested that the cumulative impacts of the permanent removal of other grazing lands due to adjoining mining offsets (biodiversity and cultural) in the Upper Hunter region combined with the removal of the land to be affected by the Project be assessed.

As stipulated in the SRLUP, the government is in the process of developing a cumulative impact assessment methodology to manage the cumulative health and amenity impacts of mining and coal seam gas proposals. This methodology will consider whether cumulative impact thresholds or tipping points can be adequately described and predicted. It will also address cumulative impacts on agricultural lands and water resources.

Given the uncertainty of the assessment methodology and the impracticality of obtaining all relevant information by a single proponent on agricultural land currently reserved as a mining offset (biodiversity and cultural), a cumulative assessment of this nature has not been prepared.

Economics

This section responds to the submissions raised by stakeholders in relation to the local and regional economic impacts of the agricultural land resources and production foregone as a result of the Project.

Submission: RA2

Regional Impacts

DPI identified that the economic impact assessment undertaken as a component of the agricultural impact statement (see Appendix R of the EA) does not adequately quantify the impacts of agricultural production foregone as a result of the Project, however, considers the reduction in agricultural land values as a proxy for this cost.

In response, the value of a property represents the present value of the stream of benefits that can be obtained from that land, including the future stream of income from any agricultural production. Any impact on agricultural land will therefore be reflected in the value of a property.

Agricultural land and water are market goods. The market will allocate these resources to their most productive use for society. The exception is where a change in land use or water use may result in market failure through the occurrence of externalities. In these circumstances, markets will not allocate resources to maximise economic welfare. Government intervention may therefore be required to determine how resources should be allocated having consideration of the costs and benefits by means of a benefit cost analysis (BCA).

The essence of BCA is the estimation of the extent to which a community benefits or is disadvantaged by a resource reallocation and a comparison of these two figures. If the benefits are greater than the costs of the intervention then it provides net benefits to the community and results in an improvement in economic efficiency.

The Project will impact on agricultural land resources associated with the Drayton South disturbance footprint and biodiversity offsets. The value of this land has been included in the BCA as an economic cost. Therefore this cost captures the future value of agricultural production foregone.

An input-output analysis can be used to provide additional information to the BCA and estimate the change in economic activity in a region from land and water resources being used for mining instead of agriculture. The regional impacts of the annual agricultural production foregone as a result of the Project were estimated from the sectors in the Upper Hunter regional input-output table (statistical local area of Singleton, Muswellbrook and Upper Hunter).

Table 27 compares the annual regional production and economic impacts associated with the Project and the level of annual agricultural production foregone.

Table 27
Regional Economic Impacts of the Project and Foregone Agricultural Production

Item	Agriculture Land	The Project
Area (ha)	4,007[1]	1,928[2]
Production Type	Beef and sheep	Coal
Direct Output Value ($M)	0.8	451
Direct Income ($M)	0.2	47
Direct Employment	7	326
Direct and Indirect Output Value ($M)	1.0	592
Direct and Indirect Income ($M)	0.3	90
Direct and Indirect Employment	8	819

[1] *This is the area of agricultural land (Drayton South disturbance footprint and offsite biodiversity offset property) that would be impacted in perpetuity by the Project.*

[2] *Drayton South disturbance footprint.*

The direct annual output of the Project is estimated at $451 M/annum. In contrast, the direct annual output of future use of agricultural lands that would be utilised by the Project is estimated at $0.8 M/annum.

The BCA estimated the present value of production costs and benefits of the Project over a 27 year period. The present value of net production benefits of the Project to Australia are estimated at $490 M (7% discount rate). In contrast, the present value of future use of agricultural lands that would be utilised by the Project is estimated at $5.6 M (7% discount rate). Based on these comparative values, the Project is considered to be significantly more efficient than continued agricultural production. In this regard, the economic efficiency of the Project justifies the change in land use from agricultural production to mining.

In undertaking a BCA, only the direct impacts on agriculture are relevant. Downstream effects on supporting industries are secondary impacts. As identified in the *Draft Guideline for the Use of Cost Benefit Analysis in Mining and Coal Seam Gas Proposals* (DP&I, 2012b), secondary impacts are not usually considered in a BCA. Sinden and Thamapillai (1995) advise that *"secondary costs and benefits can only truly be identified, and ther inclusion justified, when the markets for inputs and outputs are clearly non-competitive"*. This is not the case with agricultural production. Given that only a small percentage of agricultural production in the region will be impacted by the Project, the secondary economic impacts on supporting services are considered to be negligble.

Local Impacts

The regional economic impacts from agricultural production foregone as a result of the Project are assessed as minor (see subsection *"Economics – Regional Impacts"*). The local economy, being a subset of the regional economy, will also lose some agricultural economic

activity. The loss of agricultural economic activity to the local economy will also be very minor, particularly compared to the economic benefits it will gain from the Project.

Downstream effects on supporting industries from the agriculture foregone as a result of the Project are discussed in subsection *"Drayton South Disturbance Footprint"* and *"Offsite Biodiversity Offset Property"* .

4.16.2 Strategic Agricultural Land

This section responds to the submissions raised by stakeholders in relation to the verification of SAL in consideration of the SRLUP.

Submission: RA2, RA6 and SIG13

The SRLUP sets out a range of initiatives to better balance growth in the mining and coal seam gas industries with the need to protect important agricultural land and water resources. Chapter 11 of the SRLUP stipulates site-specific processes to verify if the applicable land associated with the development constitutes SAL. The verification process involves assessing the land against Map 6 and the criteria listed in Table 1 of the SRLUP. The land is only verified as being SAL if the relevant criteria are satisfied.

SAL is represented by one of two categories; BSAL and CIC. **Figure 39** reproduces Map 6 of the SRLUP and indicatively identifies BSAL and CIC relevant to the Project.

The CICs illustrated on Map 6 of the SRLUP are currently being reviewed by the NSW government against the verification process for SAL. This will establish if current land uses, as mapped by the SRLUP, meet the criteria to constitute a CIC. As an interim measure, Chapter 11 of the SRLUP specifies that Map 6 is to be used as a trigger to determine if a development is subject to the gateway process and its associated criteria.

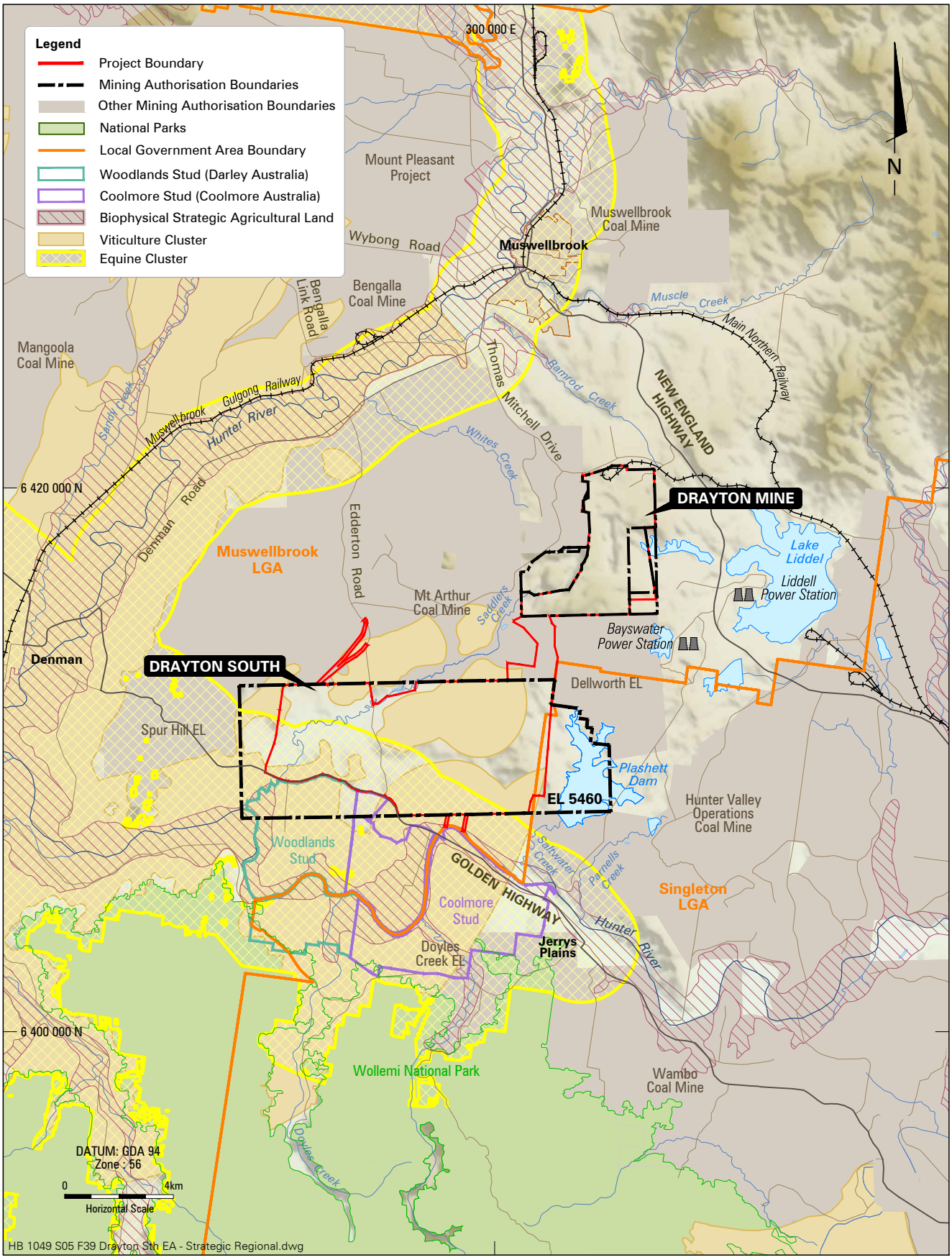
The Drayton South disturbance footprint has been assessed against the mapping and criteria outlined in the SRLUP to gain an appreciation of the extent and likely impact of the Project on potential BSAL and CICs (see **Figure 39**). Information from related impact assessments prepared as part of the EA to support the Project application have been drawn upon to assist in the verification process.

Biophysical Strategic Agricultural Land

This section responds to the submissions raised by stakeholders in relation to the verification of BSAL in consideration of the SRLUP and the gateway criteria. It also discusses the potential for the Project to impact on BSAL.

Submission: RA2 and RA6

As indicated by **Figure 39**, the land within the Drayton South disturbance footprint does not represent mapped BSAL. In accordance with the *Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (OEH and DPI, 2013), **Table 28** further verifies that land within the Drayton South disturbance footprint does not trigger all relevant criteria required to constitute BSAL. In this regard, the Project is not subject to the gateway process and the associated criteria outlined in Table 2 of the SRLUP.



DRAYTON SOUTH COAL PROJECT

AngloAmerican | Hansen Bailey ENVIRONMENTAL CONSULTANTS

Strategic Agricultural Land

FIGURE 39

Table 28
Biophysical Strategic Agricultural Land Verification

Criteria	Verification
Properties with access to a reliable water supply, defined by: • Rainfall of 350 mm or more per annum (9 out of 10 years); or • A regulated river (maps show those within 150 m); • A 5th order or higher unregulated river (maps show those within 150 m); or • An unregulated river which flows at least 95 per cent of the time (maps show those within 150 m); or • Highly productive groundwater sources, as declared by the NSW Office of Water. These are characterized by bores having yield rates greater than 5L/s and total dissolved solids of less than 1,500 mg/L and exclude miscellaneous alluvial aquifers, also known as small storage aquifers.	The land within the Drayton South disturbance footprint: • Receives 350 mm or more rainfall per annum (9 out of 10 years); • Is further than 150 m from the Hunter River, which is a regulated river; • Is within 150 m of Saddlers Creek, which is a 4th order unregulated watercourse; • Is within 150 m of Saddlers Creek, an unregulated watercourse, which does not flow at least 95% of the time; and • Does not overlie significant groundwater aquifers, such as that of the Hunter River. This information has been verified by the surface water impact assessment (see Appendix M of the EA) and groundwater impact assessment (see Appendix N of the EA). The criterion for available rainfall is triggered. Other criteria are not triggered.
and	
Land that falls under soil fertility classes 'high' or 'moderately high' under the Draft Inherent General Fertility of NSW (OEH), where it is also present with land capability classes I, II or III under the Land and Soil Capability Mapping of NSW (OEH)	The land within the Drayton South disturbance footprint is identified as soil fertility class '*moderately low*' and '*moderate*' as mapped by the *Draft Inherent Soil Fertility of NSW Map* (OEH) and land and soil capability class 5 and 6 under the *Land and Soil Capability Mapping of NSW* (OEH). The criterion is not triggered.
or	
Land that falls under soil fertility classes 'moderate' under the Draft Inherent General Fertility of NSW (OEH), where it is also present with land capability classes I or II under the Land and Soil Capability Mapping of NSW (OEH)	The land within the Drayton South disturbance footprint is identified as soil fertility class '*moderately low*' and '*moderate*' as mapped by the *Draft Inherent Soil Fertility of NSW Map* (OEH) and land and soil capability class 5 and 6 under the *Land and Soil Capability Mapping of NSW* (OEH). The criterion is not triggered.

A supplementary EAR was issued by the Director-General under section 75F(3) of the EP&A Act requiring the preparation of an agricultural impact statement that includes a specific focused assessment of the impacts of the Project on SAL, having regard to the gateway criteria in the SRLUP. As such, the Project has been assessed against the gateway criteria for BSAL as outlined in Table 2 of the SRLUP.

With regard to assessing the potential impacts of a proposal on agricultural land and water Table 2 of the SRLUP requires consideration as to:

> *Whether the proposal would significantly reduce the agricultural productivity of the land based on a consideration of:*
>
> *a) Impacts on the land through surface area disturbance and subsidence;*
>
> *b) Impacts on:*
>
> *(i) Soil fertility*
>
> *(ii) Rooting depth, or*
>
> *(iii) Soil profile materials and thickness*
>
> *c) Increases in land surface microrelief or soil salinity, or significant changes to soil pH, and*
>
> *d) Impacts on Highly Productive Groundwater, including the provisions of the Aquifer Interference Policy and the advice of the Minister for Primary Industries (note that the Minister for Primary Industries must take into account the advice of the Commonwealth Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development in providing advice in this stage)*

The land within the Drayton South disturbance footprint does not constitute BSAL, as verified by **Figure 39** and **Table 28**. In this regard, the Project is assessed as not reducing agricultural productivity of the land in consideration of items (a to c) relevant to the value of BSAL in Table 2 of the SRLUP.

As outlined the groundwater impact assessment (see Appendix N of the EA), the Project is not predicted to impact on the highly productive groundwater of the Hunter River alluvial aquifer through drawdown or seepage effects. In this regard, the Project is assessed as not reducing agricultural productivity of the land in consideration of item (d) relevant to the value of BSAL in Table 2 of the SRLUP.

Equine Critical Industry Cluster

This section responds to the submissions raised by stakeholders in relation to the verification of equine CIC in consideration of the SRLUP and the gateway criteria. It also discusses the potential for the Project to impact on the equine CIC.

Submission: RA2, RA6, SIG10, SIG13, SIG15, SIG16, P21 and P23

As indicated by **Figure 39** (which has been prepared from Map 6 of the SRLUP), a portion of the land within the Drayton South disturbance footprint has been mapped as equine CIC.

Two of the premier thoroughbred horse breeding studs in NSW, Woodlands Stud and Coolmore Stud, are located to the south of the Project. These enterprises represent a dominant land use in the vicinity of the Project and as such have been identified as part of the equine CIC as indicated on Map 6 of the SRLUP.

The portion of the Drayton South disturbance footprint (494 ha) that has been mapped as equine CIC within the SRLUP (see **Figure 39**) is not directly situated on land utilised for the operations of Woodlands Stud and Coolmore Stud. However, this area is within the 2 km buffer to the north of the Golden Highway as outlined by the equine CIC mapping criteria (see Appendix of the SRLUP). In this regard, the portion of land within the Drayton South disturbance footprint has been assessed against Table 1 of the SRLUP to verify if it meets the criteria for identifying a CIC in relation to the thoroughbred horse breeding industry. The assessment against Table 1 of the SRLUP is discussed below.

Table 1 of the SRLUP outlines the values that are used to identify SAL. It stipulates that CICs are:

> *Industry clusters that meet the following criteria:*
>
> - *there is a concentration of enterprises that provides clear development and marketing advantages and is based on an agricultural product;*
> - *the productive industries are interrelated;*
> - *it consists of a unique combination of factors such as location, infrastructure, heritage and natural resources;*
> - *it is of national and/or international importance;*
> - *it is an iconic industry that contributes to the region's identity; and*
> - *it is potentially substantially impacted by coal seam gas or mining proposals.*

The predominant agricultural land use within the Drayton South disturbance footprint is associated with cattle grazing with the major enterprise being beef cattle breeding for weaner and domestic markets. This is one of many beef cattle enterprises in the locality, which contribute to the economy and supporting services and industries, such as sale yards and abattoirs, at a local scale. To facilitate operations, minor infrastructure such as temporary/portable yards are utilised on site.

The soil and land capability characteristics within the Drayton South disturbance footprint are generally of poor quality with limited water holding capacity given that it is divided in the landscape by a significant ridgeline to the south, which excludes it from receiving benefits from the Hunter River. The land is identified as land capability Class IV, V, VI and VII as verified by the soil and land capability impact assessment (see Appendix Q of the EA). This indicates that the land is ideally suited to grazing and limited cultivation.

The land and nature of the beef cattle enterprise associated with the Drayton South disturbance footprint is not interrelated with the existing thoroughbred horse breeding enterprises in the locality. In this regard, these factors do not contribute to the operations, development or marketing of thoroughbred horse breeding as an iconic industry nor does it influence its importance at a national or international level.

The portion of the Drayton South disturbance footprint that has been mapped as equine CIC within the SRLUP does not embody the definition of an equine CIC as prescribed by the criteria in Table 1 of the SRLUP.

A supplementary EAR was issued by the Director-General under section 75F(3) of the EP&A Act requiring the preparation of an agricultural impact statement that includes a specific focused assessment of the impacts of the Project on SAL, having regard to the gateway criteria in the SRLUP. As such, the Project has been assessed against the gateway criteria for a CIC as outlined in Table 2 of the SRLUP.

Table 2 of the SRLUP stipulates:

> *Whether the proposal would lead to significant impacts on the critical industry cluster through:*
>
> *a) Surface area disturbance*
>
> *b) Subsidence*
>
> *c) Reduced access to agricultural resources*
>
> *d) Reduced access to support services and infrastructure*
>
> *e) Reduced access to transport routes, or*
>
> *f) Loss of scenic and landscape value*

In response to item (a), the Drayton South disturbance footprint is not directly situated on land utilised for the operations of thoroughbred horse breeding, including Woodlands Stud and Coolmore Stud. However, a portion of the Drayton South disturbance footprint (494 ha) is within the 2 km buffer to the north of the Golden Highway as outlined by the equine CIC mapping criteria (Appendix of the SRLUP). This land has been verified as not meeting the definition of the equine CIC as outlined in Table 1 of the SRLUP. In this regard, it is considered that the Project will not impact the equine CIC through surface area disturbance.

