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INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

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RTI DL RELEASE - EHP

EXECUTIVE
SUMMARY

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

INTRODUCTION

The existing Isaac Plains Coal Mine is an open-cut coal mine located in the Bowen Basin, Central Queensland, approximately 7 km east of the township of Moranbah along the Peak Downs Highway, and 150 km south-west of Mackay. The EIS has been prepared to facilitate approval for an increase in the area to be mined and an increase in the rate of run-of-mine (ROM) coal production from the approved mining rate of 1.9 million tonnes per annum (Mtpa) for up to approximately 4 Mtpa ROM coal. The additional area to be mined, known as the Expansion Area, lies within the southern portion of Exploration Permit for Coal 755 (EPC755) but outside the current Mining Lease (ML) 70342 (ML70342). The Expansion Area is located 10 to 12 km south-east from Moranbah south of the Peak Downs Highway. The Project has been named the "Integrated Isaac Plains Project" (IIPP) and is referred to as such throughout this EIS.

The existing Isaac Plains Coal Mine and the proposed Expansion Area are located within Nebo Shire and Belyando Shire Local Government Areas¹, which both lie within a region that contains a number of significant coal mines including Moranbah North, Goonyella, Riverside, North Goonyella, Peak Downs, Burton and Broadlea, Carborough Downs, South Walker Creek, Broadmeadow, Millenium, Moorvale and Coppabella. Mining activities in this area co-exist with the local grazing industry.

THE PROPONENT

The IIPP is operated as an unincorporated joint venture with Isaac Plains Coal Management Pty Ltd (IPCM) being the management company responsible for all operations undertaken as part of the IIPP on behalf of the joint venture participants, i.e. IP Coal Pty Ltd (50%) and Vale (50%). For the sake of simplicity, the term IPCM is used throughout this document to refer to the joint venture participants and the Manager of the IIPP.

PROJECT DESCRIPTION

The existing approved Isaac Plains Coal Mine is located in ML70342 and an Environmental Authority (EA) (Permit # MIN100329505) was granted on 25 August 2005. The EA was recently re-issued on 21 December 2007 following an administrative amendment made by the EPA. The existing Isaac Plains Coal Mine currently has approval to mine at a rate of 1.9 Mtpa ROM. The first coal was railed from the existing Isaac Plains Coal Mine in October 2006.

In the period since then, IPCM have identified sufficient coal reserves in the Expansion Area that they now deem it feasible to proceed with development of this area. It is proposed that the rate of mining for the IIPP would be up to 4 Mtpa ROM coal, producing approximately 3.3 Mtpa of product coal. The existing Coal Handling and Preparation Plant (CHPP) at the existing Isaac Plains Coal Mine would not require an upgrade in size to increase capacity, but the current rate hours of operation will be increased. The CHPP was approved based on conservative modelling for a 24 hr, 7 days per week operation.

IPCM, through the joint venture partners, is planning to secure MLs under the *Mineral Resources Act 1989* (MRA) for an extension to the existing Isaac Plains Coal Mine onto the southern part of EPC755, over the Conrock Gully dam reservoir area and onto an adjoining area to the west of EPC755 known as the Kumba Designated Area (KDA). In addition, an access/haul road linking the Expansion Area to the existing Isaac Plains Coal Mine is required and it is proposed to construct an underpass beneath the Peak Downs Highway and a low level crossing of the Isaac River. As part of the Expansion Area mining activities, it is proposed to divert Conrock Gully to access the economic reserves beneath this waterway. Furthermore, the coal reserves under Smoky Creek on the existing Isaac Plains Coal Mine have also been deemed of sufficient economic value to divert Smoky Creek to mine the underlying coal and therefore this diversion is proposed as part of the IIPP.

In addition, a heavy equipment construction pad will be built at the existing Isaac Plains Coal Mine. The pad will be used initially to assemble a dragline and then periodically over the life of the mine for refurbishment work that needs to take place on larger items of mining equipment. The dragline will be initially used in the existing mine, prior to moving to the Expansion Area.

¹ NB: Since the release of the final EIS for public comment Belyando, Nebo and Broadsound Shires have been amalgamated into the Isaac Regional Council. This revised EIS has not been amended to reflect this as the intention of this version of the EIS is to address comments from stakeholders at the time of public release, including both Belyando and Nebo Shire Councils.

On average, the existing Isaac Plains Coal Mine will disturb up to approximately 45 ha per annum of land over the 15 year mine life. For the Expansion Area, the annual land disturbance area is estimated as 53 ha per annum. The total area of disturbance for the IIPP is estimated at approximately 1,477 ha. This disturbance includes open cut mine operations, roads, water management structures, mine infrastructure and waterway diversions.

PROJECT OBJECTIVE

IPCM plans to develop the IIPP to extract approximately 4 Mtpa ROM (IIPP total product). The IIPP will produce, for the export and domestic market, approximately 3.3 Mtpa of product coal (25% coking coal, 50% pulverised coal injection (PCI) and 25% thermal coal).

The key objectives of the IIPP are to:

- produce increased tonnages of coking, PCI and thermal coal in response to the increasing world demand for these products and to enhance IPCM's competitiveness as a coal provider;
- operate the mine in a manner which minimises impacts on surrounding residents and the local physical, biological and socio-economic environment;
- implement a level of management control and mitigation measures that comply with or exceed, both appropriate environmental criteria and reasonable community expectations;
- develop and operate the IIPP in compliance with all relevant statutory requirements;
- continue to maintain an open and honest relationship with stakeholders; and
- achieve the above objectives in an economically, environmentally and socially acceptable manner which benefits stakeholders and ensures the Proponent's continued economic viability.

THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The EIS process is divided into four distinct stages of which this EIS is the second stage. The first stage involved preparation of the Terms of Reference (ToR) for the EIS, during which a draft ToR was publicly advertised by the Environmental Protection Agency (EPA). The ToR included the comment period of 30 days to allow stakeholders to respond to the EPA with proposed amendments, with the public comment period commencing on 6 November 2006 and concluding on 15 December 2006. Comments on the draft ToR were considered by IPCM and a final ToR was published by the EPA on 23 March 2007. This EIS is based on the final ToR.

The second stage of the EIS process involves two sub-components. Firstly, the EIS was submitted to the EPA for consideration against the final ToR, following which, approval to proceed to public notification under Section 49(2) of the *Environmental Protection Act 1994* (EP Act 1994) was granted on the 24 October 2007, allowing the EIS to proceed to the public notification stage of the EIS process.

