



**BHP Billiton Mitsubishi Alliance**

## **Goonyella Riverside and Broadmeadow Mines**

**Application for amendment of environmental authority (mining activities) under section  
224 of the *Environmental Protection Act 1994***

**Environmental Authority: EPML00853413**

**Principal Holder: BHP Coal Pty Ltd**

## **Background**

Goonyella Riverside and Broadmeadow Mines are located 34km north of Moranbah in the Central Queensland Coalfields. Goonyella Riverside Mine is an open cut operation producing hard coking coal. The underground, punch longwall mine, Broadmeadow, has been developed in an existing highwall of the open cut operation. In addition to the mining operation, Goonyella Riverside Mine comprises two coal processing plants where mined coal is sorted, washed and blended to match demand specifications. Following processing, coal product is transported by rail to the BMA owned Hay Point Terminal south of Mackay.

This application relates to the future subsidence of the Isaac River by Broadmeadow Mine. The Environmental Authority (EA) for the complex was amended in 2012 (granted March 2012) which included the schedule of Watercourse Subsidence conditions authorising subsidence of the Isaac River up to and including Panels 110. With continuation of mining, BMA must now progress authorisation for subsidence of the Isaac River for Panel 111 and beyond to sustain operations.

The supporting information presented below is in response to advice from the Department of Environment and Heritage Protection (DEHP) following pre-lodgement engagements that further information will be required for the application. This is also further to pre-lodgement discussions held in April through August 2015 on the proposed amendments. This document draws all relevant information together for the Department and is presented in accordance with the relevant provisions of the *Environmental Protection Act 1994*. This document refers out to, but is in addition to other documents provided in the application, including the Broadmeadow Mine Subsidence Management Plan (SMP).

Rationale is detailed to justify the proposed conditions providing the Department with all necessary supporting information to assess and approve the proposed amendment.

## **Amendment Conditions and Rationale**

### **Existing Watercourse Subsidence Conditions**

The current Watercourse Subsidence conditions authorise subsidence of the Isaac River by longwall mining for Panels 107 to 110 for Broadmeadow Mine. Longwall top coal caving is prohibited under the Isaac River. The Watercourse Subsidence schedule of the current EA is based on the standard set of conditions in the Guideline “Watercourse Subsidence – Central Queensland Mining Industry”. The conditions are centred around the requirement for a Subsidence Management Plan.

The Broadmeadow Mine Subsidence Management Plan has been in place since 2012. Annual inspections of subsided reaches of the Isaac River are also required by the conditions, which have been conducted at the mine since 2008.

### **Proposed Amendments**

Proposed amendments to the current EA are provided in Attachment 3. As seen in attachment 3 the complete schedule of conditions remains, with only minor administrative changes required to remove the restriction of subsidence of the Isaac River to Panels 107-110.

The foundation of this amendment to the EA is the work BMA has progressed on understanding cumulative impacts of subsidence of the Isaac River. The Isaac River Cumulative Impact Assessment (IRCIA) has been completed and outcomes of the study have been considered in the revision of the Broadmeadow SMP to support progression of longwall mining.

The revised version is based on the existing SMP which was developed to support the approval of Panels 107-110. The SMP adopts adaptive management as the approach to subsidence impacts, which includes the following principles:

- Assess the risk;
- Design operational treatments (mitigation measures);
- Implement treatments;
- Monitor key response indicators;
- Re-evaluate effectiveness of implemented mitigation measures; and
- Adjust policies and/or practices.

The proposed amendments include the following key matters in terms of the strategy and ongoing requirements built into conditions of the EA:

- Authorise watercourse subsidence of the Isaac River for the future progression of the Broadmeadow longwall;
- Remove the restriction of sections of panels in the mine plan and allow the adaptive management strategy of the SMP to capture any future changes in the mine plan and associated subsidence impacts;
- Maintain the commitment that longwall top coal caving will not be deployed under the Isaac River to minimise surface expression and impacts on the beds and beds of the Isaac River; and
- Work in conclusions and key outcomes of the IRCIA into the management strategy for the Isaac River within the scope of the SMP to best address impacts directly related to Broadmeadow longwall mining.

## **Requirements of Amendment Application – s226 of the *Environmental Protection Act 1994***

The application form and associated attachments, including cover letter, address all items in section 226 of the *Environmental Protection Act 1994*, with the exception of items (1)(k) and (l).