In response to item (b), a component of the operations within the Drayton South mining area will be undertaken via highwall mining methods. The highwall mining design will be consistent with the guidelines outlined in the Australian Coal Association Research Program report *Optimal Design and Monitoring for Highwall Mining* (CSIRO, 2001) to ensure no noticeable subsidence or surface disturbance as defined by the *Guidelines for Applications for Subsidence Management Approvals* (DMR, 2003). In this regard, the Project will not impact the equine CIC through subsidence.

In response to item (c), the Drayton South disturbance footprint is not directly situated on land utilised for the operations of thoroughbred horse breeding, including Woodlands Stud and Coolmore Stud. In this regard, the Project will not impact the equine CIC through reduced access to land resources. Water from the Hunter Regulated River Water Source is another key resource relied upon by the equine CIC. As discussed in **Section 4.13**, the groundwater model prepared for the Project predicted a maximum groundwater take of 2 ML during mining and 4 ML post mining from the Hunter Regulated River Water Source. This is not anticipated to result in a material impact on the Hunter River alluvial aquifer. Furthermore, the model predicts that no private registered bores are within the zone of influence at the end of mining. In this regard, the Project will not impact the equine CIC through reduced access or availability to water resources.

In response to item (d), the predominant agricultural land use within the Drayton South disturbance footprint is associated with cattle grazing with the major enterprise being beef cattle breeding for weaner and domestic markets. To facilitate operations, minor infrastructure such as temporary/portable yards are utilised on site. Agricultural output from the land contributes to the local supporting services, such as sale yards and abattoirs. This operation and its supporting services and infrastructure are not interrelated with existing thoroughbred horse breeding enterprises in the locality. In this regard, the Project will not impact the equine CIC through reduced access to support services and infrastructure.

In response to item (e), the key transport routes utilised by existing thoroughbred horse breeding enterprises include the Golden Highway and Edderton Road. A component of the Project involves the realignment of a portion of Edderton Road and its intersection with the Golden Highway. The existing Edderton Road will remain operational throughout the construction period; it will only be closed once the new alignment has been completed. Traffic and transport impacts associated with the Project are discussed further in **Section 4.21**. In this regard, the Project will not impact the equine CIC through reduced access to transport routes.

In response to item (f), the Project will impact on the existing visual amenity to the south of the Project Boundary through the construction of the Houston visual bund. This will involve an eight stage construction program from Year 3 for a period of approximately 16 months. At completion, the visual bund will be integrated with the existing ridgeline. This will result in a permanent yet beneficial change to the landscape as it will shield all views to the Project for the remaining life of operations. In this regard, it is considered that the Project does not significantly compromise the scenic and landscape settings of the equine CIC to the south of the Project Boundary in the medium to long term. Visual impacts associated with the Project are discussed further in **Section 4.7**.

Viticulture Critical Industry Cluster

This section responds to the submissions raised by stakeholders in relation to the verification of viticulture CIC in consideration of the SRLUP and the gateway criteria. It also discusses the potential for the Project to impact on the viticulture CIC.

Submission: RA2, RA6, SIG10, SIG13 and P21

As indicated by **Figure 39**, a portion of the land within the Drayton South disturbance footprint represents mapped viticulture CIC. **Table 29** further verifies that part of this area triggers relevant mapping criteria required to constitute viticulture CIC.

Table 29
Viticulture Critical Industry Cluster Mapping Verification

Criteria	Verification
The viticulture cluster is spatially defined as the following land (excluding State Forests and National Park): • the Broke-Fordwich and Pokolbin Geographical Indicators (GI) sub-regions;	The land within the Drayton South disturbance footprint is not situated within the Broke-Fordwich and Pokolbin Geographical Indicators sub-regions. The criterion is not triggered.
• the parish of Belford and the suburbs of Lovedale, Nulkaba, Mount View and Rothbury;	The land within the Drayton South disturbance footprint is not situated within the parish of Belford and the suburbs of Lovedale, Nulkaba, Mount View and Rothbury. The criterion is not triggered.
• properties proximate to the Hunter Wine Country Private Irrigation District pipeline to the east of Lovedale road as well as those properties bounded by Mears Lane, Majors Lane and the Suburb of Lovedale; and	The land within the Drayton South disturbance footprint is not situated within properties proximate to the Hunter Wine Country Private Irrigation District pipeline to the east of Lovedale road as well as those properties bounded by Mears Lane, Majors Lane and the Suburb of Lovedale. The criterion is not triggered.
• land (excluding National Park and State Forest) within 20 km of Denman, and that falls under soil fertility classes 'high', 'moderately high', 'moderate' or 'moderately low' under the Draft Inherent General Fertility of NSW (OEH), and land capability classes I, II, III, IV or V under the Land and Soil Capability Mapping of NSW (OEH), and is within 2 km of a mapped alluvial water source.	The land within the Drayton South disturbance footprint is: • Situated within 20 km of Denman; and • Identified as soil fertility class '*moderately low*' and '*moderate*' as mapped by the *Draft Inherent Soil Fertility of NSW Map* (OEH); A portion of the land within the Drayton South disturbance footprint is: • Identified as land capability Class IV and V as verified by the soil and land capability impact assessment (see Appendix Q of the EA). See **Section 4.15** for soil and land capability mapping and rationale; and • Within 2 km of a mapped alluvial water source. The criterion is triggered. All requirements of the criterion have been met for a portion of the land within the Drayton South disturbance footprint.

The verification process confirms that much of the mapped viticulture CIC within the Drayton South disturbance footprint (1,157 ha) fails to meet the mapping criteria (see Appendix of the SRLUP), predominately on the basis that it fails to meet the appropriate land capability classification. Furthermore, the majority of this land is situated further than 2 km from a mapped alluvial, including the Hunter River, Saddlers Creek and Saltwater Creek alluviums.

Only a small portion of the Drayton South disturbance footprint (220 ha) is verified as meeting the relevant mapping criteria for viticulture CIC, however, only 146 ha of this area is shown on Map 6 of the SRLUP. This highlights the need for the mapping contained in the SRLUP to be verified and revised.

Arrowfield Estate, which for the past few seasons has not been operational as a vineyard, is located to the south of the Project. This enterprise has been identified as part of the viticulture CIC as mapped and described in Table 1 of the SRLUP.

The portion of the Drayton South disturbance footprint (220 ha) verified as meeting the relevant mapping criteria for viticulture CIC is not directly situated on land utilised for the operations of Arrowfield Estate. However, given that part of the footprint meets the mapping criteria it has been assessed against Table 1 of the SRLUP (reproduced in subsection *"Equine Critical Industry Cluster"*) to verify if it meets the criteria for defining a CIC in relation to the viticulture industry. The assessment against Table 1 of the SRLUP is discussed below.

Similar to the justification provided for the equine CIC (see subsection *"Equine Critical Industry Cluster"*), the land and nature of the beef cattle enterprise associated with the Drayton South disturbance footprint are not interrelated with the existing viticulture enterprises in the locality. In this regard, the land and production associated with the Drayton South disturbance footprint does not contribute to the operations, development or marketing of viticulture as an iconic industry nor does it influence its importance at a national or international level.

The portion of the Drayton South disturbance footprint verified as meeting the relevant mapping criteria for viticulture CIC (see Appendix of the SRLUP) does not embody the definition of viticulture CIC as prescribed by the criteria in Table 1 of the SRLUP.

A supplementary EAR was issued by the Director-General under section 75F(3) of the EP&A Act requiring the preparation of an agricultural impact statement that includes a specific focused assessment of the impacts of the Project on SAL, having regard to the gateway criteria in the SRLUP. As such, the Project has been assessed against the gateway criteria for a CIC as outlined in Table 2 of the SRLUP (reproduced in subsection "*Equine Critical Industry Cluster*").

In response to item (a), the Drayton South disturbance footprint is not directly situated on land utilised for the operations of viticulture, including Arrowfield Estate. However, a portion of the Drayton South disturbance footprint (220 ha) is verified as meeting the relevant mapping criteria for viticulture CIC (Appendix of the SRLUP). This land has been verified as not meeting the definition of the viticulture CIC as outlined in Table 1 of the SRLUP. In this regard, the Project will not impact the viticulture CIC through surface area disturbance.

In response to item (b), a component of the operations within the Drayton South mining area will be undertaken via highwall mining methods. The highwall mining design will be consistent with the guidelines outlined in the Australian Coal Association Research Program report *Optimal Design and Monitoring for Highwall Mining* (CSIRO, 2001) to ensure no noticeable subsidence or surface disturbance as defined by the *Guidelines for Applications*

for Subsidence Management Approvals (DMR, 2003). In this regard, the Project will not impact the viticulture CIC through subsidence.

In response to item (c), the Drayton South disturbance footprint is not directly situated on land utilised for the operations of viticulture, including Arrowfield Estate. In this regard, the Project will not impact the viticulture CIC through reduced access to land resources. Water from the Hunter Regulated River Water Source is another key resource relied upon by the viticulture CIC. As discussed in **Section 4.13**, the groundwater model prepared for the Project predicted a maximum groundwater take of 2 ML during mining and 4 ML post mining from the Hunter Regulated River Water Source. This is not anticipated to result in a material impact on the Hunter River alluvial aquifer. Furthermore, the model predicts that no private registered bores are within the zone of influence at the end of mining. In this regard, the Project will not impact the viticulture CIC through reduced access or availability to water resources.

In response to item (d), the predominant agricultural land use within the Drayton South disturbance footprint is associated with cattle grazing with the major enterprise being beef cattle breeding for weaner and domestic markets. To facilitate operations, minor infrastructure such as temporary/portable yards are utilised on site. Agricultural output from the land contributes to the local supporting services, such as sale yards and abattoirs. This operation and its supporting services and infrastructure are not interrelated with existing viticulture enterprises in the locality. In this regard, the Project will not impact the viticulture CIC through reduced access to support services and infrastructure.

In response to item (e), the key transport routes utilised by existing viticulture enterprises and its potential tourism base include the Golden Highway and Edderton Road. A component of the Project involves the realignment of a portion of Edderton Road and its intersection with the Golden Highway. The existing Edderton Road will remain operational throughout the construction period; it will only be closed once the new alignment has been completed. Traffic and transport impacts associated with the Project are discussed further in **Section 4.21**. In this regard, the Project will not impact the viticulture CIC through reduced access to transport routes.

In response to item (f), there are three residences and a former winery on Arrowfield Estate, none of which will experience views of the Project due to screening provided by a significant ridgeline to the immediate south of the Project Boundary. At higher elevations on the north-western ridgeline at the back of the property, there may be views of the Project. It is understood that this area may form part of United Pastoral's plans to develop the Arrowfield Estate site. If these plans were to progress then additional mitigation measures could be developed and implemented at this location to minmise visibility of the Project through ongoing consultation with the owners. In this regard, it is considered that the Project does not significantly compromise the scenic and landscape settings of the viticulture CIC to the south of the Project Boundary. Visual impacts associated with the Project are discussed further in **Section 4.7**.

4.16.3 Thoroughbred Horse Breeding Enterprises

Economics

This section responds to the submissions raised by stakeholders in relation to the operations of neighbouring thoroughbred horse breeding enterprises and their contributions to the economy. It also discusses the potential economic impacts of the Project on these enterprises.

Submission: RA2, RA6, SIG1, SIG3, SIG5, SIG8, SIG9, SIG10, SIG13, SIG15, SIG16, P4, P5, P8, P13, P14, P15, P16, P18, P19, P20, P21, P23, P24, P25, P26, P30, P31, P35, P37, P39 and P40

Coolmore Stud and Woodlands Stud are marketed as multi-million dollar breeding enterprises. **Table 30** provides a summary of recent operating costs and contributions solely from the NSW operations of Coolmore Australia and Darley Australia (obtained from publicly available financial statements for the respective enterprises). These figures have been compared to the Project alone.

Table 30
Economic Contributions Comparison

Item	Darley Australia[1]	Calago Bloodstock AG (Coolmore Australia)[2]	The Project[3]
Annual Revenue ($M)	53	16	417
Annual Expenditure ($M)	84	15	278
Company Tax Paid ($M)	0	0.5	32
Royalties ($M)	0	0	33
Annual Loss/Profit ($M)	-7	0.7	75
Employees	345	N.A.	463
Salaries ($M)	N.A.	5.5	65

[1] Based on 2011 financial statements.

[2] Based on 2010 financial statements.

[3] Based on economic impact assessment (see Appendix U of the EA).

N.A. Not available.

Darley Australia is an owner-breeder operation, whereby horses are typically bred, reared and retained on site for the enterprise's future breeding operations with only some yearlings offered for sale. Darley Australia was shown to operate at a loss of $7 M in 2011 and $49 M in 2010. The stud paid no company tax or royalties to NSW government in either year. It is evident that the company's ability to continue operations is dependent on the ongoing financial support of its shareholders.

Calago Bloodstock AG (Coolmore Australia) is a breeding operation, whereby client's mares are brought to site for servicing by the enterprise's owned stallions. Calago Bloodstock AG

was shown to return an operating profit of $0.7 M in 2010 with $0.5 M paid in company tax, however, did not contribute royalties to the NSW government for that year.

In contrast, the Project is estimated to return an operating profit of $75 M/annum. An estimated $32 M/annum will be paid in company tax and $33 M/annum paid in royalties to the NSW government.

Based on the comparative values outlined in **Table 30**, the Project is considered to be significantly more efficient as a standalone operation than that of both thoroughbred horse breeding enterprises.

DPI, Coolmore Australia and a number of other stakeholders raised that the economic impact assessment undertaken as a component of the agricultural impact statement does not adequately quantify the impacts of the Project on neighbouring thoroughbred horse breeding enterprises.

The Drayton South disturbance footprint is not directly situated on land utilised for the operations of thoroughbred horse breeding, including Coolmore Stud and Woodlands Stud. In this regard, the Project will not impact on these enterprises through reduced availability of agricultural land via surface area disturbance. It has also been assessed through the EA and this RTS that the Project is capable of operating in conjunction with neighbouring thoroughbred horse breeding enterprises without causing significant adverse offsite impacts (e.g. air quality and noise) on their operations and the health of their horses (see **Section 4.2**, **4.4**, **4.5**, **4.6**, **4.11** and **4.12**).

Given that the Project will not result in direct disturbance or significant adverse offsite impacts on the thoroughbred horse breeding enterprises in the locality or on the health of its horses, it is considered that there would not be any negative economic impact. As such, the impact of the potential closure of neighbouring thoroughbred horse breeding enterprises in the locality was not assessed.

In its submission, Coolmore Australia highlight that the visual amenity of the landscape is key to the presentation of their enterprise. In consideration of the Project, the EA reports that there will be impacts on the existing visual amenity to the south of the Project Boundary during the construction of the Houston visual bund. This will involve an eight stage construction program from Year 3 for a period of approximately 16 months, which will be in view from Coolmore Stud. At completion, the visual bund will be integrated with the existing ridgeline. This will result in a permanent yet beneficial change to landscape as it will shield all views to the Project for the remaining life of operations. Visual impacts associated with the Project are discussed further in **Section 4.7**.

Any potential for clientele or the public to be discouraged from investing or appreciating the quality of the horses produced from Coolmore Stud due to the construction of the Houston visual bund or the Project on a broader scale would be based on perception alone and not actual scientific data. This cannot be accurately quantified given the number of factors that could influence a perception based decision. In this regard, the short term visual impacts experienced at Coolmore Stud were not assessed in the economic impact assessment of the

agricultural impact statement. The issue of perception on thoroughbred horse breeding is discussed further in the subsection *"Perception-Based Issues"*.

Perception-Based Issues

This section responds to the submissions raised by stakeholders, in particular Coolmore Australia, in relation to the potential for adverse impacts on thoroughbred horse breeding enterprises and its reputation as a result of the Project and negative public perception.

Submission: RA2, RA6, SIG1, SIG3, SIG5, SIG8, SIG9, SIG10, SIG13, SIG15, SIG16, P2, P4, P5, P8, P9, P16, P19, P20, P21, P24, P25, P26, P35, P37 and P39

For the public's perception to be affected there would need to be impacts of a detrimental kind on the neighbouring thoroughbred horse breeding enterprises, including Coolmore Stud and Woodlands Stud. The Project scientifically demonstrates through the EA and this RTS that it is capable of operating in conjunction with these enterprises without causing any significant adverse impacts on their operations. Thereby it will not impact the continued viability and function of breeding high quality thoroughbred horses, which is the core of their business.

A case study was prepared on behalf of the NSW Minerals Council (2012a) highlighting the successful coexistence of both the thoroughbred horse breeding and mining industry in the Hunter Valley. The case study features Edinglassie Stud and Mt Arthur Coal Mine.

Edinglassie Stud is located approximately 500 m from the boundary of Mt Arthur Coal Mine's operations and is separated from the mine by Denman Road. It is also in close proximity to the neighbouring Bengalla Mine. Despite the stud's proximity to the neighbouring mines, the lessee (Mick Tally) continues to produce high quality thoroughbred race horses that have included multiple Group 1 race winners, such as Bentley Biscuit, which was trained by Gai Waterhouse and raced in the prestigious Kings Stand Stakes at Royal Ascot in 2007. Other Group 1 race winners that have come from Edinglassie Stud include Wonderful World, Gods Own, Nadeem, Tell a Tale, Sharscay, Miss Margaret, Suntain, Emerald Dream, Lasserfaire, and most recently Nechita who won the Group 1 Coolmore Stud Stakes in 2012.

Mick Tally quoted:

> *"Edinglassie stud has a good reputation in the local industry for breeding good race horses and selling quality foals.*
>
> *Both industries have been around a long time and the fact that we are continuing to provide the local industry with quality horses shows that mining and thoroughbred farmers have worked side by side."*

In consideration of the case study and the predicted impacts, the Project is not anticipated to discourage clientele or the public from investing in or appreciating the quality of the horses produced from the thoroughbred horse breeding enterprises of Coolmore Stud and Woodlands Stud. This case study demonstrates that these two industries can coexist.

Social

This section responds to the submissions raised by stakeholders in relation to the assessment of social impacts on neighbouring thoroughbred horse breeding enterprises as a result of the Project.

Submission: RA2, RA6, SIG1, SIG3, SIG5, SIG8, SIG9, SIG10, SIG13, SIG15, SIG16, P4, P5, P8, P13, P16, P19, P21, P23, P24, P25, P26, P30 ,P31, P35, P37, P39, P40 and P41

Population and Accommodation

The Project will continue to utilise the existing workforce of up to 530 employees and contractors. The accommodation strategy for the operations phase of the Project assumes that all employees currently residing in the local area will continue to be located permanently there. As such, there are not anticipated to be any requirements for additional dwellings. In this regard, the Project is not anticipated to cause strain on the housing or accommodation availability for the neighbouring thoroughbred horse breeding enterprises. Furthermore, it is understood that the majority of the staff employed by these enterprises occupy a dwelling on the studs.

Labour Pool

As discussed in **Section 4.23**, the local area has a low rate of unemployment. However, given that the Project will continue to utilise the existing workforce it is considered unlikely to place an unreasonable strain on the local labour pool. As such, the Project is not anticipated to reduce the labour supply available for the operation of neighbouring thoroughbred horse breeding enterprises.

Labour Skills

As discussed in **Section 4.23**, the mining sector is the largest employer in the local area and as a result there are well established mining communities upon which to draw any replacement staff that maybe required by the Project. As such, the Project is not anticipated to draw upon valued labour skills sought after by neighbouring thoroughbred horse breeding enterprises.