Secondly, the EIS was made public with the community and relevant stakeholders invited to view and comment on the document for a period of 30 business days, from 12 November 2007 to Tuesday 19 February 2008. The comment period was informally extended from 8 January 2008, at the discretion of the EPA, to allow for further collation of stakeholder comments. (NB: EPA does not consider the dates from 20 December to 5 January in each calendar year as business days). All comments regarding the EIS were directed to the EPA and collated before being forwarded to the Project Proponent for consideration. This current version of the EIS addresses the comments provided by stakeholders. The Proponent has also provided the EPA with a summary of the submissions and a statement of response to the submissions and how they have been assessed in the EIS. A Supplementary EIS (v 4.0 dated 6 June 2008) was submitted to the EPA following the EIS public exhibition period. This Supplementary EIS included amendments related to IPCM's response to public submissions.

The following additional information in relation to the project was provided to the EPA after the submission of the Supplementary EIS (v 4.0 dated 6 June 2008) to 26 February 2009:

- IPCM Response to EPA Comments (Supplementary IIPP EIS) dated 29 August 2008 in response to additional information requirements specified in the EPA's Notice of extension of decision period dated 4 July 2008;
- IPCM letter dated 10 November 2008 in response to additional information requirements specified the EPA's email dated 10 October 2008;
- IPCM letter dated 28 November 2008 and WRM's Conrock Gully Diversion Concept Design report dated 26 November 2008 in response to additional information requirements specified the EPA's Notice of extension of decision period dated 18 November 2008; and
- IPCM letter dated 26 February 2008 in response to additional information requirements specified the EPA's Notice of extension of decision period dated 19 December 2008.

The EPA's Notice of extension of decision period dated 19 December 2008 requested the compilation of an Amalgamated EIS to replace all previous versions of the EIS and to include the latest version of all EIS information included in the additional information provided (listed above). This Amalgamated EIS provides the final description of environmental impact assessment of the project and supersedes and replaces all previous EIS versions and additional information correspondence submitted to the EPA.

During the third stage the EPA prepares an EIS Assessment Report after considering the final EIS. On approval the EPA provides a report to IPCM giving consideration to the final TOR, submissions, and the EIS, referencing the standard criteria under the EP Act.

At the fourth and final stage the EPA provides the EIS Assessment Report to the Project Proponent.

PROJECT JUSTIFICATION

Market Demand

It is felt that given the current demands for coal worldwide the expansion of the existing Isaac Plains Coal Mine is justified. The IIPP will produce coking, PCI and thermal coal for the export market.

Importantly, Australia is the world's largest exporter of coal, with Queensland accounting for over two thirds of Australia's export tonnage. The export of Queensland coal generated revenue in excess of A\$17.8 billion in 2005/2006 (DME, 2006). Continued growth in the demand for coking coal is predicted, based on consistent increases in global steel production that have occurred in recent years.

Benefits

During both the construction and operational phases of the IIPP, both the surrounding region and Queensland stand to benefit from this development. The IIPP is located within both the Nebo and Belyando Shires in Central Queensland. Major benefits to the Shires and the Central Queensland region include increased employment and vocational training opportunities. Furthermore, capital expenditure and annual operational expenditure will create direct and indirect social and economic flow-on benefits to the region. The Queensland State Government will benefit from the IIPP in the form of additional royalties, estimated at approximately \$12.6 M per year, and additional rail freight charges estimated at \$7.6 M per year. Port charges are estimated to reach \$7.7 M per year.

Ecologically Sustainable Development

Ecologically Sustainable Development (ESD) aims to meet the needs of Australians today while conserving our ecosystems for future generations. Specialist consultants were engaged in the design and planning of the IIPP to address the principles of ESD. The consultants have assessed the potential impacts of the IIPP and examined options to protect and/or enhance the environmental values of the area

Features of the IIPP which address these principles include:

- placement of infrastructure in areas which have been previously disturbed and cleared to prevent further clearing;
- consideration of alignment options for the access/haul road to minimise impact on endangered Brigalow in consultation with the underlying landholder. The initial alignment was located to the north of the Expansion Area and required disturbance of endangered Brigalow. The chosen alignment, albeit longer in length, now avoids endangered Brigalow and minimises impacts on landuse;
- on-site monitoring of dust, noise and vibration, groundwater and surface water releases;
- creating economic benefits to the Shires, the Region and the State;
- responsible water management through recycling and reuse on-site; and

- progressive rehabilitation of the mine with the final land use returned to predominantly natural ecosystem.

ALTERNATIVES TO THE PROJECT

Coking Coal and Steel Making

Steel making production technology is dependent on blast furnaces for reduction of iron ore to crude steel and requires both coking and PCI coals. Alternative steel making technologies, such as Direct Reduction (based on thermal coal), recycling of scrap steel through Basic Oxygen Furnaces (BOF), and Electric Arc Furnaces (EAF), have not proven to be as successful on a technical, commercial and environmental basis.

Mining Methods

The current approved Isaac Plains Mine uses truck and shovel operations and this mining method is to be implemented in the Expansion Area. It is proposed to augment the northern operation with a dragline which will operate within ML70342 until the resource is depleted in approximately 2016, at which time the dragline will be moved to the Expansion Area. This dragline move will allow more efficiently mining in the Expansion Area.

Water Supply

The IIPP will adopt the same water supply strategy used in the existing Isaac Plains Coal Mine. This strategy minimises raw water use in the CHPP by utilising dry reject disposal thereby maximising the percentage of on-site recycling. Alternatives to this method, e.g. using water to dispose of tailings, would mean smaller volumes of water were recycled on-site, increasing consumption from the Eastern Spur Pipeline. In addition, water contained within release dams and the coal management system will be beneficially reused in the CHPP or for watering of roads to reduce dust emissions. An additional water supply is also available through the Burdekin River Pipeline Agreement.

Waste Management

Currently the Isaac Plains Coal Mine utilises a filter press dry reject disposal method in the CHPP. As there is no requirement to use water to dispose of rejects, water consumption is minimised. As a back up to the filter press and to enable the operation to capture coal fines to be sold if needed, a fine coal management system has recently been approved for the existing Isaac Plains Coal Mine and will continue to be used for the IIPP.

Watercourse Diversions

The economic benefits to be realised by accessing coal through the diversion of the two waterways to access coal, Smoky Creek in the existing Isaac Plains Coal Mine and Conrock Gully in the Expansion Area, were considered greater than the option of creating no diversions. Alternative diversion options were evaluated and the diversion plans considered to create the least impact to the surrounding environment, balanced against earthworks requirements, are included in the EIS.