The information below presents the information relevant to the proposed amendments as required by section 226 (1) (k) and (l) of the *Environmental Protection Act 1994* to allow clear alignment to assessment requirements for the Department.

### **Impact Assessment of Environmental Values (Item k)**

BMA has completed full and complete assessment of the risk of impacts by the proposed amendment including the actual and potential for environmental harm.

The revised Broadmeadow SMP includes a comprehensive assessment of subsidence impacts in section 3 of the Plan. The impact assessment considers:

- direct physical effects of subsidence (1st Order);
- geomorphic response (2nd Order) including hydraulics, sediment transport, and land surface cracking;
- water quality and quantity impacts (3rd Order) including in channel ponding, overland flow and water quality;
- flora and fauna impacts (4th Order);
- cumulative impacts; and
- infrastructure impacts.

The quantification of future impacts and measurement of success of mitigation actions employed under the SMP will be inspected and assessed annually under the monitoring and evaluation program with observed outcomes fed back into the SMP

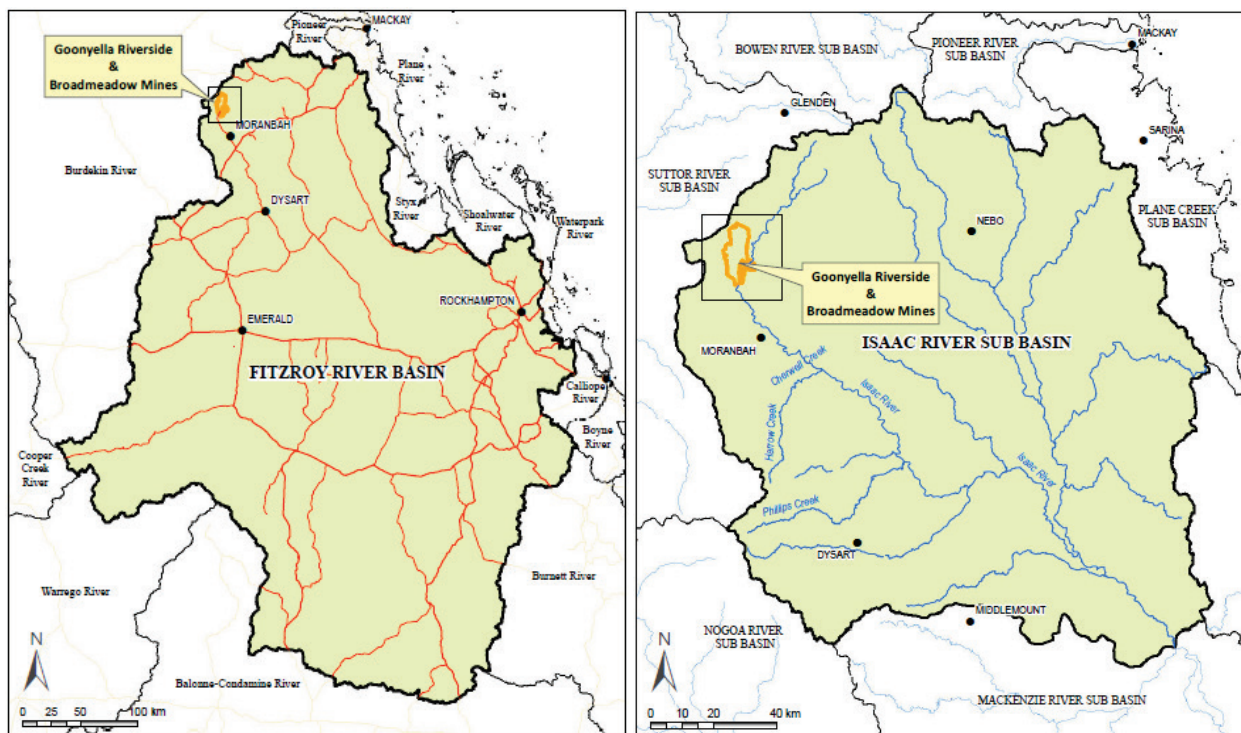
### **Environmental Values (Item k (i))**

BMA has a deep and comprehensive understanding the environmental values in and around the Goonyella Riverside and Broadmeadow complex, and the values relevant to or that have the potential to be impacted by the activities proposed in the amendment. All environmental values, including Flora and Fauna, for the subsidence of the Isaac River from longwall mining are summarised at length in Appendix A and B of the revised SMP.