Mine Closure

Cessation of the Project after 27 years of operation may lead to a reduction in economic activity at that time. The impacts on the economy after closure will entirely depend on the structure of the mining and resource sector at that time, which is not able to be predicted at present. The significance of these cessation impacts on the local community would depend on the degree to which any displaced workers and their families remain within the region, even if they remain unemployed. This is a result of continued expenditure by these people in the local area (even at reduced levels) and its contributions to final demand. If there are other as-yet-unconstructed or unknown projects operating at that time, then the impacts of the gradual decrease of the Project workforce will be lessened as other projects absorb the excess labour. In addition, if Project closure takes place in a declining economy the impacts might be felt more greatly than if it takes place in a growing and diversified economy. Pending the socio-economic conditions at the time of Project closure, there may potentially

be negligible or significant impacts on the local community, including thoroughbred horse breeding enterprises in the locality.

4.16.4 Viticulture Enterprises

Agricultural Production

This section responds to the submissions raised by stakeholders regarding the impact of the Project on neighbouring viticulture enterprises and its associated agricultural productivity.

Submission: RA2, SIG1, SIG3, SIG5, SIG6, SIG8, SIG10, SIG13, SIG15, P1, P4, P19, P21, 24, P25, P26, P37 and P40

Arrowfield Estate is located to the south of the Project. In 2010, it ceased operations and agricultural production and wine making infrastructure was removed. On 13 February 2012, the ownership of Arrowfield Estate was transferred to United Pastoral. Since acquisition, approximately 36 ha of vines remain on the property. Under existing conditions, the current agricultural production from Arrowfield Estate is nil.

The Australian Bureau of Statistics' *Agricultural Census* (ABS, 2012a) found that within the Muswellbrook LGA there are 18 vineyards with a total of 883 ha under grapes (881 ha vines of bearing age), producing 2,819 t of grapes (3.19 t/ha) with a gross farm gate value of $0.9 M ($319/t).

For the Hunter region wine district (Cessnock, Singleton, Muswellbrook and Upper Hunter LGAs) there are 342 vineyards with a total of 3,299 ha under grapes (3,233 ha vines of bearing age), producing 14,217 t of grapes (4.39 t/ha) with a gross farm gate value of $5.0 M ($352/t).

In NSW there are 1,425 vineyards with a total of 42,246 ha under grapes (39,502 ha vines of bearing age), producing 449,209 t of grapes (11.37 t/ha) with a gross farm gate value of $136.4 M ($304/t).

In the event United Pastoral adopt superior management practices and invest capital into the development of Arrowfield Estate as a viable viticulture enterprise, the potential agricultural production is estimated at 115 t of grapes with a gross farm gate value of $36,685/annum. This represents 4.1% of the production of grapes in the Muswellbrook LGA, 0.8% in the Hunter region wine district and 0.03% in NSW.

In consideration of the revised air quality modelling (see **Section 4.2**), the Project is predicted to generate dust deposition concentrations of up to 1.6 g/m^2/month over Arrowfield Estate. This is within the human amenity cumulative criterion for dust deposition (4 g/m^2/month).

Doley and Rossato (2010) reported that "*Deposition of mining, quarry and road dust on vegetation canopies has been observed to inhibit plant growth when dust burdens exceed 7 g/m^2*".

Based on the revised air quality modelling and the research undertaken by Doley and Rossato (2010), the predicted dust deposition concentrations generated by the Project

(alone or cumulatively) is not considered to reduce the growth and hence potential productivity of the vines on Arrowfield Estate.

Economics

This section responds to the submissions raised by stakeholders in relation to the operations of neighbouring viticulture enterprises and the potential economic impacts of the Project on these enterprises.

Submission: RA2, RA6, SIG1, SIG3, SIG5, SIG6, SIG8, SIG10, SIG13, SIG15, SIG16, P1, P4, P13, P14, P15, P18, 19, P20, P21, P24, P25, P26, P30, P31, P37 and P40

DPI and a number of other stakeholders raised that the economic impact assessment undertaken as a component of the agricultural impact statement (see Appendix R of the EA) does not adequately quantify the impacts on the neighbouring viticulture enterprise. The impacts and associated justification provided in **Section 4.16.3** (subsection *"Economics"*) for thoroughbred horse breeding enterprises is consistent for viticulture enterprises, including the potential of any future operations at Arrowfield Estate. This is that the Project is capable of operating in conjunction with neighbouring viticulture enterprise without causing any significant adverse offsite impacts (e.g. air quality and noise) on their operations.

Land Acquisition

This section responds to the submissions raised by stakeholders in relation to the assessment of Project's predicted air quality and noise impacts on Arrowfield Estate and Anglo American's acquisition liabilities.

Submission: RA2, RA4, SIG1, SIG3, SIG5, SIG6, SIG8, SIG10, SIG13, SIG14, SIG15, P1, P4, P19, P21, P24, P25, P26, P37 and P40

The air quality impacts at Arrowfield Estate and its residences have not been under considered given its current non-operational status. Arrowfield Estate was represented in the air quality impact assessment (see Appendix F of the EA) as receiver 226. This assessment predicted that Arrowfield Estate will experience exceedances of the cumulative annual average criterion for PM_{10} and TSP and the 24-h average PM_{10} criterion for the Project alone.

Since public exhibition of the EA, Anglo American has further refined the accuracy of the air quality model and adopted additional best practice dust management measures to reduce the impacts predicted at Arrowfield Estate (see **Section 4.2**). The outcomes of this work demonstrate that the Project is capable of operating without causing exceedances of the cumulative annual average criterion for PM_{10} and TSP and the 24-h average PM_{10} criterion for the Project alone at Arrowfield Estate. Given these predictions, the property is no longer situated within a zone likely to be afforded acquisition rights under the conditions of any Project Approval. Despite this, Anglo American has been involved in discussions with United Pastoral with regard to the opportunity to acquire the property.

Arrowfield Estate and its residences were also considered in the acoustics impact assessment (see Appendix G of the EA) to determine the potential impacts of noise

generated by the Project. The assessment predicted that there will be no exceedance of the relevant criteria in all years and time periods (see **Section 4.4**).

Critical Mass Implications

This section responds to the submissions raised by stakeholders regarding the potential for the Project to cause critical mass implications for the viticulture industry.

Submission: RA2, SIG1, SIG3, SIG5, SIG8, SIG10, SIG13, SIG14, SIG15, P1, P4, P19, P21, P24, P25, P26, P37 and P40

The concept of critical mass refers to the retention of a cluster of agricultural land and its associated productivity to sustain an agricultural sector and the local market. Should a significant portion of that land be removed from agricultural production, it may potentially affect the economic viability of that agricultural sector. Viticulture is considered to be an agricultural sector, which is influenced by a reduction in land mass and its associated productivity.

Arrowfield Estate is located to the south of the Project. It was originally established as a 1,000 acre vineyard in the early 1980s by W.R. Carpenter Agriculture Pty Ltd. Following acquisition in 1986 by Votraint No. 140 Pty Ltd (a company owned by John Messara thoroughbred interests), all but about 150 acres of the grape vines were removed. The estate changed ownership again in 1991 and was transferred to Mount Arrow Pty Ltd. In 2010, Arrowfield Estate ceased operations and agricultural production and wine making infrastructure was removed.

At the time of closing Arrowfield Estate, there was no evidence of any significant flow on effects to the local or regional viticulture industry from the agricultural production and infrastructure foregone. This reflects the current oversupply of grapes in Australia and NSW and demonstrates how it reduces the prices of wine and affects the overall financial viability of existing vineyards. In this regard, it does not appear that the closure of Arrowfield Estate created critical mass implications for the viticulture industry.

On 13 February 2012, the ownership of Arrowfield Estate was transferred to United Pastoral. This stakeholder also has vested interest in Hollydene Estate (as of 2009) and Wybong Estate (as of 2005).

United Pastoral outlines in their submission:

> *"United Pastoral wine enterprise is comprised of three Upper Hunters three oldest vineyards and pastoral properties comprising Wybong Estate, Hollydene Estate that supply through and operate from the main infrastructure and facilities at Arrowfield Estate. These are only with 25klms from each other and since 2003 have been fully integrated relying solely on Arrowfield as the hub for processing, marketing, retail, administration hospitality and export facilities. These properties provide three of the oldest and most iconic vineyard and wine estates in the Upper Hunter. It is important to note that without Arrowfield Estate and the significant facilities Hollydene and Wybong could not viably operate as standalone enterprise…*

> *…After some ten years of investing all our resources into building and developing a sustainable long term business from one of the world's renowned premium wine grape regions located at Australia's first wine grape growing estate Arrowfield, we are now confronted with a coal mine development which will see this destroyed."*

The claims that these three vineyards have been fully integrated since 2003 are considered false and misleading and highlight a number of inconsistencies with that of ownership records. Given that agricultural production had ceased and key infrastructure was removed in 2010 followed by transfer of ownership to United Pastoral only in 2012, it does not seem apparent as to how the operations of Hollydene Estate and Wybong Estate, to date, have been reliant on Arrowfield Estate nor is it evident that this stakeholder has vested interest in the property over the last ten years. In this regard, the continued non-operational status of Arrowfield Estate is not considered to create critical mass implications for nearby vineyards, including those of Hollydene Estate and Wybong Estate.

Furthermore, the impacts on agricultural land resources from the Project relate to the Drayton South disturbance footprint and its offsite biodiversity offset property. The Project will not remove any land that was previously or is currently proposed to be used for grape production on Arrowfield Estate through surface disturbance (see **Section 4.16.2**), reduced productivity (see subsection *"Agricultural Production"*) or acquisition (see subsection *"Land Acquisition"*). As such, the Project will not create critical mass implications for the viticulture industry.

Social

This section responds to the submissions raised by stakeholders in relation to the assessment of social impacts on neighbouring viticulture enterprises as a result of the Project.

Submission: RA2, RA6, SIG1, SIG3, SIG5, SIG6, SIG8, SIG10, SIG13, SIG15, SIG16, P1, P4, P13, P19, P21, P23, P24, P25, P26, P30, P31, P37 and P40

The impacts and associated justification provided in **Section 4.16.3** (subsection *"Social"*) for thoroughbred horse breeding enterprises is consistent for viticulture enterprises, including the potential of any future operations at Arrowfield Estate. This is that the Project is not anticipated to have any material impacts on availability of housing and accommodation or labour skills and supply for the viticulture enterprise.

Tourism

This section responds to the submissions raised by stakeholders in relation to the potential impacts of the Project on tourism in consideration of neighbouring viticulture enterprises, including accommodation supply and demand.

Submission: RA2, RA6, SIG1, SIG3, SIG5, SIG6, SIG8, SIG10, SIG13, SIG14, SIG15, P1, P4, P9, P13, P19, P20, P21, P24, P25, P26, P37 and P40

For the public's perception to be affected there would need to be impacts of a detrimental kind on neighbouring viticulture enterprises, including Arrowfield Estate. The Project

scientifically demonstrates through the EA and this RTS that it is capable of operating in conjunction with these enterprises without causing direct or significant long term, indirect biophysical impacts on their operations. It does not affect the viability and function of producing high quality grapes and wines, which is the core of their business. This view was also adopted by the Commissioners of Inquiry for the Mount Arthur South Coal Project specific to the issues regarding the development and its potential impacts on the tourist appeal of Arrowfield Estate (Commissioners of Inquiry, 1986).

It is understood that an adequate supply of accommodation suitably tailored to the requirements of the tourist market is one of the basic conditions of tourism development. However, there is no evidence to suggest that the demand for accommodation in the Upper Hunter region to support tourism is strained by the demand for accommodation generated by the mining industry.

In September 2012, the Hunter Tourism Region had a room occupancy rate and a bed occupancy rate of 65.8% and 33.5%, respectively (ABS, 2012b). This indicates considerable spare capacity in accommodation options for tourists.

4.16.5 Other Agricultural Enterprises

Several other agricultural enterprises operate within the locality of the Drayton South area, including 11 dairies, an olive grove and an olive processing plant.

Economics

This section responds to the submissions raised by stakeholders in relation to the operations of neighbouring agricultural enterprises and the potential economic impacts of the Project on these enterprises.

Submission: RA2, SIG1, SIG3, SIG5, SIG8, SIG13, SIG15, SIG16, P4, P13, P14, P15, P18, P20, P21, P24, P25, P26, P29, P30, P31, P34, P37, P40 and P41

The impacts and associated justification provided in **Section 4.16.3** (subsection *"Economics"*) for thoroughbred horse breeding enterprises is consistent for other agricultural enterprises in the locality of the Project. This is that the Project is capable of operating in conjunction with existing agricultural enterprises within the broader locality.

Social

This section responds to the submissions raised by stakeholders in relation to the assessment of social impacts on neighbouring agricultural enterprises as a result of the Project.

Submission: RA2, SIG1, SIG3, SIG5, SIG8, SIG13, SIG15, SIG16, P4, P13, P21, P23, P24, P25, P26, P30, P31, P34, P37 and P40

The impacts and associated justification provided in **Section 4.16.3** (subsection *"Social"*) for thoroughbred horse breeding enterprises is consistent for other agricultural enterprises in the locality of the Project. This is that the Project is not anticipated to have any material impacts on availability of housing and accommodation or labour skills and supply for the existing agricultural enterprises within the broader locality.

4.16.6 Water Resources

This section responds to the submissions raised by stakeholders in relation to impacts of the Project on water resources and groundwater extraction locations.

Submission: SIG15, P12, P13, P20, P21, P23, P24, P30 and P40

The Hunter Regulated River Water Source is a significant agricultural resource in the locality of the Drayton South area. It contributes to BSAL and supports the operations of CICs identified in the SRLUP.

A number of private agricultural enterprises in the locality of the Drayton South area have registered bores for extraction from the Hunter River. As outlined in the groundwater impact assessment (see Appendix N of the EA), the groundwater model predicts that no private registered bores are within the zone of influence at the end of mining. In this regard, there are not anticipated to be any impacts on groundwater availability for any agricultural enterprises within the locality.

4.16.7 Supporting Infrastructure

This section responds to the submissions raised by stakeholders in relation to the impacts of the Project on infrastructure that support agricultural enterprises and tourism.

Submission: RA2 and P20

Agricultural Enterprises

The key transport infrastructure utilised by existing agricultural enterprises in the locality of the Project include the Golden Highway and Edderton Road.

A component of the Project involves the realignment of a portion of Edderton Road and its intersection with the Golden Highway. The existing Edderton Road will remain operational throughout the construction period; it will only be closed once the new alignment has been completed. Traffic and transport impacts associated with the Project are discussed further in **Section 4.21**. In this regard, the Project will not impact agricultural enterprises through reduced access to transport infrastructure.

Tourism

The development of tourism relies upon appropriate infrastructure, such as transport routes, accommodation and restaurants, to service the needs of visitors and encourage further investment in a product.

The Golden Highway is considered the primary transport infrastructure located in the locality of the Project that contributes to servicing tourism. A component of the Project involves the repositioning and upgrade of the Edderton Road / Golden Highway intersection. The existing Golden Highway will remain operational throughout the construction period. Traffic and transport impacts associated with the Project are discussed further in **Section 4.21**. In this regard, the Project will not impact on tourism through reduced access to the Golden Highway. No other operational infrastructure adding value to tourism exists in the locality of the Project.

In the event the owner of Arrowfield Estate, United Pastoral, invests capital into the development of Arrowfield Estate as a viable viticulture enterprise and reinstates relevant equipment of the former winery and/or develops their planned tourism and accommodation facility, this site would become a tourist attraction. The Project scientifically demonstrates through the EA and this RTS that it is capable of operating in conjunction with Arrowfield Estate without causing direct or significant long term, indirect biophysical impacts on any potential future operations.

4.16.8 Project Alternatives

This section responds to the submissions raised by stakeholders in relation to mine design and visual bund alternatives considered for the Project having regard to the impacts on agricultural resources and enterprises.

Submission: RA2 and SIG15

Anglo American undertook a comprehensive pre-feasibility study for the Project, which included the assessment of various mine plans and operating scenarios. These alternatives were considered having regard to the social, economic and environmental impacts as well as the principles of ESD and the objects of the EP&A Act.

The alternatives considered for the broader project are described below having regard to potential impacts on agricultural resources and enterprises.

Alternative 1 – Closure of Drayton Mine

Alternative 1 results in no change to the availability of the land resource within the Drayton South area and its associated beef cattle production.

When compared to the broader outlook of this project alternative, the premature closure of Drayton Mine fails to maximise the recovery of a major identified coal resource or optimise existing infrastructure and employment for the existing workforce. It would also result in the significant loss of local socio-economic benefits, royalties and other payments to both the State and Commonwealth governments. In this regard, Alternative 1 was rejected.

Alternative 2 – Underground Mining of Shallow Seams

Alternative 2 results in no change to the availability of the land resource within the Drayton South area and its associated beef cattle production.

When compared to the broader outlook of this project alternative, the potential hazards of the inherent geology through the overlying shallow seams at Drayton South, making the resultant design, economics and overall resource recovery unattractive in comparison to open cut recovery. In this regard, Alternative 2 was rejected.

Alternative 3 – Underground Mining of Deep seams

Alternative 3 results in no change to the availability of the land resource within the Drayton South area and its associated beef cattle production.

When compared to the broader outlook of this project alternative, initial underground mining of deep coal seams at Drayton South would sterilise shallow open cut seams. By removing

the shallow resource prior to underground mining, many potential hazards, including surface subsidence, cracking and seam gas, can be avoided and coal resources can be maximised. In this regard, Alternative 3 was rejected.

Alternative 4 – Maximum Resource Recovery

Alternative 4 results in the development of mining operations over an area of 2,291 ha of land within the Drayton South area and reduces its associated beef cattle production proportionately.

When compared to the broader outlook of this project alternative, all areas that are technically and economically feasible to mine will maximise the recovery of coal resources. However, this would result in neighbouring private receivers, including agricultural enterprises, experiencing excessive environmental and social impacts, particularly with regard to air quality, noise and visual amenity. In this regard, Alternative 4 was rejected.

Alternative 5 – The Project

Alternative 5 results in the development of mining operations over an area of 1,928 ha of land within the Drayton South area and reduces its associated beef cattle production proportionately.

When compared to the broader outlook of this project alternative, coal resources and operational efficiency can be optimised whilst minimising potential environmental and social impacts at neighbouring private receivers, including agricultural enterprises. It also maximises the opportunity to secure the social and economic benefits that would result from the continued utilisation of the existing Drayton Mine infrastructure and employment for the existing workforce. In this regard, Alternative 5 was adopted as the Project.

Visual Bund Alternatives

Anglo American's key objective when developing the mine plan for the Project was to reduce the visual impacts of the Project on receivers located to the immediate south, including Coolmore Stud, Woodlands, Arrowfield Estate, the village of Jerrys Plains and the Golden Highway.

The visual impact assessment undertaken for the Project (Appendix I of the EA) has determined that views to the Project are largely screened from surrounding areas due to existing natural topography, remanent vegetation and the establishment of tree screening. The exception is the views that will be available through an existing valley to the Houston and Whynot mining areas. To alleviate potential long term views of the Project, a visual bund will be constructed.

Three visual bund alternatives were considered as part of the consultation process and ongoing working group participation with neighbouring stakeholders, in particular Coolmore Australia. The alternatives considered for the visual bund design as part of the EA are illustrated in Figures 36, 48 and 49 in the EA and further described in **Section 4.7** having regard to potential impacts on agricultural resources and enterprises.

As part of this RTS, a fourth visual bund design was investigated. This is discussed further in **Section 4.7**.