Access/Haul Road Location

An access/haul road will be required to link the Expansion Area to the existing Isaac Plains Coal Mine. This will involve constructing a low level crossing of the Isaac River, as well an underpass beneath the Peak Downs Highway. The access/haul road planning process aimed to balance land use with environmental and engineering requirements. The potential impacts on flora and fauna, as well as land use, were mitigated to the highest possible extent such that the chosen alignment avoids impact on endangered Brigalow, minimises the disturbance of the riparian vegetation along the Isaac River and enables the landowner to continue use of the land for pastoral purposes.

Transport

Coal will be transported from the Expansion Area to the CHPP by trucks along the internal access/haul road, i.e. no coal will be hauled on public roads. An alternative overland conveyor system was investigated however, given the distance from the Expansion Area ROM stockpile to the CHPP at the existing Isaac Plains Coal Mine, and the need cross the Isaac River, it was determined that the conveyor option was not economically viable.

No Project

A decision not to proceed with the IIPP will greatly constrain IPCM's capacity to supply its target markets' demand for coal. It will also result in a loss of employment opportunities, as well as economic

benefits to the Project Proponent, employees, Nebo and Belyando Shires, the Mackay region and the State and Commonwealth governments.

GEOLOGY, RESOURCES AND RESERVES

The coal deposit being mined is located in the northern part of the Permo-Triassic Bowen Basin. The main economic coal seams, the Leichhardt seam (LHD) and the Vermont seam (VER), are contained in the Late Permian Rangal Coal Measures. It is estimated that within the LHD, a resource of 230 Mt is available. There is also a potential resource in the underlying VER, 20 to 25 m below the LHD seam. However, its exploitation is dependent upon defining the resource at an acceptable yield and quality. To date the VER has not been reported as part of the resource as it is too deep to mine through the proposed open-cut mining method.

Based on the current mine plan for the IIPP, IPCM propose to extract a reserve of approximately 60 Mt as defined in the reserve statement dated June 2007, i.e. extracting ROM coal at a rate of up to 4 Mtpa over the next 15 years. The conceptual mine plan identified within this EIS is based on mining the Leichhardt seam. Mining of this seam will not sterilise the underlying VER seam.

PHYSICAL ENVIRONMENT

Climate

The Moranbah region is classified as 'Subtropical'. Moranbah has a warm climate and recorded mean temperatures ranging from a maximum of 34.2°C in summer to a minimum of 9.7°C in winter. Average annual rainfall is 589.5 mm per year while the average annual evaporation is 2,372.5 mm per year, approximately four times the average rainfall. The wind is predominantly from the north-east to the south-east.

Topography

The topography of both the existing Isaac Plains Coal Mine and the Expansion Area can be described as gently undulating, with the exception of a small mesa located on ML70342. Steeper slopes occur throughout the IIPP within the waterways and in the undisturbed hills to the east and west of the open cut pits. The topography of the Expansion Area generally grades from the west to the east towards the Isaac River, with the topography characterised by a small ridge/plateau in the centre, running almost north-south.

Soils, Land Use and Suitability

A detailed soil survey and land suitability assessment was undertaken for the Expansion Area. Six soil types (and one variant) were identified, principally non-cracking sandy clay, gently undulating Brigalow plains; and sandy duplex poplar box woodlands. Deep sandy and duplex alluvia, with mixed poplar box woodland occur in association with major alluvial lines in the area.

The principal use of the land in the area, other than the existing Isaac Plains Coal Mine, is for grazing. There is no indication that grain crops have been cultivated anywhere across the entire area of the proposed IIPP, which was originally vegetated with mixed Brigalow and Poplar Box communities and associated grasslands. The area has been almost completely cleared to increase grazing capacity, and to allow for farm infrastructure, including fences, dams and water troughs. Although some sheet wash erosion of the Brigalow plains was found, the area includes considerable reserves of topsoil, which will be available for rehabilitation at the end of mine life.

Water Resources

The IIPP is located within the Fitzroy Basin. The IIPP is dissected by the Isaac River, a major river system of the Fitzroy Basin catchment. The existing Isaac Plains Coal Mine is located to the north of the Isaac River and the Expansion Area to the south.

The Isaac River catchment, upstream of the IIPP, comprises mainly scattered to medium dense bushland, grazing land and with the township of Moranbah, located approximately 7 km south-west from the existing Isaac Plains Coal Mine. Several coal mines already exist in this catchment upstream of the site, including Moranbah North, Goonyella, Riverside, North Goonyella, Burton and Broadlea, and several downstream, including Carborough Downs, South Walker Creek, Broadmeadow, Millenium, Moorvale and Coppabella.

Smoky Creek and a drainage line known locally as Billy's Gully, traverse the existing Isaac Plains Coal Mine and are tributaries leading to the Isaac River. IPCM are proposing to divert Smoky Creek to access economic coal reserves beneath the waterway.

The Expansion Area is bounded to the north by the Isaac River and south by Cherwell Creek. Conrock Gully traverses through the centre of the proposed mine pit and will require diversion to facilitate mining.

Cherwell Creek is a major tributary of the Isaac River, and both the Isaac River and Cherwell Creek are subject to flooding, with the extent of flooding associated with the Isaac River posing a risk of flooding of the open cut Expansion Area coal pit. Flood levees will be required to reduce the flood risk from the Isaac River to the mine. Levees will be constructed as part of the pre-strip operation, at the commencement of mining in the Expansion Area.

Smoky Creek, Billy's Gully, the Isaac River, Cherwell Creek and Conrock Gully are all ephemeral systems with the majority of flows typically occurring intermittently following storm events in the wet season from December to March. Smoky Creek, Billy's Gully, the Isaac River and Cherwell Creek are regarded as waterways for the purposes of the *Water Act 2000*.

Hydrology

Flooding

A flood assessment was undertaken of the Isaac River, Cherwell Creek and Conrock Gully to determine the depth and extent of flooding in the Expansion Area for a range of design flood events. The flood modelling for the Isaac River indicates that without control flooding will impact on the Expansion Area. ~~It is proposed to construct a levee to protect mining activities against flooding.~~

It is proposed to construct levees to protect the operational phase works and the post-mine landform at the IIPP Expansion Area from flooding. The levees will partially obstruct flood flows on the south-western floodplain of the Isaac River during large flood events. The operational phase levee is proposed to be 0.5 m higher than the 500 year ARI design flood level and will be partially relocated and raised to prevent flooding from the Probable Maximum Flood (PMF) post-mining. Hydrologic and hydraulic models were developed to determine design flood levels at the IIPP Expansion Area for pre-mine conditions as well as for the operational phase and the proposed post-mine landform conditions. The results of the modelling were used to determine the differences in flood levels, depths, extents and velocities to assess the impact of the proposed levees on the long term stability of the Isaac River at the IIPP Expansion Area.