Further information on near and far field environmental values relevant to the mine and its regional setting are described below for reference and to provide a thorough understanding for the Department.

### **Receiving Environment and Environmental Values**

The Goonyella Riverside and Broadmeadow Mine complex is regionally located downstream of a number of other coal mines in the western catchment of the Isaac River which is a significant tributary of the Fitzroy River (see Figure 1).



**Figure 1. Location of the Goonyella Complex in the Fitzroy River Basin and Isaac River Sub-Basin.**

The mine is traversed by a number of watercourses including the Isaac River, Eureka, Fischer, Cleanskin and Goonyella Creeks. The creeks on the mine leases drain from west to east into the Isaac River. A diversion has been built on Eureka Creek and Fischer Creek to permanently divert flows around mine workings. Goonyella Creek skirts the mine to the north, on the North Goonyella mining lease before discharging into the Isaac River to the North-East of the Goonyella Complex and also receives mine water discharges from North Goonyella Coal Mine.

The major features of the waterways local to the Goonyella Complex are the Eureka Creek and Isaac River diversions. Through the middle of the site is the Eureka Creek diversion. This system has approximately 100 square km of natural catchment upstream of the mine and joins the Isaac River Diversion on the east of the mine. Approximately 300m from the confluence with the Isaac River is a Regulated Dam GS4a which is the only authorised release point for the mine site. The diverted section of Eureka Creek between GS4a and the Isaac River Diversion consists of a constructed chute and is traversed by the old Red Hill Road, as with the Isaac River, this section of Eureka Creek has few semi-permanent pools which evaporate during the dry season.

The Goonyella Riverside and Broadmeadow Mine Regional Environmental Monitoring Program (REMP) has identified the following near field environmental values in relation to the creeks into which discharge of mine water is proposed:

- Stock watering; and
- Slightly to moderately disturbed ecosystems.

Stock Watering

The downstream water quality limits in the current EA align to the stock water quality guidelines set out in ANZECC (2000). Water quality analysis indicates that when mine water discharges are managed to achieve the sulphate and EC limits, the downstream water quality will also comply with stock water limits for other potential toxicants.

Aquatic Ecosystems

Goonyella Riverside and Broadmeadow Mine has conducted multiple investigations of impacts on aquatic ecosystems from mining activity and controlled releases of mine affected water to local and regional waterways.

The conclusions of these studies indicate that within the study area, the impacts on aquatic ecosystems from the mine water releases were not discernible against the background of catchment wide impacts to aquatic ecosystems. The conclusions indicate that aquatic ecosystems in the study area are either not impacted by mine water releases, or sufficiently opportunistic and adaptive to readily recolonise following any impact.

### **Emissions or Releases (Item k (ii))**

No change in the nature, scale of intensity of emissions or releases are proposed as a result of the amendment for watercourse subsidence to that currently authorised by conditions of the current EA for the mine.

All other conditions of the EA, including water release and management conditions, remain unchanged as a result of this proposed amendment.

### **Risk and Magnitude of Impacts and Management Practices (Item (iii) and (iv))**

The risk of subsidence impacts as a result of the proposed amendments is addressed in a residual risk assessment included in the revised SMP, Section 4.6.

The risk assessment framework built into the SMP is based on the risk and mitigation option analysis completed by BMA, using an independent expert consultant, in August 2011. This analysis was completed by BMA to support development of the SMP for the Panels 107-110 approval and was provided to the Department as part of the previous amendment application.

The residual risk assessment in the revised SMP takes into account the residual risk of impacts from short term and long term mitigation actions. The conclusions of the residual risk, as presented in Table 4-1 of the SMP, is that **Low** residual risk for impacts on features and values for the subsided reaches of the Isaac River exists post mitigation.

In addition, annual inspections completed on the subsidence of the Isaac River to date have confirmed that pre-subsidence mitigation actions, implemented under the SMP, are successful and future subsidence impacts and risks going forward can be managed.

The risk analysis indicates further that impacts on environmental values are expected to be **Minor** as a result of subsidence and predicts the impacts expected are to be physical in nature. With maximum predicted depths of subsidence of the Isaac River of up to 2.8-2.9 metres risk of impacts on environmental values are not expected to be significant.