4.16.9 Management and Mitigation

Land Management

This section responds to the submissions raised by stakeholders regarding land management measures to be adopted within the Drayton South area.

Submission: RA2

Anglo American is committed to outlining land management measures as a component of the broader rehabilitation plan (as required by DRE) for the Drayton South area. The plan will include, but not be limited to, the measures outlined below.

Operational Mining Area Fencing

As outlined in **Section 4.16.1**, agricultural land situated within the Drayton South disturbance footprint will be progressively removed from production as a result of the Project. Cattle exclusion fencing will be established on the boundaries of operational mining areas in conjunction with the staged mine plans (from commencement of the Project through to Year 10).

Sustainable Grazing Practices

The three sectors within the agricultural land reserve will benefit from the promotion of rotational grazing techniques subject to establishment of a suitable stock density and paddock layout. Extensive grass growth in some areas near Saddlers Creek may benefit from more intensive grazing over short periods with longer periods of rest to utilise the growth potential of the existing pasture mix. The installation of subdivisional fencing will allow for such strategic grazing rotations. Sustainable grazing practices will be undertaken in accordance with the principles of Anglo American's agreement with the CMA.

Stock and Vehicle Crossings

A designated stock and vehicle crossing will be established and maintained across Saddlers Creek to avoid disturbing the onsite biodiversity offset area. This crossing will also facilitate rotational grazing practices and continued access for land management.

Weed Control

The presence of weeds, in particularly noxious species, in the landscape has the potential to significantly impact on agricultural productivity. Weed management will be a critical component of continued beef cattle production within the agricultural land reserve.

Weeds will be managed across the agricultural land reserve through a series of controls, including herbicide application, biological controls and manual weeding. Any use of herbicides will be carried out in accordance with the regulatory requirements.

Regular inspections will be undertaken to identify potential weed infestations. Control programs will be implemented according to industry best management practice for the weed species of concern.

All weeds will ideally be removed prior to flowering, or at flowering prior to seed set. Flowering or fruiting plants are high priority, particularly given to the potential downstream impacts on agricultural production.

Mine Closure Strategies

Following the cessation of mining, the agricultural land reserve will continue to be managed in line with ongoing cattle operations (see **Section 4.16.1**) and in accordance with the agreement between Anglo American and its approved lessee. As part of this agreement, land managers will be required to undertake operations in a responsible manner with respect of the onsite biodiversity offsets, which are to be protected in perpetuity.

The broader mine closure strategy for the Project is described further in **Section 4.20**.

Other Environmental Management

This section responds to the submissions raised by stakeholders in relation to environmental management during the operation of the Project having regard to agricultural enterprises in the locality, including monitoring and reporting requirements and the preparation of management plans and implementation of contingency measures.

Submission: RA2

Management Plans

Various mitigation and management measures are proposed to be implemented as part of the mine plan design to ensure the Project is operated in an environmentally responsible manner. These measures will be detailed in numerous environmental management plans for the Project, including an air quality management plan (see **Section 4.2**), noise management plan (see **Section 4.4**), blasting management plan (see **Section 4.5**), water management plan (see **Section 4.11** and **4.12**), rehabilitation plan (see **Section 4.17**) and traffic control plan (see **Section 4.21**). Each plan will be prepared in consultation with relevant regulatory agencies and stakeholders.

The aforementioned management plans will contribute to minimising and managing predicted impacts on receivers in the locality, including agricultural enterprises.

Contingency Measures

A range of contingency measures have been considered for the Project in the event significant variations from the results predicted in the EA occur.

Anglo American has committed to implementing a real-time monitoring network to provide ongoing feedback regarding the performance of the Project under varying operational and weather conditions. This system will capture any variation to the modelled air quality and noise predictions (see **Section 4.2** and **4.4**) and provide accountable personnel with information required to implement appropriate mitigation and management controls, such as adjustment of operational practices, to keep dust and noise to an acceptable level.

Anglo American has also committed to implementing a blast monitoring network, which is representative of the closest sensitive receivers. In the event vibration and overpressure

levels substantially differ to that predicted, mandatory reporting will be undertaken and data collected from monitors will be used to ensure future blasts designs are altered to ensure compliance with relevant criteria (see **Section 4.5**).

The visual impact has been predicted according to the visual effect of the Project (its visibility) and the visual sensitivity of areas from which it is seen. Should the visual impact differ from that presented in Appendix I of the EA and **Section 4.7**, additional mitigation may be achieved at specific sensitive viewing locations via offsite visual treatments, such as establishing tree screens and/or plantings at the viewer's location to reduce visibility.

Monitoring and Reporting

Anglo American maintains an existing environmental monitoring network at Drayton Mine and within the Drayton South area, which includes meteorological, dust, noise, blast and water monitoring stations. This network provides accountable personnel with information required to implement appropriate mitigation and management controls, such as adjustment of operational practices, to avoid or minimise environmental harm.

Anglo American is committed to upgrading the environmental monitoring network to meet regulatory expectations and allow for the identification and management of environmental risks. This may involve installing monitoring stations on neighbouring land that sustains an agricultural enterprise. The network will contribute to minimising and managing predicted impacts on receivers in the locality, including agricultural enterprises.

An Annual Review will be prepared for all operations associated with the Project. This document will summarise company activities and performance in the areas of health, safety, environment and community, including the results of environmental monitoring.

Agricultural Offsets

This section responds to the submissions raised by DPI regarding the warrant of agricultural offsets for the Project.

Submission: RA2

The Drayton South disturbance footprint encompasses an area of 1,928 ha. This land does not constitute SAL as verified in **Section 4.16.2**. It primarily coincides with a land capability of Class VI and VII as verified by the soil and land capability impact assessment (see Appendix Q of the EA). The soil is generally of poor quality with limited water holding capacity given that it is divided in the landscape by a significant ridgeline to the south, which excludes it from receiving benefits from the Hunter River. As such, the land is limited to grazing and restricted cultivation. Given that the Drayton South disturbance footprint does represent prime SAL, an agricultural offset is not warranted.

Furthermore, the agricultural production generated off the land within the Drayton South disturbance footprint is relatively small when compared to a local and regional scale. Given that Anglo American is committed to reserving a significant portion of the remaining land for continued beef cattle production an agricultural offset is not warranted.

Consultation

This section responds to the submissions raised by stakeholders regarding ongoing consultation with land owners of neighbouring agricultural enterprises, including Coolmore Stud and Woodlands Stud, throughout the life of the Project and upon mine closure.

Submission: RA2

Anglo American is committed to ongoing engagement with relevant stakeholders throughout the life of the Project and upon mine closure, including land owners of agricultural enterprises in the locality. Various consultation methods will be adopted in accordance with the stakeholder engagement plan for the Project, including working groups, meetings with the Drayton Community Consultative Committee and the distribution of newsletters.

4.17 REHABILITATION

4.17.1 Rehabilitation Strategy

This section responds to the submissions raised by stakeholders regarding the need for further detail on the proposed rehabilitation strategies for the Project.

Submission: RA3 and RA6

Section 8.17 of the EA outlines rehabilitation objectives for the Project. DRE supports these objectives and has advised that the rehabilitation requirements for the Project are sufficiently addressed in the EA. However, to address the concerns of other stakeholders, a detailed rehabilitation strategy has been prepared for the land to be disturbed by the Project and for the restoration of Saddlers Creek. The rehabilitation strategy is presented in **Appendix J**. In summary, the strategy provides:

- Detailed rehabilitation strategies for the Drayton South disturbance footprint and each of its domains;
- A revegetation program for the Drayton South disturbance footprint and onsite biodiversity offset areas;
- A monitoring program to assess performance of the rehabilitated areas; and
- Objectives and preliminary completion criteria for final void management and mine closure.

A detailed mining operations plan and a rehabilitation plan (as required by DRE) will be prepared following the granting of Project Approval. These management plans will provide additional information beyond the strategy (see **Appendix J**) to address all aspects of rehabilitation.

4.17.2 Revegetation

This section responds to the submissions raised by stakeholders regarding program for the revegetation of the Drayton South disturbance footprint and Saddlers Creek and potential land use rezoning requirements.

Submission: RA2, RA6, RA7, RA13, RA17, SIG12, P3, P12 and P30

Drayton South Disturbance Footprint

The Houston visual bund will be constructed in an eight-staged program from Year 3 for a period of approximately 16 months. Upon completion of each lift, the face of the bund will be progressively covered with topsoil and rehabilitated with pasture grass and/or sterile cover crops to minimise exposed areas. Tree screens, composed of native species, will then be established to restore amenity.

The Drayton South disturbance footprint will progressively be rehabilitated in line with the progression of the staged mine plans (as presented in Figure 14 to Figure 20 of the EA) to establish Narrabeen Footslopes Slaty Box Woodland and Central Hunter Box-Ironbark Woodland communities. This area will be protected in perpetuity as an onsite biodiversity offset for the Project. The rehabilitation strategy, presented in **Appendix J**, includes details on the revegetation program for the Drayton South disturbance footprint and the proposed species that will be planted for the development of the aforementioned vegetation communities.

OEH raised concern regarding the rehabilitation proposed for the Project, particularly the success rate and time lag associated with rehabilitation of the mined areas and its contribution to the biodiversity offset package. This issue is addressed in **Section 4.8**.

In line with MSC's (2011) *Land Use Development Strategy*, up to 70% of the Drayton South disturbance footprint will be rehabilitated to high density tree planting, which is defined in the order of greater than 30 trees/ha, and provide for biodiversity connectivity. As per the requirement of the strategy, the Project aims to enhance the local and regional habitat corridors as presented in the *Synoptic Plan: Integrated Landscapes for Coal Mine rehabilitation in the Hunter Valley of New South Wales* (Synoptic Plan) (DMR, 1999) to allow for the movement of flora and fauna. This also aligns and compliments existing conservation areas established by Mt Arthur Coal Mine.

Rehabilitation completion criteria for the Drayton South disturbance footprint will be developed and agreed in consultation with the relevant government agencies and community. Progress against the criteria will be regularly monitored (see **Section 4.8**) and reported to relevant stakeholders. Once the state of rehabilitation achieves the set criteria post mining operations and following surrender of the Mining Lease, the land may be rezoned to a more suitable land use under the *Muswellbrook Local Environmental Plan 2009*, if required by MSC.

Saddlers Creek Restoration

The Saddlers Creek corridor that lies on land owned by Anglo American will be set aside as an onsite offset in perpetuity as part of the biodiversity offset package for the Project. An existing 24 ha of existing vegetation is situated within the immediate vicinity of Saddlers Creek. This will be enhanced through the revegetation of an additional 62 ha of Hunter Floodplain Red Gum Woodland. As Saddlers Creek is a moderately saline watercourse, salt tolerant species (representative of the target community) will be planted.

The restoration strategy for Saddlers Creek involves a combination of earthworks, revegetation, fencing and implementation of land management practices. Together, this will result in the improvement of wildlife corridor values and creek line condition and function. It also aligns with the corridors presented in the Synoptic Plan (DMR, 1999) and compliments existing conservation areas established by Mt Arthur Coal Mine.

All restoration works along Saddlers Creek will be conducted in accordance with the collaborative agreement between Anglo American and the CMA.

The principles and key leanings from Anglo American's previous success at Dartbrook Mine with the Hunter River Restoration Project will be adopted for the restoration of Saddlers Creek. As recommended and in consultation with NOW, appropriate geomorphological frameworks, such as River Styles, may be implemented to establish the most appropriate program and focus for the restoration works based on consultation with the CMA.

Restoration completion criteria for the Saddlers Creek corridor will be developed and agreed in consultation with the relevant government agencies and community. Progress against the criteria will be regularly monitored (see **Section 4.8**) and reported to relevant stakeholders. Once the state of rehabilitation achieves the set criteria, the land may be rezoned to a more suitable land use under the *Muswellbrook Local Environmental Plan 2009*, if required by MSC.

4.17.3 Demonstrated Capacity for Successful Restoration and Rehabilitation

This section responds to the submissions raised by stakeholders regarding the ability of Anglo American to successfully achieve restoration and rehabilitation works as proposed for the Project.

Submission: RA2, RA7, RA13, SIG1, P20, P22 and P30

Anglo American has a proven track record for river restoration works. In 2005, a joint project between Anglo American and the CMA was established to improve the health of a 6.5 km section of the Hunter River and Dart Brook at Dartbrook Mine north of Muswellbrook. This project involved:

- Protection and enhancement of one of the largest remaining populations of River Red Gum (*Eucalyptus camaldulensis*);
- Promotion of natural regeneration within natural and artificial flood areas;
- Increasing native vegetation density and diversity;
- Minimisation of further riparian and stream biodiversity loss;
- Management of introduced species and weed infestations;
- Improvement of channel bed stability, water quality and flow regimes; and
- Restoration of fish habitat and native fish stocks.
- Ongoing management, including periodic inspections by the CMA and monitoring undertaken by external consultants using the methodology as prescribed by the CMA, has determined that these works are progressing well.

There has been an extensive history of rehabilitation at Drayton Mine. This experience will be utilised and expanded upon for the Project.

In order to develop a practical prescription for the establishment of nominated woodland communities within the Drayton South disturbance footprint a 1 ha trial site, containing a range of treatments, was established at Drayton Mine in 2012.

The trial has been established to examine the suitability of a wide range of species with specific focus on two EEC communities, which include the Central Hunter Box-Ironbark Woodland and the Narrabeen Slopes Slaty Box Woodland. The trial includes the following treatments:

- Comparison of the relative merits of tube stock versus direct seeding;
- Within each EEC community assess the suitability of a wide range of relevant local native tree, shrubs and ground cover species; and
- Compare the benefits of applying seed with and without fertiliser.

This investigation will be on going and is intended to inform the future mine rehabilitation within the Drayton South area to improve the likelihood of rehabilitation success.

4.17.4 Weed Control

This section responds to the submissions raised by stakeholders regarding land weed management measures to be adopted within the Drayton South area.

Submission: RA2, P13 and P41

The presence of weeds, in particularly noxious species, in the landscape has the potential to significantly impact on rehabilitation efforts and long term biodiversity values.

Weeds will be managed across the Drayton Complex through a series of controls, including herbicide application, biological controls and manual weeding. Any use of herbicides will be carried out in accordance with the regulatory requirements.

Regular inspections will be undertaken to identify potential weed infestations. Control programs will be implemented according to industry best management practice for the weed species of concern.

All weeds will ideally be removed prior to flowering, or at flowering prior to seed set. Flowering or fruiting plants are high priority, particularly given to the potential downstream impacts on biodiversity.

4.17.5 Water Management

This section responds to the submissions raised by stakeholders regarding water supply options to irrigate revegetated areas within the Drayton South disturbance footprint and along Saddlers Creek.

Submission: RA2 and RA13

During the life of the Project, progressive rehabilitation may be sustained by supply from the clean component of the water management system (e.g. Blakefield Dam and highwall dams)

should weather conditions result in rehabilitation stress. Following the cessation of mining and upon rehabilitation of the entire Drayton South disturbance footprint, Anglo American will retain relevant WAL sourced for the Project under the Hunter Regulated River Water Source the ongoing agricultural irrigation and rehabilitation maintenance (if required).

4.18 SUBSIDENCE

This section responds to the submission raised by DRE, which requests a subsidence management plan be prepared prior to the commencement of highwall mining.

Submission: RA3

A component of the operations within the Drayton South area will be undertaken via highwall mining methods. This mining method will allow for increased productivity, reduced environmental impacts and access to resources that would otherwise not be recoverable due to the self-imposed restrictions placed on the open cut mine plan to address stakeholders concerns.

Anglo American will prepare a subsidence management plan prior to the commencement of highwall mining. Design parameters and management measures outlined in the plan will be consistent with the Australian Coal Association Research Program report *Optimal Design and Monitoring for Highwall Mining* (CSIRO, 2001) to ensure no noticeable subsidence or surface disturbance as defined by the *Guidelines for Applications for Subsidence Management Approvals* (DMR, 2003).

4.19 FINAL LANDFORM

This section responds to the submissions raised by stakeholders regarding the conceptual final landform for the Drayton South area and Drayton Mine and how these landforms will be designed to integrate with the surrounding environment consistent with best practice expectations. It also justifies the optimisation of the final voids at Drayton Mine, which support the Project and potentially the operations of neighbouring industry.

Submission: RA6, RA13, SIG5, SIG8, SIG12, SIG13, P4, P12 and P13

The Project has been designed in consideration of the final landform principles of the draft *Muswellbrook Shire Council Land Use Development Strategy* (MSC, 2011). The way in which the Project has considered and adopted these key principles is as follows:

- Final landform design across the Drayton Complex has been engineered to ensure a successful and safe final landform, including sustainable low walls and highwalls within the voids at Drayton Mine and within the Drayton South area;
- Final landform design to ensure the landscape will replicate the natural features of the surrounding environment and result in a free-draining landform (where practical). Diversion contours will be established above the required sustainable highwall to ensure the stability of the final void highwalls and minimise geotechnical failure and erosion of the created landform;
- The final landform design has incorporated the re-establishment of the pre-disturbance catchment areas as far as practicable;

- The final void within the Drayton South area will have sufficient freeboard and as such will not require a spillway; and
- Utilisation of the existing voids at Drayton Mine for tailings and rejects disposal and potential future ash disposal.

Each of design parameters are discussed in further detail below.

4.19.1 General Landform Design

The conceptual final landform proposed for Drayton Mine (see Figure 24 to 29 of the EA) and the Drayton South area (see **Figure 40**) is generally consistent with the surrounding landscape, with slopes of approximately 10 degrees or less across the majority of the disturbance footprint to mimic surrounding undisturbed topography. The exception to this is the landform associated with the Houston visual bund and the final voids.

The slope of the Houston visual bund ranges between 10 and 17 degrees, which increases with elevation. This is to allow for the final landform to be integrated with the existing ridgeline to the south of the Project (which itself has slopes that range from 6 to 17 degrees) and to shield views from sensitive receivers during the life of operations. In this regard, the conceptual final landform design and existing topography creates a barrier between the Drayton South area and the high quality agricultural land to the south. As such, a functional association between the two areas, as asserted by MSC, is not feasible. It is noted, however, that a functional association will be maintained throughout the Project by continuing to undertake sustainable agricultural practices on the Plashett property to the immediate south of the ridgeline down to the Hunter River flats and on the Bowfield property to the west.

The design of the final voids is described further in **Section 4.19.2**.

To minimise surface water catchment as far as practical, the conceptual final landform for Drayton Mine and the Drayton South area has been designed to include diversion drains and contour banks to redirect surface water runoff away from low lying areas.

The final landform designs included in the EA are conceptual in nature and are intended to commit to the broader principles of final landform design for the Project. As part of the detailed design phase, Anglo American is committed to developing a detailed final landform design for the Project through the use of GeoFluv software (or similar), which is used to produce a free draining, integrated and sustainable landform that is stable against erosion. Empirical measurements collected for the natural landscape surrounding the Drayton South area will be utilised as model inputs to provide a high degree of certainty that the detailed design will perform to the existing surrounding natural landform. The intended result is to design a final landform that will emulate existing areas of the natural landscape by incorporating aspects of micro-relief and replicating natural features such as rolling hills in the rehabilitated landscape. The software has been extensively proven and has provided designs for what is arguably the most erosive area in North America (i.e. areas around the Grand Canyon).

Details pertaining to the rehabilitation of the final landform and nominated final land uses upon mine closure are described further in **Section 4.17** and **4.20**, respectively.