The impacts of the proposed levees used for the operational phase and post-mine landform on Isaac River, Cherwell Creek and Conrock Gully are as follows.

- The post-mine landform does not impact on Cherwell Creek channel design flood levels or flood velocities for any design flood up to the PMF.
- The post-mine landform does not impact on 20 year ARI design flood levels or flood velocities along the Isaac River. Therefore, the erosion potential of the Isaac River for floods up to the 20 year ARI design flood will not change.
- There is a significant change in water level at the northern most corner of the levee where the Conrock Gully drains into the Isaac River for the 500 year ARI design flood. Extensive erosion protection works or even a training wall may be required at this location.
- Flood levels along the Isaac River channel increase by a maximum of 0.3 m for the 100 year ARI design flood and 0.6 m for the 500 year ARI design flood immediately upstream of the mine. Additional inundation areas external to the MLA from these low probability events affect only limited areas of grazing land (13 ha for the 100 year ARI event) and would therefore not have a significant adverse impact on land use. The channel flood depth is about 12 m at the peak of the 100 year ARI design flood and about 13 m at the peak of the 500 year ARI event.
- Flood velocities along the Isaac River channel adjacent to the mine increase by about 0.25 m/s for the 100 year ARI design flood and about 0.3 m/s for the 500 year ARI design flood. Flood velocities upstream of the mine are decreased by a similar amount. The banks of the river channel and the floodplain are stable and well vegetated. The minor increase in channel flood velocities adjacent to the IIPP Expansion Area are therefore not expected to cause significant additional erosion during the 100 year and 500 year ARI design floods.
- Flood levels along the Isaac River channel increase by a maximum of 2.1 m for the PMF immediately upstream of the mine. The channel flood depth is about 19.5 m at the peak of the PMF.

- Flood velocities along the Isaac River channel adjacent to the mine increase by about 2 m/s for the PMF to about 4.5 m/s. Significant erosion is expected along the Isaac River channel adjacent to the IIPP Expansion Area for this event. However, the PMF significantly exceeds the recommended design criteria for the post-mine landform design.
- Long term maintenance of the Isaac River adjacent to the IIPP Expansion Area is not required or expected for the following reasons:
 - A major channel avulsion of the Isaac River adjacent to the IIPP is unlikely because the channel is relatively straight.
 - Given the extent of sand on the bed of the channel, significant erosion of the bed would be expected, in a similar manner to existing conditions. There appears to be a sufficient supply of sand from the upstream reach to 'self repair' any bed erosion.
 - It is possible that successive extreme floods may cause significant bank erosion. Any widening of the channel during such an event will increase the channel capacity and thereby reduce the potential for further erosion.

NB: It is expected that the configuration of the site during mining operations will produce a greater impact on flood levels, i.e. worst case, when compared to the post mine configuration, which has no levees and only the rehabilitated spoil dump. Therefore, an analysis of the post mine landform was not undertaken.

The proposed levee will be approximately 1 m above the 1% AEP flood level. Modelling of more extreme flood events to determine the actual flood immunity of the levee has not been undertaken. However, given that the difference between the 1% AEP flood and the 2% AEP flood is at most 0.4 m, the probability of the levee being overtopped will be significantly lower than the 1% AEP and is likely to be of the order of 0.5% to 0.1% AEP. Despite the low risk feedback received on the EIS raised concerns over the risk of levee failure. Such feedback has necessitated further assessment to minimise this risk of catastrophic failure of the levee and to provide a long term self sustaining landform.

To reduce the risk of overtopping the levee and flooding the final void, the Expansion Area final void, that runs perpendicular to the Isaac River, will be progressively backfilled from north to south, following mining, for approximately 1.2 km along its length by battering back the low wall until the backfill ground level exceeds the designated flood immunity level of 202 m AHD. The flood levee will remain in place. Backfilling up to the 202 m AHD contour has been chosen to provide flood immunity for the 1% AEP plus 1 m as discussed above. To achieve this level of flood immunity will require a considerable volume of material to be pushed into the void at considerable cost. The length of void to be backfilled is approximately 1.2 km, with a width of 70 m and depth of approximately 80 m, which equates to a volume in the order of 7,000,000 m³. The movement of this amount of spoil is considered necessary in this instance to provide a long term self sustaining landform.

Existing flood levels and velocities determined for Cherwell Creek from the HEC-RAS modelling indicate the creek will remain unaffected by the project.

The Conrock Gully diversion potentially increases the extent of flooding both on the Expansion Area MLAs and on adjacent grazing land upstream of the site. Flooding on the Expansion Area MLAs can be controlled by protecting the box-cut pit spoil dumps with a levee or relocating the access/haul road against the spoil dump and either filling or providing a levee for the ROM stockpile area. The additional inundation extent upstream of the site is unlikely to affect the upstream land use of grazing.

The impacts both upstream and downstream of the proposed Smoky Creek diversion are predicted to be minimal.

Diversions

To enable efficient mining of the coal resources to the north, south and beneath Conrock Gully, Conrock Gully will be diverted from its current course to allow development of the mine pit in the Expansion Area. Under current conditions, approximately 44-45 km² of the Conrock Gully catchment and a further 16-17 km² of the catchment to the north of Conrock Gully, drains to the Expansion Area.

Two diversion options were considered:

- a 4 km diversion to the south to Cherwell Creek; or
- a 2.4 km diversion to the north to the Isaac River.

For both options, it is necessary to construct a dam across Conrock Gully at the western boundary of the Expansion Area, within the ML, to raise water levels sufficiently so that water can discharge, under gravity, into the diversion channel. Prior to the end of mining, the area impounded by the dam will be filled by compacted overburden so that the impounded area freely drains into the constructed diversion channel without ponding water. The raised upstream end of the diversion channel will minimise cut volumes but will also cause water to pond on the adjoining property to the west for extended periods and reduce flows draining along Conrock Gully to the Isaac River.

An analysis of the two diversion options with a range of spillway crest elevations has been undertaken to determine the optimum diversion and dam configuration. The results illustrated that the Cherwell Creek diversion options require significantly more excavation than the Isaac River diversion options. Four various options were then investigated for the diversion to the north.