The current mitigation actions as stated are proven to be successful by the monitoring and evaluation program for the previously mined panels at Broadmeadow and will inform all future mitigation actions. Annual inspections completed on the subsidence of the Isaac River will continue to confirm the success of pre-subsidence mitigation actions. Future and long term actions are included in the SMP, including for any impacts on infrastructure, to be implemented should monitoring indicate this is required.

Riparian and terrestrial vegetation monitoring across the RE's found at Broadmeadow is undertaken as part of the annual monitoring program.

The mine is currently investigating remote sensing technology to monitor vegetation height, density and health as well as ground cover in the riverine areas of the Isaac River and Diversion that overlays the mine plan area. The technology includes Lidar and Normalised Difference Vegetation Index (NDVI) captured by aircraft and satellite imagery. The data sets will be captured on an annual basis allowing comprehensive comparison of vegetation health over time (and seasons) in mined and unmined areas. This monitoring has the potential to provide an improved method for measuring the impact of subsidence on riverine vegetation. The technology also provides the opportunity to capture soil exposure information that will assist soil erosion potential assessment.

The monitoring plan is currently under development with data sets planned to be available for the 2016 annual subsidence monitoring program. It is anticipated that the program will be adapted and modified over time as refinements are made and technology changes.

### **Rehabilitation (Item k (v))**

The subsidence of the Isaac River under the proposed amendment does not alter or change the details or existing plans for how the land will be rehabilitated by BMA following the cessation of longwall mining at Broadmeadow Mine.

The SMP clearly outlines that progressive rehabilitation of subsided areas will be required as the mine progresses. 'Rapid' rehabilitation, i.e. rehabilitation of subsided reaches of the Isaac River immediately following surface depression, is stated as one of the strongest mitigating measures in managing ongoing impacts. The planning for this progressive rehabilitation will be informed by the annual monitoring of subsidence and the condition of previously rehabilitated land. This approach has been implemented for the previously mined panels at the mine and has been proven as a successful management approach.

As a tangible example of this ongoing commitment for rehabilitation, in the Goonyella Riverside and Broadmeadow Mine FY16 Plan of Operations, BMA has committed to the completion of the following:

- Rehabilitation of the subsided Longwall Panel 8 will begin during FY16 at Goonyella Riverside and Broadmeadow Mine. Piling work has been completed up to Panel 12 and some bank battering work for the Isaac River will be undertaken for Panel 6 in FY16.

The work is budgeted and executed on an ongoing basis in accordance with Plan of Operations commitments. Future Plan of Operations for the mine will include similar commitments throughout the mine life.

The Rehabilitation Management Plan as required by the current EA, states the requirements for rehabilitation of subsidence areas as an independent land domain for post mining land use. As per the RMP, potential impacts which may require mitigation under the SMP mostly include cracking, surface water ponding and erosion. The Plan identifies a range of options available for Riparian Areas depending on the impact and severity. The Plan also clearly identifies the most appropriate post mining land use objectives for subsided areas as being bushland or grazing (depending on pre-subsidence land uses).

Section 4.6.1 of the SMP addresses the considerations relevant to the long term rehabilitation of the Isaac River diversion. The proposed activities for watercourse subsidence do not change or alter the long term plans for BMA. The Goonyella Riverside and Broadmeadow Mine complex has a mine life currently in excess of 70+ years. Given the extended life of mine, BMA proposes to implement an adaptive management plan for the Isaac River diversion. This plan will be centred around a combination of short term and long term mitigation measures both of which will work towards the long term goal of a self-sustaining, stable waterway.

BMA continues to progress short to mid-term final landform design studies and life of asset planning phases for the Goonyella Riverside and Broadmeadow complex, which as stated above, includes options for the Isaac River diversion.

### **Minimising and Managing Wastes (Item (l))**

Wastes or waste products are not generated by the proposed subsidence of the Isaac River.



No change in the nature, scale of intensity of waste produced by the Broadmeadow Mine are proposed as a result of the proposed amendment to that currently authorised by conditions of the current EA.

All other conditions of the EA, remain unchanged as a result of this proposed amendment.