Anglo American will continue to liaise with DRE and MSC with regard to the design and establishment of the final landform for the Project.

4.19.2 Final Voids

Optimisation of Voids

Following completion of mining at Drayton Mine in 2017, Anglo American will maximise opportunities to use the final voids for storage of water, rejects and tailings generated from the Drayton South mining areas. Void allocation is contingent upon commercial agreement with Macquarie Generation. As such, there are three possible scenarios proposed (see Section 4.4.1 of the EA).

The preferred scenario (Scenario 2) assumes that Macquarie Generation does not elect to occupy the East (South) Void and is granted planning approval to raise their current ash dam wall to increase its storage capacity or make other arrangements for the disposal of ash.

In Scenario 2, the East Void will be utilised for tailings disposal during the life of the Project and capped and rehabilitated at RL 140 m. As the East (South) Void is located on land owned by Macquarie Generation, Anglo American will enter into new commercial arrangements for the Project to occupy this void until closure of operations. At this time, Macquarie Generation may elect to dispose ash from its operations to the full capacity of the East Void.

The North Void, which is situated on land owned by Anglo American, will be utilised as a rejects emplacement area and capped and rehabilitated at RL 181 m. As committed to in the EA, Anglo American commits to installing groundwater monitoring bores in strategic locations to detect the movement of seepage water away from the voids. Water levels will be recorded on a quarterly basis. In addition, groundwater samples will be collected and analysed on a six-monthly. This will enable direct comparison with groundwater samples collected from other areas associated with the Project.

The South Void, which is substantially within land owned by Macquarie Generation, will be utilised as a water storage area for the life of the Project. Currently Drayton Mine has the right to utilise the South Void until 1 January 2023. Anglo American will consult further with Macquarie Generation regarding the utilisation of the South Void following this date.

Each of these scenarios aims "*to reduce the number and depth of residual landform voids*", which is a key principle of the *Land Use Development Strategy* (MSC, 2011) and is raised specifically in their submission.

With regard to the Drayton South area, each of the Blakefield, Redbank and Houston mining areas will be completely filled and rehabilitated to create a free draining landform. It is only the Whynot mining area which will result in a final void. The design of the final void for the Whynot mining area is such that the highwall will be blasted back and low wall battered back to ensure the long term geotechnical stability. Further details pertaining to the design of the final voids are discussed in subsection *"Slope and Stability"*.

Slope and Stability

Following the cessation of mining, the low wall, which is the side of the void containing overburden and disturbed material, will be stabilised in the following manner:

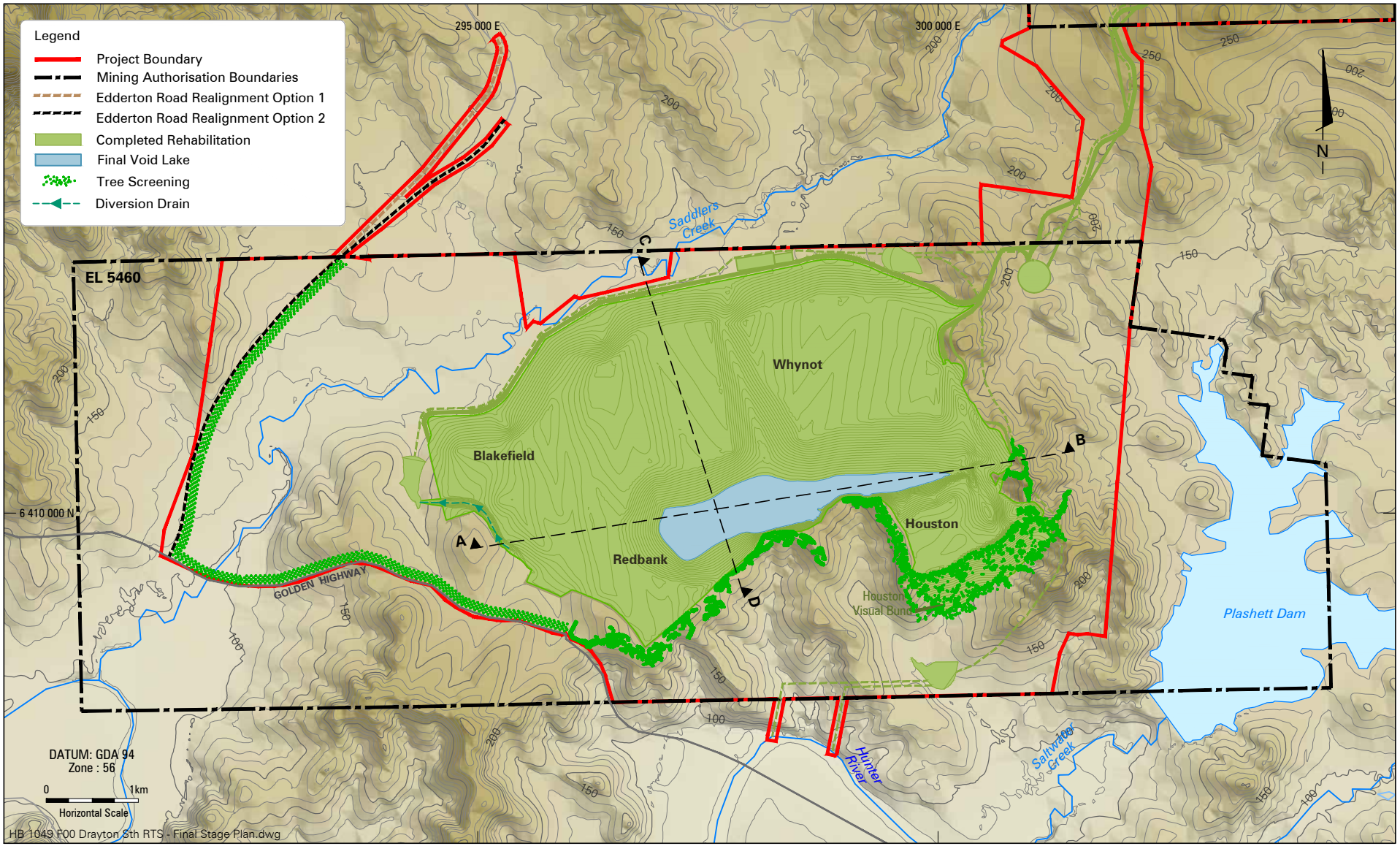
- The low wall will be battered back from the angle of repose to ensure the long term geotechnical stability of the face, with the determination of geotechnical stability and recommendations as to the final slope undertaken by a qualified geotechnical engineer. This will be based on an assessment of the overburden material, the likely degree of settlement, and the degree of weathering expected in the long term. However, it is expected that the low wall sides of the final voids will be battered back to 10 degrees where practical or a maximum of 18 degrees;
- Surface water drainage on and over the low wall will be minimised through the construction of drainage control structures and the aim of diverting as much of the catchment as possible away from the final void and back into the surface water system; and
- Erosion of the low wall will be controlled by limiting the length of slope through the use of contour and graded drains, minimising the slope, and by the establishment of suitable vegetation.

The highwall is the actively mined side of the void and is generally comprised of undisturbed, solid material generally above the economically lower-most limits of the mineable seam. As part of the final landform it is planned that the final void will have the majority of the highwall blasted back to improve the safety and stability. This will be undertaken consistently with the sustainable highwall work that is being implemented for the Drayton Mine final voids. As per commitments outlined in the current Drayton mining operations plan, the three final void highwalls will have inert material dumped from the crest above the highest coal seams, at 37 degrees. This will then be direct seeded. Anglo American has commenced discussions with DRE on the implementation of these sustainable highwalls and any learnings from the implementation at Drayton Mine will be transferred to the Drayton South area to achieve the mine closure objectives.

Figure 40 and **Figure 41** illustrate cross-sections of the Drayton South final void.

Final Void Lake

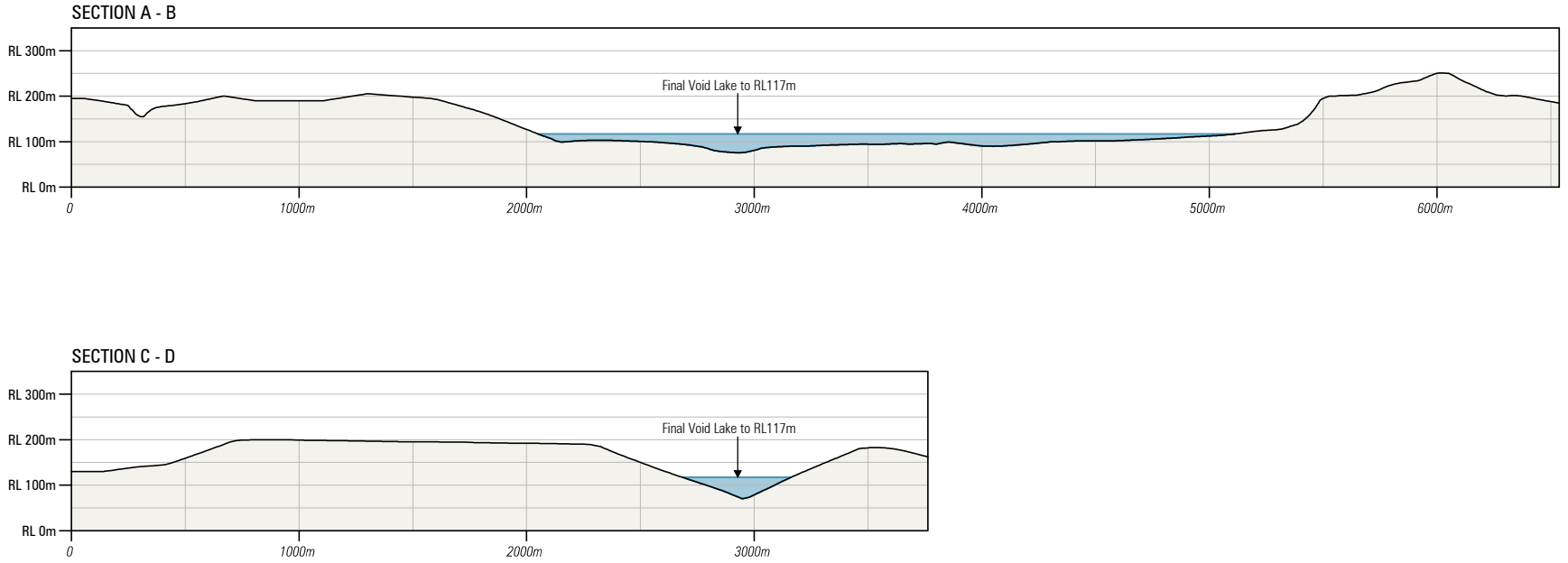
Surface water runoff and groundwater seepage will settle in the remaining void within the Drayton South area, creating a lake to approximately Reduced Level (RL) 117 m at 1,000 years following the cessation of mining (see **Figure 41**). The freeboard between the water level surface and the void spill height is predicted to be approximately 90 m and as such does not warrant a spillway. Water quality aspects of the final void lake are discussed in **Section 4.11.6** and **4.12.3.**



DRAYTON SOUTH COAL PROJECT
RESPONSE TO SUBMISSIONS

Conceptual Drayton South Final Landform

FIGURE 40



HB 1049 F00 Drayton Sth RTS - Final Landform Sections.dwg

DRAYTON SOUTH COAL PROJECT
RESPONSE TO SUBMISSIONS

Conceptual Drayton South Final Landform Cross-Sections

FIGURE 41

4.20 MINE CLOSURE

This section responds to the submissions raised by stakeholders regarding the preparation of a mine closure strategy for the Project and the nominated final land use options for the Drayton South area upon cessation of mining.

Submission: RA3 and RA6

Anglo American is committed to providing a mine closure strategy as a component of the broader rehabilitation plan (as required by DRE) for the Project. The strategy will be guided by the *Mine Closure and Completion handbook and the Strategic Framework for Mine Closure* and shall reflect contemporary expectations, including changes to the final mine plan as may be required, regulatory requirements, new technologies and stakeholder expectations.

The mine closure strategy will prescribe detailed procedures to ensure the success of the nominated final land uses. In this regard, the Drayton South disturbance footprint and the Saddlers Creek corridor will be set aside as an onsite offset in perpetuity as part of the biodiversity offset package for the Project. The Drayton South final void will be retained as one of the following land use options:

- OEA for future open cut mining operations;
- Waste disposal area for future mining operations or council use;
- Ash disposal area for neighbouring power stations;
- Water storage for neighbouring power stations or future mining operations;
- Aquaculture; or
- Recreational lake.

The majority of the land situated outside of the Drayton South disturbance footprint and onsite biodiversity offset areas will be reserved for agricultural purposes and managed in line with current cattle operations (see **Section 4.16.1**) and in accordance with the agreement between Anglo American and its approved lessee. Ongoing agricultural production on this land will allow for the rural character of the Drayton South area to be retained.

As the Drayton South mining area is largely surrounded by existing or proposed future mining developments and is immediately adjacent to the existing Bayswater Power Station and the conceptually approved Bayswater 2 Power Station it is highly likely that the Drayton South final void will have a beneficial use as the area is further developed. It is also likely that the majority of infrastructure remaining at the end of the mine life will similarly retain a beneficial use.

Decommissioning and removal of mine site facilities and all infrastructure items will take place if that infrastructure is not required post-mining or sold on for other industrial purposes. Any infrastructure including dams, levee banks, roads and buildings, which are deemed beneficial for future use by post mine land owners, will be left in place in accordance with the relevant stakeholder or land owner agreements. Any contaminated land in the vicinity of mine site facilities will be remediated.

4.21 TRAFFIC AND TRANSPORT

4.21.1 Road

Assessment Methodology

This section responds to submissions raised by stakeholders regarding the processes used to calculate traffic volumes.

Submission: P3, P10, P13 and P24

In order to calculate traffic volumes along the Golden Highway, previously records from the RTA (2004) study were adopted. An annual growth rate was applied to this value to obtain the traffic volumes along this road in 2012. Therefore, the traffic volumes used in the assessment are indicative of current conditions.

The SIDRA model considered the traffic generated by both existing and approved mines, including Bengalla Mine, Mt Arthur Coal Mine, Mangoola Coal Mine and the Mount Pleasant Project. Traffic increases due to other mines are accounted for in the annual growth rate applied to the background traffic volume. Therefore, the predicted traffic impacts are the cumulative impacts of mining in the region.

The traffic and transport impact assessment (see Appendix T of the EA) considered mining proposals for which a development application and accompanying EA were publically available. At the time of the assessment, there was no public information on the proposed modification to Mt Arthur Coal Mine. Although this proposed modification was not included in the traffic model, the traffic impacts of this development as approved are represented in the annual growth in background traffic. Since mining contributes largely to the growth in traffic volumes within the region, applying this growth rate will somewhat reflect the impact of the proposed Mt Arthur Coal Mine modification.

Modelling

This section responds to the submission raised by RMS, which requests electronic model files developed for the traffic and transport impact assessment (Appendix S of the EA) be provided to allow for a complete analysis and verification of road infrastructure upgrade requirements.

Submission: RA9

The SIDRA model files developed for the traffic and transport impact assessment (Appendix S of the EA) were provided electronically to RMS on 20 December 2012.

Safety

This section responds to the submission raised by NSW Transport in relation to the presentation of collision events along the existing Edderton Road. It also responds to submissions from stakeholders regarding the impacts of the Project on road safety.

Submission: RA10, SIG3, SIG9, SIG10, SIG13, SIG16, P5, P6, P13, P20, P21, P23 and P41

NSW Transport commented that Figure 17 of the traffic and transport impact assessment (Appendix S of the EA), which provides a diagram of the collision events that have occurred

along the length of the existing Edderton Road, was difficult to interpret. The arrows shown on the figure indicate the nature and direction of travel before and during the collision. Multiple arrows indicate that more than one vehicle was involved and swirling lines indicate that the vehicle lost control. This figure is consistent with standard crash-collision symbology for the definition for coding accidents or road user movements and is used in Austroads and RMS literature on crash analysis and investigation.

A number of stakeholders expressed concern that the Project will increase dangers on local and regional roads due to increased heavy vehicle movements and employee movements. Since the Project will not increase the workforce of Drayton Mine, there is not predicted to be any material increase in traffic volumes on local and regional roads. Numbers of heavy vehicle movements (including oversized vehicles) will also remain similar to existing operations. Therefore, the Project is not expected to cause increased dangers on local and regional roads.

In fact, the Project will facilitate a number of road upgrades that may reduce the incidence of road accidents. The realigned section of Edderton Road will have a greater sealed width than the existing Edderton Road. The new section of road will have 1.3 m wide shoulders, which the existing road lacks. These improvements will reduce the level of risk along this 7 km long section of Edderton Road. The relocation of the Edderton Road/Golden Highway intersection will also reduce the level of risk by increasing the stopping sight distance for westbound traffic on the Golden Highway and the gap acceptance distance from the hold line of Edderton Road.

Edderton Road Realignment

This section responds to the submissions raised by stakeholders in relation to the Edderton Road realignment, its interactions with Mt Arthur Coal Mine and the implementation of management measures to minimise the impact of construction on existing road users.

Submission: RA2, RA9, RA10 and SIG9

Anglo American proposes to realign and upgrade of the southern portion of Edderton Road further to the west by approximately 5 km to facilitate operations in the Blakefield and Redbank mining areas. The construction of the Edderton Road realignment will primarily be undertaken offline and will not affect the daily operations of the existing alignment. There will be some traffic staging requirements at the two tie-in points at the intersection with the Golden Highway and the existing Edderton Road; however, this is not envisaged to significantly disrupt traffic along existing routes.

Construction works for the Edderton Road realignment and its associated intersection are not expected to significantly increase volumes or disrupt traffic on the existing Edderton Road/Golden Highway intersection. All other operational traffic accessing the Drayton Complex will continue to be via the existing Drayton Mine Access Road off Thomas Mitchell Drive.

The existing portion of Edderton Road will remain operational throughout the construction phase and will only be closed once the new alignment has been completed. Edderton Road

and the Golden Highway are used by thoroughbred horse breeding enterprises as equine ambulance routes. By ensuring that the existing portion of Edderton Road remains open until the completion of the realignment, these routes will remain available to thoroughbred horse breeding enterprises.

An emergency access will be developed and maintained off the existing Edderton Road for health and safety purposes only. This route will be directly linked to the Edderton Road realignment situated immediately to the west. It will be gated and clearly signposted so as to indicate the nature of the access.

Similarly, Mt Arthur Coal Mine has approval to realign and upgrade the northern portion of Edderton Road and its intersection with Denman Road by 2019 to allow for future mining operations. Two options have been proposed by Mt Arthur Coal Mine for the northern realignment of Edderton Road. Given that the majority of these works will also be undertaken offline, there are no significant disruptions anticipated to traffic along existing routes during the construction phase.

The two proposed Edderton Road realignments result in a portion of the existing road being excluded from road work upgrades. As such, Anglo American has committed to ongoing consultation with Mt Arthur Coal Mine and MSC to enable the upgrade of the remaining section of the existing road.

To ensure the construction standards along Edderton Road are consistent and to allow for the best outcome for stakeholders, Anglo American will continue to consult with Mt Arthur Coal Mine and MSC regarding the establishment of common design criteria and objectives and to identify synergies between the two realignments.