The concept design for the selected diversion option is as follows:

- a channel with a 10 m wide base and 1V:3H channel side slopes will be constructed along the upper and middle reaches of the diversion. The channel width will be reduced to 1 m at the lower end to conform with the existing channel that drains into the Isaac River at that location;
- the invert level of the stage 1 diversion, which is the spillway level of the proposed Conrock Gully dam prior to filling is 204 AHD;
- the finished surface level of the Conrock Gully dam fill will slope at a grade of 1V:250H towards the proposed diversion channel. A total of 3.3 million cubic metres (compacted in place) of material is required to fill the dam;
- the diversion connects to an existing flood channel that drains into the Isaac River in a similar manner to the existing Conrock Gully Channel. The adopted bed gradient in this lower reach is consistent with the bed gradient of the flood channel as it drains into the river; and
- the estimated volume of material to be excavated for the diversion is 533,000m³. The selected diversion option consists of the following:

~~the construction of a dam across Conrock Gully (the access/haul road) at a level of 208.9 m AHD to raise water levels sufficiently to allow water to discharge into a diversion channel (volume at full supply level is 551 ML);~~

~~the construction of a diversion drain from Conrock Gully dam northward to the Isaac River. The base of the diversion at Conrock Gully will be 204.6 m AHD and will grade at approximately 0.17% to the Isaac River. The channel will be designed using natural channel principals where possible. It is noted that the diversion channel is longer and has a flatter bed slope than the existing Conrock Gully channel and will therefore not mimic the current natural channel features;~~

~~the construction of a culvert crossing on the diversion under the haul road; and~~

~~the raising of the ROM stockpile pad and MIA to prevent flooding.~~

~~It is noted that there will be no significant change in the total flow volume or frequency of stream flows in the Isaac River as a result of this diversion due to the relative differences in catchment area.~~

Subsequent to the approval of the existing Isaac Plains Coal Mine, IPCM identified an economic quantity of coal reserves under Smoky Creek in the existing Isaac Plains Coal Mine. To mine the coal seam under Smoky Creek, the creek will be diverted to a new alignment to the south for a length of about 1.2 km. The diversion does not change the catchment area contributing to the creek or any other waterway and accordingly, flood flows will remain unaltered.

The Smoky Creek diversion will have no significant impact on stream flows because the diversion will involve a partial realignment of the creek rather than diversion to another catchment.

Water Quality

No site-specific water quality monitoring data is available for Cherwell Creek and Conrock Gully. However, data is available from gauging stations located on the Isaac River and on creeks with similar catchment characteristics to those in which the Expansion Area is located. Water quality monitoring in the region suggests that the water quality in the Isaac River and the representative tributary creeks is generally suitable for stock watering.

Potential impacts to surface water quality resulting from the construction and operation of the IIPP include run-off from spoil dumps, the mine infrastructure area including septic systems, the fine coal management system and coal stockpile areas, pit dewatering and the diversion of the two waterways, i.e. Smoky Creek and Conrock Gully.

A mine site water management system and surface water monitoring program developed during construction of the existing Isaac Plains Coal Mine has been implemented. The mine site water management system and monitoring program protects the beneficial uses of Smoky Creek and Billy's Gully. The IIPP will not involve any significant changes to these systems, indicating water quality within the existing Isaac Plains Coal Mine will not be affected, provided the Smoky Creek diversion is designed, constructed and stabilised in accordance with the conceptual design.

During the construction and operation of the mine within the Expansion Area, and areas in the existing Isaac Plains Coal Mine affected by the IIPP, drainage from operational areas will include runoff from large areas of disturbed ground, including haul roads, waste rock dumps, pre-strip areas, coal stockpiles, the mine infrastructure area and mine pit high walls. A mine site water management system has been developed to collect and capture runoff from these areas to prevent contaminants reaching the downstream waterways of the Isaac River and Cherwell Creek. The main elements of the system are detailed below:

- a clean water diversion dam on Conrock Gully and channel immediately upstream of the haul road to divert clean water from the upstream catchments to the Isaac River;
- flood protection levees along the Isaac River to separate clean Isaac River water from the potentially dirty operational areas;
- a mine water dam of approximately 1,200 ML storage capacity, (Release Dam 3), to allow mine water to be reused and allow controlled releases to the Isaac River during flood flows;
- pit sumps that collect pit water to be pumped to Release Dam 3;
- highwall pit dewatering pumps to allow the open cut pit to be dewatered and water discharged to Release Dam 3;
- sediment dams to allow runoff from the rehabilitated and unrehabilitated areas of the spoil dumps to be captured and treated and pumped to Release Dam 3. Overflows from the sediment dams will drain to the pit via mine water pipelines. If water is not required, and the quality of the captured runoff meets the water quality compliance criteria, the sediment dam water may be pumped directly to Cherwell Creek or the Isaac River under discharge licence conditions;
- a retention pond to allow runoff from the ROM Stockpile and mine infrastructure area (referred to as MIA Retention Pond) to be collected and pumped to the Release Dam 3. Any runoff in excess of the design capacity of the retention pond will overflow to the Isaac River. If water is not required, and the quality of the captured runoff meets the water quality compliance criteria, water from the MIA Retention Pond water may be pumped directly to the Isaac River;
- a transfer pipeline to allow excess mine water to be pumped to the Isaac Plains CHPP for use in processing coal (stored in the Raw Water Dam); and
- water fill points linked to Release Dam 3 to allow mine water to be used for dust suppression.

Release Dam 3 and the MIA Retention Pond are the primary water dams to manage surface and groundwater runoff from the operational areas of the Expansion Area. Release Dam 3 will collect pumped inflows from the spoil dump sediment dams, the MIA retention pond, and the open cut pit together with runoff from the undisturbed catchment downstream of the mine pit. The MIA Retention Pond will collect runoff from the MIA and the ROM. The water quality within Release Dam 3 is expected to be similar to the release dam for the existing Isaac Plains Coal Mine, which is not considered as a hazardous dam.

A water balance model was used to design the mine water management system. The model identified water supply and discharge requirements based on water demands to operate the mine and water generated through the operations.

A surface water monitoring program has been developed to collect local background data and monitoring water quality within water storages, at the release point in the Isaac River from Release Dam 3 and downstream.

Isaac River Low Level Crossing

The crossing of the Isaac River is proposed to be an over topping low level crossing, accommodating low flow events of less than a 1 in 2 year occurrence interval. Given the size of the Isaac River, the crossing will have minimal impact on the river. The crossing will be an engineered design with the details to be provided in support of an application for a Riverine Protection Permit under the *Water Act 2000* and IIPP Plan of Operations.

The crossing will be designed to allow coal to be hauled from the Expansion Area to the existing Isaac Plains Coal Mine primarily in haul trucks. The crossing will also allow for the dragline to be 'walked' across the Isaac River on completion of mining the existing Isaac Plains Coal Mine, nominally in the year 2016. This will require the Isaac River crossing to be widened by adding bed sand or gabions to increase the width. The additional material will be removed once the dragline has crossed. These provisions will be confirmed with the EPA and DNRW prior to moving the dragline.