### **Details of Minor Amendment – s223 of the *Environment Protection Act 1994***

Since 2008, BMA has completed assessment and study work and now has deep and comprehensive understanding of the potential for impacts and understands the risk of cumulative impacts for Broadmeadow Mine as part of the cumulative contribution of longwall mining at the regional scale. It was agreed in discussion with the Departments (then Department of Environment and Resource Management and Natural Resources and Mines) at that time of the amendment for Panels 107-110 that BMA would move to complete further investigations into cumulative impacts on the Isaac River. This led to the completion of the IRCIA.

The Departments were involved in the development and completion of the study and were engaged on its outcomes. With this understanding the proposed amendment is aimed at removing the restriction on future subsidence and will prevent the need for BMA to re-apply to amend the EA and extend further the authorisation of subsidence in future years. This is seen by BMA as the most appropriate approach to the ongoing regulation of subsidence of the Isaac River, and the most time efficient and effective outcome for BMA and the Department.

As stated above, the intent of the proposed amendments is to remove the current prescription and move to an outcome focussed regime to manage subsidence. The SMP is maintained as a live management tool by BMA. BMA has also made commitment on the long term mine plans for the Isaac River, that top coal caving will not be deployed within the extent of the bed or banks of the River. This is the current practice and has proven that minimising the surface expression from subsidence under the River limits the impacts to that of conventional longwall mining.

### **Level of Environmental Harm (Item (b))**

From the impact assessment outcomes as per the SMP, the proposed amendment does not significantly impact environmental values or increase the risk of actual or potential environmental harm.

The proposed subsidence of the Isaac River does not change the environmental outcomes or objectives as currently authorised by conditions of the EA for Air, Surface water and Ground water, Noise, Waste or Land for the mine.

- Air – dust or odour emissions are not generated by the subsidence activities proposed by this amendment.
- Water – no actual or foreseeable discharges of water or releases of contaminants are proposed by this amendment for watercourse subsidence in addition to water emissions authorised in the current EA. Water quality and quantity impacts are expected to be minimal from the subsidence as stated in section 3.3 of the revised SMP. A comprehensive surface water quality monitoring program at the mine is in place.
- Wetlands – There are no wetlands located at the mine or in proximity of the mine.
- Noise – No noise emissions are generated by the proposed activities in this amendment.
- Waste – As stated above, wastes or waste products are not generated by the activities proposed by this amendment in addition to that currently authorised by the current EA conditions.
- Land – Flora and fauna environmental values are well understood by BMA. Given the physical nature of expected land responses, disturbance by surface expressions from subsidence are not expected to have significant impacts on flora or fauna environmental values in or around the bed or banks of the Isaac River. Low residual risk exists for 3<sup>rd</sup> and 4<sup>th</sup> order impacts to land following the implementation of mitigation options. The land subject to subsidence at the mine has been previously disturbed by broad



scale clearing and ongoing grazing. The Isaac River diversion is vegetated by re-growth in the riparian areas following the construction of the diversion. Rehabilitation objectives for the Goonyella Riverside and Broadmeadow Mine complex cover the extent of the subsidence of the Isaac River proposed by this amendment. The Rehabilitation Management Plan currently in place for the mine sets out to achieve a post mining landform which is safe, non-polluting, stable and self-sustaining.

The independent expert consultant commissioned by BMA to revise the SMP as the primary management tool has provided a certification for the SMP and its contents and methodology under the current EA. All potential impacts from the predictive modelling can be managed under the adaptive management approach.

No significant impacts on the local environmental values are expected as a result of the future subsidence. Impacts predicted are expected to be majorly direct physical impacts (1<sup>st</sup> order) and short term changes to sediment bed loads (2<sup>nd</sup> order). The IRCIA has provided assurance that the 1<sup>st</sup> and 2<sup>nd</sup> order impacts are manageable in terms of cumulative impacts at the regional scale. The Department has been briefed on the outcomes of the IRCIA and a summary was provided to the Department in the pre-lodgement session for the amendment in April 2015.

As evidence of the response of the Isaac River to the 1<sup>st</sup> and 2<sup>nd</sup> order impacts from subsidence, Table 1 includes photos to clearly substantiate the statements above. Table 1 provides a clear overview of the success of the pre-subsidence works (pillaring) on previously mined panels (LW 104-105) at Broadmeadow. This demonstrates the sediment bedload moving downstream through the diversion following a wet season. This substantiates the self-healing nature of the Isaac River and demonstrates the available sediment budget in the catchment in action.