Anglo American has committed to preparing a traffic control plan, which will describe management measures that will allow works along the Edderton Road realignment and its intersection with the Golden Highway to be safely undertaken whilst still affording public access. This plan will be developed prior to the construction phase and to the satisfaction of RMS and MSC. As road works are required on the Golden Highway, a State road, Anglo American will enter into a Works Authorisation Deed with RMS following PA and meet the requirements under this process.

Edderton Road/Golden Highway Intersection

This section responds to the submission raised by RMS in relation to design requirements and the adequacy of the proposed Edderton Road/Golden Highway intersection under existing and future traffic regimes. It also specifies management measures to minimise the impact of construction on existing road users.

Submission: RA9 and P10

The current traffic conditions for the existing Edderton Road/Golden Highway intersection were assessed in the traffic and transport impact assessment (Appendix S of the EA) by means of a series of midblock tube surveys and an intersection turning movement count in February 2012. The highest volume hour for this intersection was recorded between 3:15 pm and 4:15 pm. Calibration adjustments (factor of 1.6) were applied to the surveyed turning

movement volumes to ensure consistency with the highest hourly volumes recorded during the midblock surveys.

During the highest volume hour, a total of 45 vehicles (including 12 heavy vehicles) were recorded turning right at the Edderton Road/Golden Highway intersection on to Edderton Road. A further 94 vehicles (including 29 heavy vehicles) were recorded as opposing traffic continuing through along the Golden Highway or turning left onto Edderton Road. With consideration of the calibration adjustments, these traffic volumes are equivalent to 72 vehicles (including 20 heavy vehicles) and 151 vehicles (including 47 heavy vehicles)/h, respectively.

Construction works for the Edderton Road realignment and its associated intersection are not expected to significantly increase volumes or disrupt traffic on the existing Edderton Road/Golden Highway intersection.

The proposed intersection of the Golden Highway with the new alignment of Edderton Road will be a channelized right-turn configuration consisting of an indented and protected right-turn lane on the Golden Highway. This is considered the highest standard of rural T intersection from both a traffic performance and safety perspective. The intersection will be engineered to the standards outlined in the *Guide to Road Design* (Austroads, 2009) and to the satisfaction of RMS and MSC. The intersection will include the following design features:

- Edderton Road will be aligned to intersect the Golden Highway at 90 degrees;
- The intersection will accommodate the turning path of the largest design vehicle;
- Provisions for on-road cyclists;
- Installation of street lighting in accordance with AS *1158 Street Lighting Applications* or as determined by RMS; and
- Installation of advanced intersection warning and other road signs on the Golden Highway.

To ensure the proposed intersection is adequate to accommodate the current and future traffic conditions, the channelized right-turn configuration was tested against the RMS and Austroads' guide for determining rural T intersection layout (see Appendix S of the EA). The critical traffic volumes used in this assessment indicated that an auxiliary right-turn configuration is required to service the demand volumes. As a channelized right-turn configuration is superior to an auxiliary right-turn configuration, the proposed intersection is regarded as one that exceeds the required capacity and safety with respects to right-turn movements onto Edderton Road.

The proposed Edderton Road/Golden Highway intersection was also assessed with regard to absorption capacity (see Appendix S of the EA). That is, the ability of the Golden Highway to absorb the left and right turning traffic from Edderton Road. The assessment was undertaken in accordance with an established Austroads (1988) method. This indicates that the Golden Highway carrying 140 vehicles/h in each lane would be able to absorb an additional 800 vehicles/h. As this greatly exceeds the turning movement volumes from

Edderton Road, this strongly indicates that there is ample spare capacity at this intersection and along the Golden Highway to absorb the egressing traffic.

The existing portion of Edderton Road and its intersection with the Golden Highway will remain operational throughout the construction phase and will only be closed once the new alignment has been completed. Following closure, the intersection will not be retained as part of the emergency access off Edderton Road to the Project (as described in subsection *"Edderton Road Realignment"*). This area will be fenced and tree plantings will be established to connect with the tree screens that already exist.

Anglo American has committed to preparing a traffic control plan, which will describe management measures that will allow works along the Edderton Road realignment and its intersection with the Golden Highway to be safely undertaken whilst still affording public access. The traffic control plan will describe management measures for both construction traffic and operational traffic associated with the Project. The traffic control plan will also prescribe conditions for the use of the emergency access off Edderton Road. This plan will be developed prior to the construction phase and to the satisfaction of RMS and MSC. As road works are required on the Golden Highway, a State road, Anglo American will enter into a Works Authorisation Deed with RMS following PA and meet the requirements under this process.

Edderton Road Closure

This section responds to the submission raised by MSC in relation to the closure of a portion of Edderton Road and the associated approvals process.

Submission: RA6

Anglo American is seeking approval under Part 3A of the EP&A Act for the realignment of Edderton Road. This requires approval under section 138 of the *Roads Act 1993* (Roads Act) which is, by virtue of section 75V of the EP&A Act, required to be issued in terms consistent with any planning approval for the Project. However, approval does not grant consent for the closure of the existing portion of Edderton Road. As such, Anglo American has submitted a road closure application under Part 4 of the Roads Act, which is subject to a separate approvals process whereby MSC is the consent authority. The closure application has been received by MSC.

Traffic Efficiency

This section responds to the submission raised by stakeholders in relation to the traffic efficiency of local roads and its associated intersections.

Submission: RA6, SIG13, P13, P24 and P30

Traffic efficiency is expressed as a measure of time per km travelled. In this regard, the length of the existing Edderton Road being bypassed and the length of the realignment are comparable. Furthermore the realigned portion of Edderton Road will have an improved geometric standard and pavement quality. Therefore a higher sustained travel speed on the realigned portion of Edderton Road will reduce the relative travel time. The only impact to travel time is associated with the portion of the trip to access Edderton Road from the

Golden Highway or Denman Road.

The realignment of Edderton Road will move the intersection with the Golden Highway further to the west. As a result, the journey east from Edderton Road and the Golden Highway will be lengthened by 5 km while the journey west will be reduced by 5 km. This will increase or decrease the travel time to access Edderton Road by three to four minutes. The realigned Edderton Road will be similar in length to the existing road. Therefore, the impact on travel times along Edderton Road will be minimal. The overall impact on travel times will be the increase or decrease of three to four minutes along the Golden Highway. This impact may be even less due to the improvement in the condition of the road. The realigned section of road will be in a better condition than the existing road, and will therefore be more conducive to travelling at the designated speed limit of 100 km/h. As a result, there will only be minimal impacts (in some cases a positive impact) on travel time.

For the highest volume of traffic turning onto Edderton Road from the Golden Highway, approximately 17% of vehicles enter the intersection from the west while 83% of vehicles enter from the east. In this regard, the travel time for the majority of traffic turning onto Edderton Road will increase marginally. Nonetheless, there will be significant safety benefits of relocating the intersection, including improved sight lines and indented turning lanes to separate through traffic from turning traffic.

Utilisation of Edderton Road with both the southern and northern realignments remains approximately three to four minutes more efficient than travelling from Muswellbrook along Denman Road and the Golden Highway to Jerrys Plains and vice versa.

The key intersections that will be impacted by Project related traffic are the New England Highway/Thomas Mitchell Drive and Denman Road/Thomas Mitchell Drive intersections. SIDRA modelling has been used to assess the performance of these intersections during the construction and operations phase of the Project. These results from the modelling indicate that these intersections will perform unacceptably if they remained in their current state. However, Mt Arthur Coal Mine has an obligation to upgrade these intersections to *"seagull"* intersections. Traffic modelling has indicated that these seagull intersections will be able to accommodate traffic volumes generated by mining developments. Therefore, the Project will not result in a long term loss of traffic efficiency in the LGA.

Mt Arthur Coal Mine is currently upgrading the New England Highway/Thomas Mitchell Drive intersection. This work will be completed before the peak construction period and will allow this intersection to accommodate construction traffic volumes. The Denman Road/Thomas Mitchell Drive intersection is scheduled to be upgraded by the end of 2019. This is not likely to cater for the Project until after its construction phase. However, SIDRA modelling suggests that this intersection is predicted to perform acceptably during this period. Therefore, the scheduling of the intersection upgrades by Mt Arthur Coal Mine will allow adverse traffic impacts during construction to be avoided.

Thomas Mitchell Drive

This section responds to the submission raised by MSC with regards to funding for the upgrade of Thomas Mitchell Drive.

Submission: RA6

As a condition of approval, HVEC is required to provide payment of $7.06 M to facilitate the upgrade of Thomas Mitchell Drive to the required engineering standard. This estimate was arrived through the independent *Review of Thomas Mitchell Drive Route Assessment* undertaken by RMS and accepted as a clause in the VPA between MSC and HVEC dated 24 June 2011. This payment was deemed by all parties as appropriate to cover the upgrade costs.

MSC asserts in their submission that the detailed costing to upgrade Thomas Mitchell Drive will exceed the previously estimated $7.06 M to $17 M, of which council has funded a further $4 M. This is a significant increase in cost since the estimate provided in 2011. Anglo American has since requested the documentation to support this cost, however, this information has not been disclosed by MSC. In this regard, Anglo American maintains their offer to pay $1.0 M as a direct contribution towards the cost of the Thomas Mitchell Drive upgrade. This amount is considered proportionate to the total usage of Thomas Mitchell Drive in Vehicle-Kilometres-Travelled (VKTs), which takes into account the number of vehicle movements generated and the distance travelled by these vehicles. The Project will generate approximately 8.2% of the daily VKTs along Thomas Mitchell Drive, and approximately 4% of the daily heavy vehicle VKTs on this road. Hence, the Project's contribution to traffic on Thomas Mitchell Drive is not significant, compared to other traffic sources.

As the Project is not seeking to increase workforce or service vehicle numbers, Anglo American should not be entirely responsible for the cost of upgrading Thomas Mitchell Drive. Part of the remaining cost to fund this initiative should be sought through other sources.

MSC also assert that should Mt Arthur Coal Mine not proceed to the full term of their development Anglo American should be obligated to complete all necessary works for the upgrade of Thomas Mitchell Drive. In response to this proposition, Anglo American is committed to a payment proportionate to its usage of Thomas Mitchell Drive only, as is fair and reasonable.

Broader Traffic and Transport Strategy and Funding

This section highlights the submission raised by RMS and MSC, which outlines the need for broader road network improvements as a result of cumulative mining projects (with consideration of the Project) and the associated funding mechanisms required.

Submission: RA6 and RA9

RMS notes that the EA has highlighted future impacts to the road network arising from the combined impacts of employee related vehicle movements associated with peak traffic conditions generated by mining operations in the local area. RMS acknowledges that as the Project does not seek to increase its existing operations workforce, Anglo American should

not be entirely responsible for the cost of constructing appropriate infrastructure to mitigate such impacts.

RMS recognises the need for transport infrastructure improvements required as a direct result of cumulative mining projects in the local area. RMS requests that DP&I, in consultation with NSW Transport, consider an appropriate funding mechanism to address the cumulative impacts arising from employee and service related traffic associated with mining operations within the area.

RMS suggests that a traffic and transport strategy be developed for the Lower and Upper Hunter regions, which would form the basis for a possible contribution plan (VPA) or similar, with funds directed to State road infrastructure upgrades, as determined by RMS.

MSC highlighted that the *Western Roads Strategy* (MSC, 1997) was the key mechanism for the strategic coordination and orderly reconfiguration of the rural road network to the west of the New England Highway to meet the traffic efficiency and safety needs of all road users, in particular the coal industry. The document was funded by those industry participants seeking network closures or realignments at the time.

Given changes in the network since the *Western Roads Strategy* (MSC, 1997) was initially published, MSC is seeking to revise the document to understand the cumulative effect of mine-related road amendments, including realignments and closures. To assist MSC, Anglo American has provided $50,000 towards the revision of the document.

4.21.2 Rail

This section responds to the submissions raised in relation to the Project's adopted train payload capacity and Anglo American's interactions with the Hunter Valley rail network owner (ARTC) and their forecasted strategies.

Submission: RA1 and RA10

NSW Transport identified that the train type and associated tonnage described in traffic and transport impact assessment (Appendix S of the EA), does not reflect those operating on the Hunter Valley rail network. However, NSW Transport has acknowledged that the assumed payload of 8,500 t/train as assessed is considered appropriate. As such no further revision to the train payload has been undertaken.

NSW Transport noted that the traffic and transport impact assessment (Appendix S of the EA) cites the *2009 – 2018 Hunter Valley Corridor Capacity Strategy* (ARTC, 2009). Since 2009, there have been two revisions to the strategy (ARTC, 2011 and 2012). One of the key changes to the strategy with each revision is the updated forecast coal tonnages from the Hunter, Gunnedah and Western coalfields. These forecasts are based on the contracted coal volumes that ARTC receives from individual coal producers. The strategy distinguishes between coal volumes that are confirmed under a binding contract (contracted volumes) and volumes from coal producers that are expanding but have not yet committed to contracted volumes (prospective volumes). Such volumes are considered when prioritising the upgrade needs of the rail network.

Ongoing consultation with coal producers in the Hunter, Gunnedah and Western coal fields allows ARTC to adjust their forecasts and the relative priority of rail improvement projects. Anglo American has committed to consulting with ARTC during the life of the Project regarding forecast production rates to assist in the planning and scheduling of rail improvement projects.

The traffic and transport impact assessment (Appendix S of the EA) highlighted rail network deficiencies, which are relevant to coal transportation from the Project. Nundah Bank (north of Singleton) was identified as a major constraint on the movement of port-bound loaded coal trains. The *2009 – 2018 Hunter Valley Corridor Capacity Strategy* (ARTC, 2009) recommended a third track be constructed to address this constraint. The revision of the strategy (ARTC, 2012) confirms that this project has been supported by industry and will be constructed between rail chainage 249.24 and 249.5 km.

Minimbah (north of Singleton) and Allandale Banks (near Greta) were also identified as similar constraints on the movement of port-bound loaded coal trains. The *2009 – 2018 Hunter Valley Corridor Capacity Strategy* (ARTC, 2009) recommended a third track be constructed from Minimbah to Maitland to address this constraint. The revision of the strategy (ARTC, 2012) confirms that this project has commenced construction.

The Drayton Junction (associated with the rail loops of Drayton Mine and Mt Arthur Coal Mine) was identified as having high maintenance turnouts, which resulted in excessive track maintenance and generated additional train delays. The *2009 – 2018 Hunter Valley Corridor Capacity Strategy* (ARTC, 2009) recommended the Drayton Junction be upgraded with high-speed (60 km/h) swing-nose turnout. The revision of the strategy (ARTC, 2012) outlines the deferral of the high speed turnout at the junction due to improvement works completed on the existing turnout in 2010. ARTC will continue to advance the full renewal of the junction in 2013.

As ARTC has resolved or is progressing works on the identified rail network deficiencies relevant to the Project, no further mitigation measures are proposed. However, Anglo American has committed to ongoing consultation throughout the life of the Project to support ARTC's strategic and planning processes. To date, ARTC has no further comment in relation to the Project and the EA.

Rail Traffic Volumes

This section responds to submissions regarding the impact of the Project on rail traffic volumes.

Submission: SIG10

If the Project achieves its peak coal production, the Project will require two trains per day to transport product coal to the Port of Newcastle. This is within Drayton Mines current approved capacity for train movements. As such there will be no increase in the number of train movements as a result of the Project. As new mining developments continue to come on line there will be an overall increase in rail traffic. In this regard, ARTC prepare and

update (generally biannually) the Hunter Valley Corridor Capacity Strategy document and conduct the necessary works program to facilitate the rail traffic demand.

Drayton Mine will continue to closely liaise with ARTC over their forecast train movements so that future rail movements can be accurately predicted and thus adequately catered for.

4.22 BUSHFIRE

This section responds to the submission raised by RFS, which requests the Project operate in accordance with relevant bushfire standards and an emergency evacuation plan.

Submission: RA8

Anglo American has committed to preparing a bushfire management plan and associated response systems for the Drayton Complex. This plan will be prepared in accordance the *Guide for Developing a Bushfire Emergency Evacuation Plan* (RFS, 2004). Anglo American will consult with the RFS during the preparation of the bushfire management plan. The draft plan will be provided to RFS for review prior to its finalisation.

All new mine site facilities constructed within the Drayton South area will comply with the requirements of *AS 3959 Construction of Buildings in Bushfire Prone Areas*.

4.23 SOCIAL

This section responds to the submissions raised by stakeholders in regard to the social impacts on the local community. Further detail in regard to potential social impacts of the Project on neighbouring agricultural enterprises and land uses is presented in ***Section 4.16****. Further detail in regard to potential impacts of the Project on property values and inflationary pressures is presented in* ***Section 4.24.2****.*

4.23.1 Census Data

This section responds to the submission raised by DPI regarding the census data adopted for the social impact assessment (see Appendix T of the EA) undertaken for the Project.

Submission: RA2

DPI noted that the data adopted in the social impact assessment included population and demographics from the 2006 census rather than the 2011 census.

It is acknowledged that on 21 June 2012, data from the 2011 census was released by the Australian Bureau of Statistics. However, the social impact assessment prepared for the EA was initially prepared during 2011 and finalised on 28 May 2012 in preparation for adequacy review by regulatory agencies, which occurred in July 2012.

As part of this RTS, a sensitivity analysis has been undertaken to review the 2011 census data for employment and accommodation against that presented in 2006. **Table 31** shows the change in the unemployment rates from the 2006 census to 2011 census. This table shows that there was a decrease in unemployment in all three LGAs over this five year period. **Table 32** shows the industry of employment for the workforce of Muswellbrook LGA in 2006 and 2011. During this period, there was an increase in the proportion of the workforce employed in the mining industry. The Project will retain its existing workforce, with

no increase in employee numbers. Therefore, the Project will not significantly alter the employment rate or the industry of employment.

Table 31
Unemployment Rate for the Upper Hunter Region (2006 and 2011)

Location	2006 Unemployment Rate (%)	2011 Unemployment Rate (%)
Muswellbrook LGA	5.4	4.8
Singleton LGA	4.2	3.3
Upper Hunter LGA	4.5	3.6

ABS 2007, 2012c

Table 32
Industry of Employment for Muswellbrook Local Government Area (2006 and 2011)

Industry	2006		2011	
	Number	%	Number	%
Agriculture, forestry and fishing	618	8.9	529	6.9
Mining	1,105	16.0	1,605	21.0
Manufacturing	487	7.0	422	5.5
Electricity, gas, water and waste services	379	5.5	329	4.3
Construction	504	7.3	612	8.0
Wholesale trade	206	3.0	253	3.3
Retail trade	665	9.6	676	8.8
Accommodation and food services	472	6.8	507	6.6
Transport, postal and warehousing	221	3.2	239	3.1
Information media and telecommunications	39	0.6	34	0.4
Financial and insurance services	87	1.3	73	1.0
Rental, hiring and real estate services	119	1.7	101	1.3
Professional, scientific and technical services	298	4.3	264	3.5
Administrative and support services	157	2.3	236	3.1
Public administration and safety	266	3.8	294	3.8
Education and training	377	5.4	353	4.6
Health care and social assistance	427	6.2	509	6.7
Arts and recreation services	67	1.0	74	1.0
Other services	261	3.8	341	4.5
Inadequately described/Not stated	170	2.5	189	2.5
Total	**6,925**	**100.0**	**7,640**	**100.0**

ABS, 2012d

4.23.2 Population and Accommodation

This section responds to the submissions raised by stakeholders regarding the impacts of the Project on the local population and the ability of the local area to provide sufficient accommodation.