The minimisation of disturbance to the riparian corridor has been considered in the Isaac River low level crossing location selection process and this will be further refined at the detailed design stage.

The low level crossing of the Isaac River will be constructed so fish and other aquatic fauna have unrestricted flow over the crossing during both low and high flow events.

Groundwater

The IIPP lies within the Central Queensland coalfields. A sub-artesian aquifer system occurs within the Permian Rangel Coal Measures and provides modest water supplies for agriculture and livestock. Regionally, the Permian sub-artesian aquifer has poor or patchy water-bearing characteristics.

Within the Expansion Area, a general 'dryness', i.e. a poor supply, is present that is similar to that experienced in the existing Isaac Plains Coal Mine.

The major geological units in the Expansion Area have been delineated by resource drilling. These are, from shallowest to deepest:

- Tertiary sediment (1-20 m thick) and river alluvium (10-23 m thick);
- Permian Rangel Coal Measures, including:
 - sandstone, siltstone, mudstone, tuff, conglomerate;
 - Leichhardt coal seam (~2.3 m thick); and
 - VER coal seam (6-7 m thick).

Quaternary Alluvium and Tertiary Sediments

The Tertiary sediments are 1-20 m thick (average 8 m) and are mostly unsaturated (i.e. 'dry'). They occur in the hills of the Expansion Area where the terrain is higher. Alluvium occurs along the Isaac River and to a lesser degree along Cherwell Creek. These alluvial sediments comprise a fining-upward sequence of unconsolidated sand, silt, clay, gravel and lithic fragments. The alluvium may extend to a distance up to 750 m from water courses, however, the lateral extent may be highly variable. The river alluvium is likely to have a relatively high permeability and relatively high specific groundwater yield. The particle size of the river alluvium ranges from fine sand to gravel.

Permian Rangel Coal Measures

In the Expansion Area, the Permian-age sedimentary rocks dip to the east (2-6 degrees) and include inter-bedded sandstone, siltstone and lesser amounts of carbonaceous mudstones, coal and tuff.

The Rangel Coal Measures typically have a relatively low permeability and poor water-holding properties (i.e. a relatively low specific yield). A weathered zone extends to 15-30 m below ground level (mBGL). The weathered zone is also considered to have poor water-holding properties.

The Permian Coal Measures contain groundwater within two coal seams: the Leichhardt Seam (LHD) and the underlying VER. The seams dip to the north-east across the site. Typically, the VER is stratigraphically located approximately 25 m below the LHD. In the north of the Expansion Area the LHD and VER seams 'coalesce' into a single, thicker seam (5-6 m thick). The coal seams are shallowest (approximately 150 to 175 m AHD) on the western side of Expansion Area and deepest (approximately 45 to 95 m AHD) at the north-eastern side of the Expansion Area. The Fort Cooper Coal Measures are located immediately beneath the first ply of the VER coal seam.

Sedimentary rocks of the Rangel Coal Measures typically have a low average hydraulic conductivity because of inter-bedding with fine-grained siltstones and mudstones which have very low hydraulic

conductivity. Higher hydraulic conductivity sedimentary rock may be encountered within the faulted and fractured zones.

Fault Zones

Faulting is extensive throughout the Expansion Area and is most clearly denoted by changes in coal seam thicknesses and elevations. The regional Isaac Thrust Fault system is a major thrust fault that trends along the Isaac River to the northeast of the proposed pit area near Conrock Gully. Numerous north-north-west trending thrust faults and orthogonal transverse faults occur throughout the Expansion Area. Thrust faults located in the middle to northern section of the Expansion Area have caused throws of up to 25 m. Deeper weathering profiles may be associated with faulted zones within the Permian coal measures. Groundwater yields from the coal measures may also be affected by faulting.

Groundwater Occurrence

Groundwater occurs within the Quaternary alluvium, primarily within prior channels of the Isaac River, and within the Permian coal seams, which are expected to act as the primary conduit of groundwater within the Rangal Coal Measures.

Alluvium

An area towards the north of the Expansion Area contains the thickest section of alluvial sediment. The thickness of alluvium in this area generally ranges between 12 to 20 m. The base of the alluvium in this area generally ranges between 185 to 190 m AHD (although there may be deeper paleo-channels that are not indicated by the available drilling data).

There are limited groundwater level data for the alluvium unit of the Expansion Area. However, existing monitoring bores indicate an average groundwater level, within the alluvial aquifer, of approximately 188 m AHD. In this case, the saturated thickness tends to be very shallow averaging 3 m. It is considered that areas of deeper paleo-channel alluvial sediment may contain a more significant saturated thickness.

Owing to the heterogeneous nature of the alluvial aquifers, groundwater level fluctuations will not be uniform or systematic across the aquifer.

Rangal Coal Measures

Based on exploration drilling results, the Rangal Coal Measures located in the Expansion Area contains little or no groundwater similar to that of nearby mines (the existing Isaac Plains Coal Mine (north) and Poirrel Coal Mine (east)). Groundwater is absent in most exploration holes located within the Permian coal measures south of Conrock Gully. Where groundwater was encountered, yields were low. Hence, it is unlikely that coal units within the area south of Conrock Gully will yield significant groundwater during pit excavation.

Drill holes located north of Conrock Gully were also found to be generally dry. An exception to these findings occurred in association with the Isaac Thrust Fault within the coal measures to the north-east of the proposed pit area.

The hydraulic conductivity of the coal seams is generally lower than the overlying units. Lateral drainage through the alluvium will occur in preference to vertical drainage to the coal seam. The coal measures are fully saturated (i.e. in a confined state). During mining this confined groundwater is expected to drain into the pits as seepage.

The Expansion Area will become an open pit mine excavated using dragline and truck-and-shovel to remove the LHD. This will result in the removal of the overlying strata and the localised dewatering of aquifers as mining progresses. The depth of the pit will therefore extend to approximately 80 m below ground. Groundwater inflow to the pit void will be collected in sumps constructed on the floor of the pit. The disturbed fill is 'uncompacted' and fractured, resulting in changes in hydraulic conductivity, specific yield and bulk volume.

Potential impacts on groundwater by open cut mining include changes to:

1. water-table levels/potentiometric surface levels;
2. groundwater flow patterns; and
3. bore water-levels and yields.

Groundwater bores within the footprint of the pit will no longer exist.

Additionally, mining activities may also inadvertently change the chemistry of groundwater via induced groundwater mixing and/or surface water mixing. To help estimate mine-induced groundwater flow and drawdown patterns, a numerical model was developed. Impacts on groundwater quality were interpreted qualitatively.