As part of annual inspections survey quantifies the infilling post subsidence and is fed back into the modelling as part of the overall monitoring and evaluation program. This clearly demonstrates the impacts of subsidence and risk of environmental harm is manageable and supports the mitigation actions. The conclusions of the IRCIA on scale and intensity of impacts are supported also, indicating this is very much dependant on the time, size and intensity of rainfall in a wet season.

In conclusion, the proposed activities for this amendment do not significantly impact environmental values and BMA can continue to comply with all other conditions in the current EA.

Table 1. The same view at 2010 (left) and 2011 (right) at the upstream end of the Isaac River diversion, looking upstream and downstream of Longwall 105-106 pillar.



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### **Rehabilitation Objectives (Item (c))**

The proposed amendments for water course subsidence do not change the rehabilitation objectives or performance outcomes for Land for Goonyella Riverside and Broadmeadow Mines. The rehabilitation objectives and performance criteria will remain on and apply to the future subsided areas along the Isaac River proposed under this amendment.

The Rehabilitation Management Plan is underpinned by achieving the following outcomes for the complex:

- Producing a safe final landform for humans and wildlife;
- Leaving a final landform, including the Isaac River, which is non-polluting;
- Planning a final landform including a sustainable state for the Isaac River, and any associated diversion of the Isaac River, which is stable; and
- Relinquishing a final landform which is self-sustaining in consideration of final land uses and community expectations for the land at the regional scale.

In consideration of the extended mine life for the complex, BMA continues its work on final landform design. The long term goal for BMA for the Isaac River diversion is to achieve a self-sustaining, stable waterway.

### **Scale or intensity of Mining Activities (Item (d))**

The proposed amendments relates only to subsidence of the Isaac River for sustained longwall mining at Broadmeadow. Longwall mining at Broadmeadow is currently authorised by the current EA.

No change to the nature of mining, the scale or intensity of the mining, the extent of the disturbance footprint or mining intensity is proposed as a result of this amendment.

### **New Resource Tenure and Surface Area (Items (e & f))**

The proposed amendments for watercourse subsidence do not require a new resource tenure. All mining activities and associated subsidence foreshadowed by this amendment are contained entirely within granted mining leases authorised by the current EA. Therefore, as no addition of tenure is required for the proposed amendment to sustain operations at Broadmeadow Mine, no additional surface areas are required.

### **Broadmeadow Mine Plan**

Section 3.1.1 of the revised SMP addresses the current mine plan for Broadmeadow. Figure 2-1 of the SMP indicates the mine plan up to and including LW116 is confirmed in the 5 year plan for the Broadmeadow longwall. The mine plan for the future panels are subject to final planning, in consideration of further geological investigations.

The proposed amendment strategy lends itself to an outcome focussed risk based approach. BMA has based the approach on the current EA, and aims to allow BMA flexibility in the future mine plan for Broadmeadow.

The existing conditions require BMA to review and update the SMP if any changes to the BRM mine plan occur. Depending on changes, this may include an update of the predictive modelling and inclusion of mitigation actions to manage any new impacts identified.

BMA is open to negotiation with the Department on the wording of conditions for the amended EA which require BMA to review and update the SMP if any changes to the mine plan are contemplated. BMA will also accept the requirement to notify the department of any changes to the mine plan, and provide the amended SMP on request. To this end, condition 15 in the current EA could be slightly amended to include these requirements.

With the construct of the conditions, any change to the mine plan will trigger a re-assessment of environmental values, impacts mitigation measures and rehabilitation requirements under the SMP. This approach focuses on BMA managing the outcome and avoiding prescription in conditions requiring further amendments in the future.

### **Conclusion**

The amendments proposed by this application do not significantly increase the risk or level of environmental harm, to that currently authorised. The amendments to the EA are administrative and can be managed as a minor amendment under the *Environmental Protection Act 1994*.

## **Attachments**

1. Goonyella Riverside and Broadmeadow Mine Subsidence Management Plan 2015
2. Certification - Goonyella Riverside and Broadmeadow Mine Subsidence Management Plan 2015
3. Draft Environmental Authority – Goonyella Riverside and Broadmeadow Mine