Submission: RA6, SIG2, SIG8, SIG13, P1, P4, P8, P10, P12, P13, P15, P20, P22, P26, P30, P35 and P40

The Project will continue to utilise the existing workforce of up to 530 employees and contractors. The accommodation strategy for the operations phase of the Project assumes that all employees currently residing in the local area will continue to be located permanently there. As such, there are not anticipated to be any requirements for additional dwellings. In this regard, the Project is not anticipated to cause strain on the housing or accommodation availability.

During the construction phase, the Project will make local hires a priority. However, it is likely that the Project will require additional hires that are non-local during this phase. Assuming 90% (332 employees) of the construction workforce is employed from the local area or broader locality and can be accommodated in their existing housing, the remaining 10% (37 employees) will require accommodation in the local area. It is noted that upgrades to the existing infrastructure of the Project will be staged over a 29 month construction period, which will reduce the pressure on short term accommodation during the construction phase.

Table 33 shows the occupancy rates for temporary accommodation in the Upper Hunter region. This table shows that temporary accommodation establishments in the area have sufficient capacity to support the small number of construction employees that will require accommodation.

Table 33
Hotels, Motels and Serviced Apartments Statistics – September Quarter, 2011

LGA	Number of Establishments*	Number of Rooms	Room Occupancy Rate	Guest Nights Occupied
Muswellbrook	9	267	74.3	22,970
Singleton	8	330	75.8	28,560
Upper Hunter	9	Data not available	Date not available	Data not available

ABS, 2011

** Establishments included are hotels and resorts with 15 or more rooms, motels, private hotels and guest houses with 15 or more rooms and serviced apartments with 15 or more units.*

4.23.3 Labour Pool

This section responds to the submissions raised by stakeholders regarding the impacts of the Project on the local labour pool.

Submission: R6, SIG2, SIG8, SIG13, P1, P4, P8, P10, P12, P13, P15, P22 and P26

The Muswellbrook, Singleton and Upper Hunter LGAs have a low rate of unemployment when compared to the NSW average. As a result there is not a large pool of unemployed or labour surplus individuals from which to source employees. Given that the Project will continue to utilise the existing workforce it is considered unlikely to place an unreasonable strain on the local labour pool.

4.23.4 Labour Skills

This section responds to the submissions raised by stakeholders regarding the impacts of the Project on the local labour skill availability.

Submission: RA6, SIG2, SIG8, SIG13, P1, P4, P8, P10, P12, P13, P15, P20, P22, P26, P35 and P40

MSC submits that the Project will deplete the availability of trade qualified persons providing domestic services to the local community.

The mining sector is the largest employer in the local area and as a result there are well established mining communities upon which to draw any replacement staff that maybe required by the Project. In this regard, the Project is not anticipated to draw upon valued labour skills sought after by other sectors, including domestic trade services. It is considered that the ongoing utilisation of the existing Drayton Mine workforce, which resides in the local area, is likely to drive the continued demand for domestic trade services.

Despite the above, in recognition of MSC's concerns, Anglo American has offered in its VPA over the Project to use its reasonable endeavours to engage four apprentices in each year of operations under the Project Approval from residents of the Muswellbrook and Singleton LGAs, Aberdeen or Jerrys Plains.

4.23.5 Community Infrastructure and Services

This section responds to the submissions raised by stakeholders regarding the impacts of the Project on the local community infrastructure and services, including the Muswellbrook sewage treatment facility.

Submission: RA6, SIG2, SIG8, SIG13, P1, P4, P8, P10, P12, P13, P15, P20, P22, P23, P26, P30 and P35

MSC submits that in the planning of local infrastructure and services, council takes into account the cumulative workforces of multiple State significant developments, including coal mines. MSC advises that in supporting new and expanding mining developments (including the Mt Arthur Coal Consolidation Project and the Mt Pleasant Project); council was entitled to assume that Drayton Mine would close during 2017 and that its workforce would be transferred to other operations.

MSC and other stakeholders assert that the Project will significantly impact on local infrastructure and services required to support sewage treatment, education and health care.

Anglo American has actively consulted with MSC regarding the Project since 2009 to allow council to adequately plan for any future demand on the Muswellbrook LGA.

In its submission, MSC notes that it provided support for the Mt Pleasant Project. Accordingly, this project would have been considered by council in its future infrastructure and services planning. Currently the Mt Pleasant Project is non-operational with Project Approval expiring in 2020. Given the current status of the Mt Pleasant Project, there has not been an increase of 350 persons as presented in the *Mt Pleasant Project Environmental Impact Statement* (EMM, 2010). This would suggest that there remains available spare capacity for existing infrastructure and services to cater for its local community. In this regard, the Project's continued utilisation of the existing workforce will not cause an increase in population nor will it place additional strain on community infrastructure and services in the local area, including those required to support health and education.

MSC specifically expressed that "*the Council has no ability to meet the sewage treatment demand (STP) induced by the Drayton South project*" and that the Project will create an additional demand of 388.8 Equivalent Persons to the sewage treatment facility (based on 450 created jobs). MSC is of the opinion that Anglo American should be responsible for the upgrade of the sewage treatment facility should the Project receive approval.

For clarification, Drayton Mine operates and maintains a sewage treatment facility on site to cater for its workforce, which will continue to be utilised for the Project. The treated effluent is then collected in two settlement ponds and the overflow is used to irrigate areas of rehabilitation.

This infrastructure is not connected to the Muswellbrook sewage treatment facility. The Project will continue to utilise the existing workforce (530 employees) at Drayton Mine of which 139 employees (26%) live within the catchment area of the Muswellbrook sewage treatment facility. As such, there will be no substantial changes to the existing conditions due to the Project. When considered as a proportion of the greater population of Muswellbrook (which is in the order of 16,000) it is not considered that the 139 employees and their families would contribute significantly to the demand on the sewage treatment facility. Furthermore, these employees, as members of the Muswellbrook LGA community, pay annual rates for their residential properties to be connected to the sewage system, which in part is allocated to fund relevant maintenance and/or upgrades of the sewage treatment facility.

In consideration of the above, there does not appear to be a tangible reason as to why Anglo American should be responsible for the cost of upgrading the Muswellbrook sewage treatment facility.

Although the impacts of the Project on community infrastructure and services are considered negligible, Anglo American has offered a VPA to ensure that any potential social effects of the Project are mitigated. A portion of this funding has been allocated to provide economic, social and environmental benefit for the community in the Muswellbrook LGA. MSC may

elect to put this funding towards the sewage treatment facility or other community infrastructure and services.

4.23.6 Urban Land Releases

This section responds to submissions raised by MSC regarding the potential for the Project to impact on urban land releases.

Submission: RA6

MSC asserts that residential growth in the local area is substantially constrained by coal mining developments, its associated rail infrastructure and land acquisitions. It is of the opinion that the Project will contribute to this existing situation and impact on the future urban land releases.

The Project is located 13 km south of the township of Muswellbrook and on land within an existing Mining Lease and zoned RU1 under the *Muswellbrook Local Environmental Plan 2009*. Mining is permissible within zone RU1 with Development Consent. Furthermore, the Project will not warrant the acquisition of any private land. In this regard, the Project will not impact on future residential land releases in the Muswellbrook LGA.

It is noted that the Project is also more than 13 km from the current expansion of housing land releases in at the Muswellbrook East Brook Link Estate and is even further remote from the North Muswellbrook Development.

4.23.7 Voluntary Planning Agreement

This section responds to the submissions raised by MSC regarding the adequacy of the VPA for the Project.

Submission: RA6

Anglo American has made an offer to enter into a VPA with MSC to provide in kind and monetary contributions to ensure the potential social effects of the Project are mitigated. Discussions are progressing with MSC in an attempt to reach an agreement as to the terms of the VPA.

The offer that has been made to MSC includes the following:

- A payment of $1.0 M as a direct contribution towards the cost of the Thomas Mitchell Drive upgrade;
- An annual contribution of $100,000 to MSC to assist in funding road maintenance in the LGA; and
- An annual contribution of $15,000 to assist in funding environmental monitoring of mining and environmental works by council;
- Annually following the commencement of coal production from the Project on each 30 January during which coal is produced, an amount of $0.065 for each tonne of saleable coal produced from the Project being for the promotion of the economic and social health (including human health, environmental enhancements and education) of the LGA.

In addition, Anglo American would use its reasonable endeavours to engage four apprentices in each year of operations under the Project Approval from residents the within Muswellbrook and Singleton LGAs, Aberdeen or Jerrys Plains.

MSC asserts that the Anglo American's offer attempting to mitigate educational and health impacts through a VPA is improper, contrary to a proper construction of planning principles and contrary to government policy and the public interest.

As noted above, the proposed VPA is designed to cover any potential social impacts of the Project (although predicted to be negligible) on local community infrastructure and services, including those required to support health and education. By no means is the VPA a method of mitigating impacts on education or human health.

The Project will not impede the ability for people in the community to receive an education. If anything, Anglo American is committed to equipping its workforce, including apprentices and vacation students, with mining industry knowledge and a tangible skill set.

The Project will not cause any significant adverse impacts on human health via dust or noise generated from mining. This issue is discussed further in **Section 4.2** and **4.4**, respectively.

4.23.8 Cumulative Impacts

This section responds to the submissions raised by stakeholders regarding the potential cumulative social impacts of the Project and adjacent mining operations in the local area.

Submission: RA2, RA6, RA12, SIG2, SIG5, SIG8, SIG9, SIG10, SIG13, SIG16, P1, P4, P8, P10, P12, P13, P15, P22, P26 and P35

As discussed in **Section 4.23.2**, the Project is not anticipated to cause an increase in population of the local area. Continued utilisation of the existing workforce as other mining projects in the local area begin or expand will reduce the available labour pool in the local area for other projects. This will result in additional non-local hires being required to fill these positions.

The predicted increase in population associated with future mining projects in the local area will continue to place stress on both the rental and sales markets. The contribution to this associated with the Project is considered negligible.

Services and facilities in the local area are sufficient to support the Project. There is however, likely to be a strain on community facilities and services in the future as other mining projects proceed. This has been identified by MSC in its submission.

In summary, potential areas of cumulative impacts in the local area include:

- Housing affordability and accessibility;
- Skills shortages and competition for skilled personnel;
- Economic growth and stability; and
- Supply and demand for community services and facilities.

Adequately addressing the cumulative impacts outlined above is likely to require significant investment into local community infrastructure, including schools, tertiary education institutions, health services, child care services and recreation and cultural facilities.

This investment will require the combined commitment of the NSW government, MSC, SSC stakeholders and mining companies (through VPAs and/or Section 94 contributions).

4.23.9 Impacts of Mine Closure

This section responds to the submissions raised by stakeholders regarding the potential social impacts associated with the eventual mine closure of the Project.

Submission: RA2, SIG8, SIG13, P1, P4, P8, P10, P12, P13, P15, P22 and P26

Cessation of the Project after 27 years of operation may lead to a reduction in economic activity at that time. The impacts on the economy after closure will entirely depend on the structure of the mining and resource sector at that time, which is not able to be predicted at present. The significance of these cessation impacts on the local community would depend on the degree to which any displaced workers and their families remain within the region, even if they remain unemployed. This is a result of continued expenditure by these people in the local area (even at reduced levels) and its contributions to final demand. If there are other as-yet-unconstructed or unknown projects operating at that time, then the impacts of the gradual decrease of the Project workforce will be lessened as other projects absorb the excess labour. In addition, if Project closure takes place in a declining economy the impacts might be felt more greatly than if it takes place in a growing and diversified economy. Pending the socio-economic conditions at the time of Project closure, there may potentially be negligible or significant impacts on the local community.

Of course if approval for the project is not forthcoming and the mine is forced to close in 2015 the following impacts will be felt immediately at a time when the coal mining industry is in an overall down tern:

- Loss of up to 530 direct jobs and a substantial number of associated indirect jobs;
- Subsequent loss of direct and indirect household incomes (regional and State level);
- Substantial loss of annual direct and indirect regional output or business turnover (regional and State level);
- Substantial loss of annual direct and indirect regional value added (regional and state level);
- Loss of annual royalties payable to the NSW State government; and
- Loss of taxes (including company tax, carbon tax and minerals resource rent tax) payable to the Commonwealth government.

4.24 ECONOMICS

4.24.1 Assessment Approach

Method

This section responds to the submissions raised by stakeholders in relation to the claims that the economic impact assessment undertaken for the Project (see Appendix U of the EA) was prepared using out-dated methods.

Submission: SIG3 and SIG8

The Director-General's EARs for the Project under the heading "*Social and Economic*" require that the social and economic assessment include:

- *"A detailed assessment of the potential impacts of the project on the local and regional community, paying particular attention to the thoroughbred breeding industry and the demand it may generate for the provision of additional infrastructure and services; and*
- *A detailed assessment of the costs and benefits of the project as a whole, and whether it would result in a net benefit for NSW community"*

Further the Director-General's EARs require that

> "*The environmental assessment of the key issues listed above must take into account relevant guidelines, policies, and plans. While not exhaustive, the following attachment contains a list of some of the guidelines, policies and plans that may be relevant to the environmental assessment of this project.*"

With regard to the methodology for the economics assessment the *"Policies, Guidelines and Plans"* as attached to the Director-General's EARs refer to DP&I's *Draft Guidelines on Economic Effects and Evaluation in EIA* (James and Gillespie, 2002), which states that:

> "*To conduct a proper economic evaluation of the options associated with a proposed development that is likely to have significant environmental impacts it is essential to undertake a benefit-cost analysis."*

BCA is the method that economists use to consider economic welfare and to justify investments on economic grounds.

DP&I's *Draft Guidelines on Economic Effects and Evaluation in EIA* (James and Gillespie, 2002) also identifies that regional economic impact assessment using input-output analysis may provide additional information as an adjunct to the BCA.

The approach to the economic impact assessment is, in addition to being as directed by the Director General in his EARs, required under the structure of the EP&A Act to address, and enable the environmental planning assessment and determination of the project application, the relevant *"objects"* of the EP&A Act contained in section 5 of the EP&A Act of which section 5(a) is:

> *"(a) to encourage:*

> *(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,*
>
> *(ii) the promotion and co-ordination of the orderly and economic use and development of land,…"*

Clause 7(1)(f) of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* requires the EA to provide "*the reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations…*"

The economic impact assessment (see Appendix U of the EA) has applied the BCA methodology and principles as the primary approach for the assessment of the Project, as required by the Director-General's EARs for the Project, to respond to the requirement to provide a "*detailed assessment of the costs and benefits of the project as a whole, and whether it would result in a net benefit for NSW community*."

To address the requirement to provide *"A detailed assessment of the potential impacts of the project on the local and regional community",* the economic impact assessment has applied, as is contemplated by DP&I's *Draft Guidelines on Economic Effects and Evaluation in EIA* (James and Gillespie, 2002), a separate input-output analysis of the economic costs and benefits of the Project.

Input-output analysis is an appropriate method for assessing economic effects of proposals to regional economies. DP&I's *Draft Guidelines on Economic Effects and Evaluation in EIA* (James and Gillespie, 2002) states:

> *"If a proposal is predicted to have significant economic impacts at the regional or State scale, it is appropriate to assess these economy-wide effects...These impacts can be assessed by means of a multi-sectoral or input-output model which identify regional impacts in terms of changes in the value of output for separate sectors of the regional economy, as well as changes in value-added, income and employment."*

HCN and NCC incorrectly assert that input-output modelling is no longer used by the Australian Bureau of Statistics, which regularly publishes national input-output tables. The input-output analysis method has also been recently used by the various levels of government in relation to a range of policy issues, including *Regional Economic Impacts of National Parks in the Riverina Bioregion* (CARE, 2009) prepared for the NSW government, *Assessing the Local Economic Impacts of the Draft Basin Plan* (Arche Consulting and Gillespie Economics, 2011) prepared for the Commonwealth government, and *Industry Dimensions of the Resource Boom: An Input-Output Analysis* (Rayner and Bishop, 2013) prepared for the Reserve Bank of Australia.

The *Draft Guideline for the use of Cost Benefit Analysis in Mining and Coal Seam Gas Proposals* (DP&I, 2012b) identifies input-output analysis and the computable general

equilibrium as potentially appropriate methods for the assessment of the economic impacts of a major project on the regional or State economy.

The method selected for the Project was input-output analysis modelling. It was deemed most appropriate for the Project for the following reasons:

- Input-output analysis has been specifically developed to examine impacts of projects and policies on regional economies, such as that within which the Project occurs;
- Input-output analysis is a cost effective means of assessing the average regional economic impacts associated with a project;
- Regional models can be easily developed from National and State input-output tables using the Generation of Regional Input-Output Table procedure developed by the University of Queensland and recognised internationally; and
- When a region is small relative to the rest of the economy (i.e. it is a small open economy), the main assumption underpinning input-output analysis modelling is that there are unlimited labour and capital resources available to the region and so increased demand for capital and labour will not result in regional price rises and *"crowding out"* of other economic activity in the region. This assumption is considered reasonable as small regions have the potential to access labour from the unemployed and employed labour force from across the country. It is not considered reasonable to assume that they are limited to the unemployed labour resources within the region. The 2011 census data illustrates how small regions access labour resources from outside the region by showing that there has been considerable in-migration of labour to the Hunter region to fill mining jobs and 46% of the direct labour force in the coal mining sector in the Hunter region reside outside this area. A study by Deloitte Access Economics (2012) prepared for SSC found insufficient evidence to conclude that house prices, rent or grocery prices were on a whole more expensive than other regional communities in NSW.

The alternative method (computable general equilibrium modelling) would not be deemed suitable for the Project for the following reasons:

- Computable general equilibrium models are considerably more complex than input-output analysis and require the estimation of a large number of coefficients and parameters. At the regional level there is virtually no local data available and so the modeller is required to make many exogenous assumptions that cannot be verified (thus creating a greater level of uncertainty);
- The main justification for undertaking computable general equilibrium modelling, to assess price changes and *"crowding out"* of other industry sectors, is not particularly relevant for small open economies; and
- Computable general equilibrium has not historically been used at the regional level as it is more suited to issues of State and National importance.

Modelling Assumptions

This section responds to the submission raised by MSC in relation to the modelling assumptions adopted in the economic impact assessment undertaken for the Project (see Appendix U of the EA).

Submission: RA6

MSC asserts that the economic impact assessment (see Appendix U of the EA) contains a number of false assumptions, including that the supply in various discrete markets will react perfectly elastically to the demand created by the Project and that it will proceed for the full proposed period of 27 years.

The input-output analysis, which was used to assess the economic activity in the region associated with the Project, assumes full employment with no capacity constraints, and thus prices have no role to play in the input-output model unlike general equilibrium modelling. However, given that the applicable study area is a small open economy relative to the rest of the nation, where factors of production can easily move into and out of the region and local prices gravitate to external prices (subject to transport margins, etc.), the input-output model provides a reasonable and cost effective approach to estimating disaggregated impacts by sector at the regional level (Powell et al., 1985; West, undated). Input-output analysis is also the standard approach used to assess the economic activity impacts of projects on regional economies.

Deloitte Access Economics (2012) in a study prepared for SSC has shown that there is little evidence in the region that markets have not reacted elastically. The study found insufficient evidence to conclude that house prices, rent or grocery prices were on a whole more expensive than other regional communities in NSW.