During mining operations, water quality within aquifers surrounding the Expansion Area is expected to remain the same as pre-mining water quality for these aquifers. No change in water quality during mining operations (as compared to pre-mining) is expected for the following reasons:

- during mining operations, groundwater will be continually extracted from the pit to ensure a safe working environment within the pit. Extraction of groundwater from the pit will create a depression in the potentiometric surface at this location, and groundwater surrounding the mine pit will travel towards this depression. The net movement of groundwater towards the pit during mine operation will prevent the movement of potentially poorer quality water (that may have been impacted by mining) from moving away from the mine operation area and into the surrounding aquifers; and
- aquifers outside of the mine pit area will continue to receive recharge via the same processes that occurred pre-mining.

Groundwater quality data also suggests that groundwater in the alluvial aquifer and the Rangal Coal Measures are of similar quality with respect to pH, TDS, major ions and metals. Hence any inadvertent mixing of groundwater (during mining) is unlikely to result in a deterioration of water quality in either aquifer.

During mine operations, water quality within aquifers surrounding the mine pit will continue to be suitable for the same purposes applicable during the pre-mining period.

Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) completed an assessment of the final void water balance in the post-mining phase. The final void will be approximately 2,750 m long and will have the flowing general geometry:

- The width of the pit base – 55 m;
- The height to the top of the high wall – 80 m;
- The slope of the high wall batter - 70° and
- The slope of the low wall batter - 36°

The final void will be located above the predicted level of the Probable Maximum Flood (PMF) and will therefore not potentially be filled by flood water from the Isaac River.

Post mining, dewatering of accumulated water from groundwater inflow, rainfall and seepage from the overburden emplacement will cease and the final void will gradually fill with water until an equilibrium condition establishes. The potential sources of water that may contribute to filling the final void are:

- seepage from the overburden emplacement west of the final void;
- groundwater discharge from the Rangal coal measures;
- direct rainfall; and
- surface water runoff from the final void slopes.

It was assessed, based on the above, that the final void will always be a sink to groundwater flow and should never over top or discharge water from the pit to the regional aquifer. That is, the stabilised pit water level will remain below surrounding Rangal coal seam aquifer levels (RL188m) and the higher pit crest level (RL210m).

The main features of the final landform after mining ceases will consist of waste rock dumps to the west, and a final void in the east, south of the 202 mAHD contour. The final void will be approximately 3,700 m long, approximately 70 m wide (at the base) and have an approximate depth of 80 m.

The final void will collect and accumulate water from groundwater ingress, direct rainfall into the void and from overland surface flows from the slopes of the waste dumps draining into the void. All undisturbed catchment flows will be diverted around the void.

The different hydrogeological parameters of the backfill material combined with the high rate of evaporation within the final void will create a different final equilibrium potentiometric surface than was present prior to mining. This will result in residual drawdown immediately surrounding the mined area when the potentiometric surface reaches an equilibrium level.

Although water quality in the final void is expected to deteriorate over time post mining, this reduction in water quality is not expected to impact the surrounding aquifers. Water present within the final void (post-mining) will not flow out of the final void and into the regional aquifer for the following reasons:

- high evaporation rates over the final void will result in the final void water level being lower than the potentiometric levels within the surrounding aquifers. Evaporation over the surface of the final void water body causes a permanent sink in the regional potentiometric surface within the vicinity of the final void;
- groundwater will flow under pressure towards the final void along a hydraulic gradient, from areas of high pressure head to areas of low pressure head (i.e. the final void). Accordingly, the permanent depression of the potentiometric surface within the vicinity of the void acts like a sink and will not permit water within the final void to flow outwards into the regional system; and
- the local and regional aquifers will be replenished by rainfall on groundwater recharge zones, and are not expected to change in quality from pre-mining levels.

The long term final void water level is predicted to be 114 (± 9) m AHD or approximately 20 (± 9) m deep at its deepest location. TDS modelling predicts that after mine closure the final void water TDS concentration will increase steadily taking approximately 6 years to exceed the ANZECC (2000) stockwater guideline TDS of 2,500 mg/L. Extrapolating further into the future, the model predicts that, in approximately 110 years, the void water TDS concentration will approach that of seawater (35,000 mg/L).

The mining activities are not expected to have a detrimental impact to the groundwater quality in the vicinity of the Expansion Area. Hence, the post mining groundwater quality within both the alluvium and the Rangal Coal Measures surrounding the mining area are expected to remain the same as pre-mining groundwater quality.

Air Quality

Air quality impacts, from coal mining and related activities such as coal transportation and processing, have the potential to be a nuisance to nearby residents in the absence of an adequate buffer distance or intervening barriers, or if there are inadequate source controls. At sufficiently high levels, dust can be intrusive and adversely affect amenity.

As potential impacts from air quality have the potential to combine with other outside emissions (i.e. cumulative impacts), an assessment of the potential for the IIPP to impact on air quality was undertaken in the context of the Queensland *Environmental Protection (Air) Policy 1997*.

The environmental values to be enhanced or protected within the IIPP area are the qualities of the air environment that are conducive to:

- the wellbeing of the community or a part of the community, including its social and economic amenity; or
- the wellbeing of an individual without unreasonable interference from intrusive dust.

The nearest town, Moranbah, is located approximately 10 to 12 km from the Expansion Area and approximately 7 km from the existing Isaac Plains Coal Mine. The nearby homesteads are deemed to be the nearest sensitive receptors.

The nearest residence to the Expansion Area is the [redacted] homestead, south of the southern most extent of the proposed area of disturbance within the Expansion Area. Three other homesteads, [redacted] of the Expansion Area

sch4p3(3) Prejudice the protection of an individuals right to privacy

Although not required by the EA for the existing Isaac Plains Coal Mine, (in collaboration with the Broadlea and Carborough Downs Mines) IPCM has undertaken dust deposition monitoring since late 2005 at 22 locations within the site and in the wider surrounding community. All the potential

background sources of dust, including the surrounding mines, in combination with any emissions from mining activities conducted by IPCM were monitored. The results of this dust monitoring indicate that occasional minor exceedances have occurred at two residences since the commencement of monitoring in October 2005, none of which have been the subject of complaints. Monitoring sites which exhibited exceedances are scattered throughout the monitoring area, with two in close proximity to the IPCM mining activities. Averaged results over the period since monitoring commenced were all well below the monthly limit set in the EA. No dust complaints have been received about the existing Isaac Plains Coal Mine since construction and operations began at the site in the third quarter of 2006.