If the Project does not proceed for the full proposed period then the economic activity provided by the Project will be for a shorter duration and the net production benefits provided by the Project will also be less than estimated in the analysis. Also, any perceived residual environmental, social or economic costs of the Project, after mitigation, will also be reduced. The assessment of regional economic impacts identifies that the Project will provide continuing employment and regional economic impacts for a period of up to 27 years. In the absence of the Project, this economic activity would not occur.

MSC also claims that the economic impact assessment undertaken for the Project (see Appendix U of the EA) incorporates the false assumption drawn from the traffic and transport impact assessment (see Appendix S of the EA) and social impact assessment (see Appendix T of the EA) that the Project will continue the employment of its existing workforce without causing impacts on the provision of services and infrastructure by third parties, including council. This is still the position held by Anglo American and is discussed further in **Section 4.21** and **4.23**.

The BCA compared the situation with the Project to the situation without the Project and considered all the major incremental environmental, social and cultural impacts of the Project. Traffic and social impacts were considered to be negligible.

Sensitivity Testing

This section responds to the submissions raised by stakeholders in relation to the price for thermal coal adopted for the economic impact assessment undertaken for the Project (see Appendix U of the EA).

Submission: SIG13, SIG16 and P13

Stakeholders asserted that a *"spot price"* for thermal coal was adopted for the economic impact assessment undertaken for the Project (see Appendix U of the EA), which is believed to be 30% higher than forecasts by the World Bank and the Bureau of Energy and Resource Economics.

The value for the Project's product thermal coal (averaged $118/t) was based on Anglo American's projections in Australian dollars rather than a spot price. Two factors are relevant to this value, the projected United States dollar value of coal in the future and the projected Australian dollar to United States dollar exchange rate. International coal prices are valued in United States dollars. In March 2013, the benchmark price for Australian thermal coal was $98.73/t in United States dollars.

Projections are for continued strong global demand for coal and hence coal prices are likely to continue to be robust. The projections for Australian dollar to United Stated dollar exchange rate is for it to fall in the medium term to around 0.80. This would substantially increase the value of coal in Australian dollars.

Given the uncertainty around future coal values, assumed Project values were subjected to sensitivity testing for 20% changes at a 4%, 7% and 10% discount rate. This test indicated that the results of the BCA are not sensitive to reasonable changes in assumptions regarding the value of coal. A significant and sustained reduction in coal price (48%) would be required to make the Project inefficient.

Discount Rates

This section responds to the submission raised by HTBA in relation to the suitability and use of discount rates in the BCA undertaken for the Project.

Submission: SIG13

HTBA asserts that a 7% discount rate adopted in the BCA unfairly favours short term mining developments over long term sustainable agricultural enterprises and recommends the use of an alternate 1% and 4% discount rate.

The discount rate used in BCA of the Project is recommended in *Guidelines on Economic Appraisal* (NSW Treasury, 2007), *Draft Guideline for Economic Evaluation in EIA* (James and Gillespie, 2002), and *Draft Guideline for the use of Cost Benefit Analysis in Mining and Coal Seam Gas Proposals* (DP&I, 2012b). Application of lower discount rates are not recommended and ignore the opportunity cost to society of using resources in investment projects.

4.24.2 Economic Impacts

This section responds to the submissions raised by stakeholders in relation to the potential for the Project to impact on the economy and its diversity.

Submission: RA6, SIG2, SIG3, SIG5, SIG7, SIG10, SIG13, SIG14, P13, P20, P24 and P27

A number of stakeholders assert that the Project will expose the economy to substantial vulnerability in the event of further weakening of the international prices of thermal or soft coking coal, an increase in the value of the Australian dollar or a further increase in the cost of coal production.

Projections of the global value for thermal coal and semi-soft coking coal are relatively strong with predicted growth in demand from China and India. Projections for the Australian dollar to weaken will only strengthen the value of future Australian coal production. In this regard, it is unlikely that the Project and the broader mining industry will disadvantage the regional economy.

A number of stakeholders submit that the Project will have a negative impact on economic diversity. These stakeholders are also of the opinion that the economic impact assessment undertaken for the Project (see Appendix U of the EA) overstates the benefits while underplaying the extent of the long term economic impacts.

Input-output analysis was used to assess the regional economic activity associated with the Project. Input-output analysis specifically examines the positive direct and indirect economic activity that will occur in a region as a result of additional spending in the region. It does not examine the *"crowding out"* of other economic activity because it is a partial equilibrium framework rather than a general equilibrium framework. Crowding out would be most prevalent if the regional economy was at full employment and it was a closed economy with no potential to use labour and other resources that currently reside outside the region. In this situation, a new mine requiring labour and other resources would compete for them with existing activities.

However, the Hunter region is not at full employment and is not a closed economy. Even where a mining project utilises already employed labour resources from inside the region, there is a filter effect where these jobs are filled by other employed or unemployed labour resources, which creates vacancies that are then filled by other employed or unemployed labour resource, with these employed and unemployed labour resources coming from both inside or outside the region. The potential labour force to meet demand in the region is considerably greater than just the labour force in the region.

Empirical evidence indicates that a considerable proportion of new mining jobs are being filled by an in-migrating or commuting workforce. For example, there was an increase in the population of the Hunter region by 2,088 between 2006 and 2011 with the number of residents of the Hunter region employed in the mining sector increasing by 1,502 during this period (ABS, 2011). In 2011, 3,678 people who were directly employed in the mining sector in the Hunter Valley resided outside the region (ABS, 2011). Consequently, for small open economies, crowding out of other economic activity is likely to be negligible.

While more complex models such as computable general equilibrium modelling can conceptually deal with the positive economic activity impacts of a project and any offsetting negative economic activity impacts, for small regional economies, it is unlikely that these more complex models will surpass the simpler input-output model. Firstly, the small open economy condition minimises the need to address offsetting impacts. Secondly, given the considerable difficulties associated with estimating a large number of coefficients and parameters required for computable general equilibrium models when there is virtually no local data available, many exogenous assumptions are required to be made by the modeller and thereby increase uncertainty. Consequently, computable general equilibrium models are mostly used at the State and National level for large scale policy issues.

Coal mining is the most significant sector in the regional economy in terms of gross regional output, value-added, income, employment, imports and exports. However, a number of other sectors, such as utilities and business services, retail trade and food manufacturing, continue to be key contributors in sustaining the regional economy.

The EA demonstrates that the Project would not cause direct or indirect significant long term, negative impacts on the viticulture and thoroughbred horse breeding sectors of the economy of the region. Furthermore, it demonstrates that the additional benefits from Project will continue to strengthen the economy.

The BCA confirms that when production costs (acquisition costs for affected land, opportunity cost of land, operating costs, decommissioning costs, etc.) and production benefits (revenues from production, residual values of land, etc.) are considered, the Project will have net production benefits of $887 M with a minimum of $490 M of these net production benefits accruing to Australia. Incorporating, externality impacts, the Project is estimated to have net benefits to Australia of between $443 M and $741 M, and hence is desirable and justified from an economic efficiency perspective.

Using the input-output analysis method, the operation of the Project is estimated to make up to the following contribution to the regional (statistical local area of Muswellbrook, Singleton and Upper Hunter) economy:

- $588 M in annual direct and indirect regional output or business turnover;
- $264 M in annual direct and indirect regional value added;
- $86 M in annual direct and indirect household income; and
- 785 direct and indirect jobs.

The local economy (statistical local area of Muswellbrook), being a subset of the regional economy will also receive economic activity as a result of the Project. The level of economic activity it receives will depend on its ability to capture the expenditure associated with operation of the Project and the expenditure of employees. Given that it is smaller in size than the regional economy the impacts on the local economy would be smaller than those reported above.

Given the economic benefits predicted to be generated from the Project, Anglo American has received the support of MCC and CFMEU who recognise the importance of the coal mining industry, particularly in the local area.

Social Cost

This section responds to the submissions raised by stakeholders in relation to the social costs for the Project.

Submission: RA2, SIG2 and SIG13

DPI identifies that the BCA does not individual quantify the various social costs and that it is considered as a component in the Project's production costs. DPI also asserts that there is an underlying assumption that these social costs will be completely mitigated by the proponent and therefore there will be no loss in consumer surplus/amenity. Further to this, HTBA are of the opinion that the economic impact assessment (see Appendix U of the EA) underestimates the social costs associated with the Project.

The estimate of net production benefits of a project generally includes accounting for costs aimed at mitigating, offsetting or compensating for the main environmental, social and cultural impacts. This includes the costs of purchasing properties adversely affected by noise and dust, providing mitigation measures for properties moderately impacted by noise and dust, the costs of providing biodiversity offsets and the cost of purchasing groundwater and surface water entitlements in the water market. Consideration of these costs effectively internalizes the respective and otherwise, non-monetary environmental, social and cultural costs.

The social impact assessment (see Appendix T of the EA) concluded that given the Project is a continuation of the existing Drayton Mine and its workforce, it is considered unlikely to place an unreasonable strain on existing infrastructure, services, labour or the local community of the Muswellbrook and Singleton LGAs. In this regard, the BCA social costs are largely internalised into Anglo American's production costs.

Anglo American has made an offer to enter into a VPA with MSC to provide in kind and monetary contributions to ensure any potential social effects of the Project are mitigated. The VPA is summarised in **Section 4.23**.

For the Project to be undesirable from an economic efficiency perspective, all incremental residual impacts from the Project that affect Australia would need to be valued by the community at greater than the estimate of the Australian net production benefits (i.e. greater than $490 M). This is equivalent to each household in the study region valuing residual impacts at $24,000 or to NSW households at $180.

Inflationary Pressure

This section responds to submissions raised by stakeholders regarding the potential of the Project to cause inflationary pressures through the demand for goods and services and price shocks on the cost of living, other sectors of the economy and labour.

Submission: RA6, RA12 and SIG2

Stakeholders consider that the demand created by the Project for goods and services in circumstances of constrained local supply would merely result in inflationary pressures in various discrete markets rather than return any local economic benefit, particularly where there is relatively inelastic supply.

MSC is of the opinion that price shocks have been created by demand spikes associated with the mining industry, which have been pronounced and given rise to sharp increases in the cost of living. A number of other stakeholders in line with MSC assert that the existing mining has impacted on other industries, which compete for land, water, and labour, and that the Project will contribute to this effect. MSC also considers that these price shocks have undermined the certainty necessary for capital investment in industries which compete in affected markets.

Given that the scale and nature of the Project remains substantially consistent with that of the existing operations at Drayton Mine, the demand for goods and services are not predicted to increase and constrain local supply. Further to this, Deloitte Access Economics (2012) has shown that there is little evidence in the region that markets have not reacted elastically. A study by Deloitte Access Economics (2012) prepared for SSC found insufficient evidence to conclude that house prices, rent or grocery prices were on a whole more expensive than other regional communities in NSW. Similarly, as there is no evidence of prices shock as a result of previous projects there is also no evidence of adverse impacts on capital investment from other sectors of the economy. In this regard, the Project is not predicted to create inflationary pressures on the local community or other sectors contributing to the economy.

MSC has asserted that the Project will cause inflation above rises in the face value of labour and consequential deterioration in the purchasing power of wages in the present economy.

The Project will contribute to the gross regional output and export market of the existing mining sector, which has contributed to higher real income and in turn has also increased the purchasing power. This additional revenue has been redistributed to other sectors of the economy via tax cuts and payments, thereby further inflating disposable incomes for the broader community and businesses.

Property Devaluation

This section responds to submissions raised by stakeholders regarding the potential for the Project to devalue nearby private properties.

Submission: RA11, P6, P11, P13, P20, P26 and P41

Property devaluation could be expected to occur when land is adversely impacted by mining through dust, noise and blast exceedances of the relevant criteria. As a result of careful planning and design, the mine plan for the Project has been developed to ensure that the predicted impacts (see **Section 4.2, 4.4** and **4.5**) are largely contained within the Project Boundary and on land already owned by Anglo American. In this regard, the Project is not anticipated to impact on the value of nearby properties.

4.25 LAND OWNERSHIP

This section responds to the submission raised by Crown Lands regarding records of Crown land and roads within the Project Boundary and associated implications.

Submission: RA15

Crown Lands submitted that there are both parcels of Crown land and roads within the Project Boundary that appear to be affected by the Project. Crown Lands has advised that this land needs to be fully identified and acquired by way of an application for sale under the *Crown Lands Act 1989*.

Following a land title search, a parcel of Crown land (reserve number 752486 on Lot 1/DP 247510) was identified within the Project Boundary at Drayton Mine. Anglo American has submitted an expression of interest to purchase this parcel of land. This offer has been accepted by Crown Lands and actions have commenced for purchase of the land.

Crown Lands also raise that there are three Crown roads within the Project Boundary applicable to the Drayton South area that have not been purchased and/or closed by Anglo American. These include Crown Road Enclosure Permits 45256 and 45411 located to the west in the area of the required Edderton Road realignment. Relevantly an application has been lodged with DPI to close these roads.

The remaining two remaining crown public roads include one that is located on Lot 1 DP1095515 (located on land owned by Macquarie Generation and leased to Drayton Mine) and another that is located across Lots 6 and 14 DP701496 (located on land owned by Drayton Mine but not impacted by the Project). At this stage there are no plans to close or purchase these crown public roads.

5 STATEMENT OF COMMITMENTS

This section provides a justification for the Project's existing statement of commitments as presented in the EA.

Following consideration of the submissions received from stakeholders, Anglo American has undertaken additional works as part of this RTS to address the issues raised in **Appendix B**, including but not limited to:

- Revision of air quality modelling, including amendments to dust control measures and incorporation of site specific monitoring data from Drayton Mine to improve the accuracy of the model;
- Investigation of the Coolmore (Option 4) visual bund design and its interactions with the Project;
- Commission of a groundwater peer review;
- Additional soil surveys within the Drayton South area to confirm the available topsoil resource;
- Additional floristic surveys of the offsite biodiversity offset property to characterise the vegetation communities present and to further justify the Project's biodiversity offset package;
- Assessment of the Project's biodiversity offset package using the NSW and Commonwealth offset methods;
- Preparation of a detailed rehabilitation strategy for the Drayton Complex; and
- Investigation of improvements to the final landform design using leading technology.

Where relevant, this RTS has also reiterated the key findings of the technical assessments that were undertaken as part of the EA in order to provide further clarification and a comprehensive response to all issues raised.

The outcomes of this work remain relatively consistent with the statement of commitments listed in Table 81 of the EA with the exception of the Houston visual bund design. As discussed in **Section 4.7.2**, based on the review of the Coolmore (Option 4) visual bund it is apparent that there are a range of advantages and disadvantages with the alternative design as provided by Coolmore Australia. However, Anglo American is willing to commit to build the Coolmore (Option 4) visual bund, if required.

The primary objective of the Project throughout the extensive constraints and EA phase was to develop a mine plan that minimised potential environmental and social impacts whilst maximising resource recovery and operational efficiency. As demonstrated in the EA and further within this RTS, the Project's socio-economic and environmental impacts have been minimised as far as practicable by implementing all reasonable and feasible management and mitigation measures. In this regard, Anglo American proposes to operate the Project in accordance with the statement of commitments provided in the EA.

6 ABBREVIATIONS

Abbreviation	Description
AIP	*Aquifer Interference Policy*
Anglo American	Anglo American Metallurgical Coal Pty Limited
ARTC	Australian Rail Track Corporation
AS	Australian Standard
AWBM	Australian Water Balance Model
BCA	Benefit Cost Analysis
BSAL	Biophysical Strategic Agricultural Land
BZE	Beyond Zero Emissions
CEEC	Critically Endangered Ecological Community
CFMEU	Construction, Forestry, Mining and Energy Union
CHPP	Coal Handling and Preparation Plant
CIC	Critical Industry Cluster
CMA	Hunter-Central Rivers Catchment Management Authority
Crown Lands	NSW Crown Lands
dBA	The peak sound pressure level, expressed as decibels (dB) and scaled on the '*A-weighted*' scale, which attempts to closely approximate the frequency response of the human ear
dBL	Linear decibel
DP&I	NSW Department of Planning and Infrastructure
DPI	NSW Primary Industries – Office of Agricultural Sustainability and Food Security
DRE	NSW Division of Resources and Energy
EA	*Drayton South Coal Project Environmental Assessment*
EARs	Director-General's Environmental Assessment Requirements
EEC	Endangered Ecological Community
EL	Exploration Licence
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	NSW Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPL	Environment Protection Licence
g	Gram
h	Hour
ha	Hectare
Hansen Bailey	Hansen Bailey Environmental Consultants
HCEC	Hunter Community Environmental Centre
HCN	Hunter Communities Network

Abbreviation	Description
HEL	Hunter Environmental Lobby
HRSTS	Hunter River Salinity Trading Scheme
HTBA	Hunter Thoroughbred Breeders Association
HVAS	High Volume Air Sampler
HVEC	Hunter Valley Energy Coal Pty Limited
HVWIA	Hunter Valley Wine Industry Association
Hz	Hertz
IESC	Department of Sustainability, Environment, Water, Population and Communities – Independent Expert Scientific Committee
kg	Kilogram
kHz	Kilohertz
km	Kilometre
L	Litre
L_{A1}	The noise level exceeded for 1% of the time
L_{Aeq}	It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period
$L_{Aeq(15min)}$	It is the energy average noise from a source, and is the equivalent continuous sound pressure level over 15 minutes
$L_{Aeq(9hr)}$	It is the energy average noise from a source, and is the equivalent continuous sound pressure level over 9 hours
$L_{A\ max}$	the maximum noise level during the specified time period
LGA	Local Government Area
LTGA	Lock the Gate Alliance
M	Million
m	Metre
m^2	Square metre
m^3	Cubic metre
µg	Microgram
µm	Micrometre
mg	Milligram
mm	Millimetre
MASCL	Mount Arthur South Coal Limited
MCC	Muswellbrook Chamber of Commerce
Mining SEPP	*State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*
ML	Megalitre
Mlcm	Million loose cubic metres
MSC	Muswellbrook Shire Council

Abbreviation	Description
Mt	Million tonnes
Mtpa	Million tonnes per annum
ng	Nanogram
NCC	Nature Conservation Council
NEPM	National Environment Protection Measure
NOW	NSW Office of Water
NSW	New South Wales
OEA	Overburden Emplacement Area
OEH	NSW Office of Environment and Heritage
PAC	Planning Assessment Commission
$PM_{2.5}$	Particulate Matter <2.5 microns
PM_{10}	Particulate Matter <10 microns
The Project	Drayton South Coal Project
Project Boundary	Project Application Boundary
RFS	NSW Rural Fire Service
RL	Reduced Level
RMS	NSW Roads and Maritime Services
ROM	Run-of-Mine
RTS	Response to Submissions document
s	Second
SAL	Strategic Agricultural Land
SEH	Scone Equine Hospital
SEWPaC	Commonwealth Department of Environment, Water, Population and Communities
SRLUP	*Strategic Regional Land Use Plan – Upper Hunter*
SSC	Singleton Shire Council
t	Tonne
TDS	Total Dissolved Solids
TSC Act	*Threatened Species Conservation Act 1995*
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
United Pastoral	United Pastoral Pty Ltd
UHSC	Upper Hunter Shire Council
UHWMA	Upper Hunter Wine Makers Association
VEC	Vulnerable Ecological Community
VKT	Vehicle-Kilometres-Travelled
VPA	Voluntary Planning Agreement

Abbreviation	Description
WAL	Water Access Licence
Water Act	*Water Act 1912*
WM Act	*Water Management Act 2000*
WS	Wilderness Society
Symbols	
%	Percent
°C	Degrees Celcius
$	Dollars

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