Sources of dust emissions from the IIPP are distributed over a range of 18 km, from the pit in the Expansion Area in the south, to the CHPP in the existing Isaac Plains Coal Mine to the north, connected by the access/haul road. Dust is produced by different activities during construction and mining operations generating dust in varying concentrations. The likely levels of dust emissions at the nearest sensitive receptors have been predicted through modelling. In most cases, the change in the dust levels with the addition of the Expansion Area and associated infrastructure for the IIPP is determined to be comparatively minor.

It is noted that locations S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S24, S25, S26, S27, S28, S29, S30, S31, S32, S33, S34, S35, S36, S37, S38, S39, S40, S41, S42, S43, S44, S45, S46, S47, S48, S49, S50, S51, S52, S53, S54, S55, S56, S57, S58, S59, S60, S61, S62, S63, S64, S65, S66, S67, S68, S69, S70, S71, S72, S73, S74, S75, S76, S77, S78, S79, S80, S81, S82, S83, S84, S85, S86, S87, S88, S89, S90, S91, S92, S93, S94, S95, S96, S97, S98, S99, S100, S101, S102, S103, S104, S105, S106, S107, S108, S109, S110, S111, S112, S113, S114, S115, S116, S117, S118, S119, S120, S121, S122, S123, S124, S125, S126, S127, S128, S129, S130, S131, S132, S133, S134, S135, S136, S137, S138, S139, S140, S141, S142, S143, S144, S145, S146, S147, S148, S149, S150, S151, S152, S153, S154, S155, S156, S157, S158, S159, S160, S161, S162, S163, S164, S165, S166, S167, S168, S169, S170, S171, S172, S173, S174, S175, S176, S177, S178, S179, S180, 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S2011, S2012, S2013, S2014, S2015, S2016, S2017, S2018, S2019, S2020, S2021, S2022, S2023, S2024, S2025, S2026, S2027, S2028, S2029, S2030, S2031, S2032, S2033, S2034, S2035, S2036, S2037, S2038, S2039, S2040, S2041, S2042, S2043, S2044, S2045, S2046, S2047, S2048, S2049, S2050, S2051, S2052, S2053, S2054, S2055, S2056, S2057, S2058, S2059, S2060, S2061, S2062, S2063, S2064, S2065, S2066, S2067, S2068, S2069, S2070, S2071, S2072, S2073, S2074, S2075, S2076, S2077, S2078, S2079, S2080, S2081, S2082, S2083, S2084, S2085, S2086, S2087, S2088, S2089, S2090, S2091, S2092, S2093, S2094, S2095, S2096, S2097, S2098, S2099, S2100, S2101, S2102, S2103, S2104, S2105, S2106, S2107, S2108, S2109, S2110, S2111, S2112, S2113, S2114, S2115, S2116, S2117, S2118, S2119, S2120, S2121, S2122, S2123, S2124, S2125, S2126, S2127, S2128, S2129, S2130, S2131, S2132, S2133, S2134, S2135, S2136, S2137, S2138, S2139, S2140, S2141, S2142, S2143, S2144, S2145, S2146, S2147, S2148, S2149, S2150, S2151, S2152, S2153, 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IPCM will assess the need for, and the options arising from, the QR investigations in order to minimise coal dust emissions during rail transportation. The increase in product coal being railed from the site to DBCT results in an increase from three trains per week to six trains per week. This is an increase in the contribution of coal dust emissions on the Goonyella System from approximately 2.2% to 4.6% per annum (based on total coal throughput at Hay Point Terminal (HPT) of 86.3 Mt in 2006-07). There is no change to the total tonnage hauled on the Goonyella line since tonnage is limited by the terminal throughput, which is already at capacity. Since coal dust emissions are related to tonnage hauled then there is unlikely to be any significant change to dust emissions from the Goonyella system.

In order to reduce the potential air quality impacts from the IIPP, IPCM will employ the following measures:

- dump truck routes are to be kept as short as is practicable;
- drop heights of coal and overburden from mining machinery will be kept to a minimum;
- tall vegetation around the IIPP area will be established to encourage dust fallout;
- spoil will not be permitted to dry out prior to removal, i.e. spoil will be removed and dumped as soon as practicable after blasting;
- speed limits will be enforced on access/haul roads;
- the access/haul road between Peak Downs Highway underpass and CHPP and for a 2 km section north-north-west of the ROM stockpile will be watered regularly;
- all other impacted areas will be watered on an as needs basis; and
- areas of disturbance will be progressively rehabilitated.

The IPCM will continue to demonstrate a pro-active commitment to minimising impacts on local air quality as a consequence of its activities and will undertake routine monitoring of dust at the nearest potentially affected residences to verify compliance with the relevant guidelines. IPCM also intend to implement a shut down procedure in the event of significant and sustained adverse meteorological conditions. These shutdown limits will be based on the limits described in the EIS and the appropriate meteorological conditions and will be established following an analysis of the emissions and propagation characteristics of the operational mine.

Greenhouse Emissions

Principal direct and indirect sources of greenhouse gas emissions from the IIPP open cut coal mine include electricity consumption and consumption of diesel, methane emissions from ROM coal, and the blasting of overburden. IPCM is committed to reducing greenhouse emissions by optimising energy efficiency in the areas of coal extraction and transportation where technically and commercially feasible. At full production, IPCM will annually export approximately 3.3 Mtpa of product coal for steel production and electricity generation. To produce 4 Mtpa and combust 3.3 Mtpa annually:

- using the 2011 emission data, the IIPP will emit 0.138 Mt CO₂-e on site annually, mainly from the use of diesel and electricity, to produce the coal; and
- coal from the IIPP will emit 9.732 Mt of CO₂-e off-shore annually when used in the steel industry and for the generation of electricity.

Therefore, the IIPP production and the ultimate overseas use and combustion of the coal will contribute 9.870 Mt CO₂-e annually towards global greenhouse gas emissions in 2011, until closure in 2024.

The total global CO₂ emissions from the burning of fossil fuels in 2005 were 27,055 Mt²CO₂-e.

Noise and Vibration

Noise from coal mining, and related activities such as coal transportation and processing, has the potential to disturb nearby residents in the absence of an adequate buffer distance or intervening barriers, or if there are inadequate source controls. At sufficiently loud levels, noise can be intrusive and adversely affect amenity.

² International Energy Agency Key World Energy Statistics 2007 Page 44. (This figure adjusted to exclude emissions from industrial waste and non-renewable municipal waste)
http://www.iea.org/Textbase/nppdf/free/2007/Key_Stats_2007.pdf

The environmental values to be enhanced or protected under the *Environmental Protection (Noise) Policy 1997* are the qualities of the acoustic environment that are conducive to:

- the wellbeing of the community or a part of the community, including its social and economic amenity; or
- the wellbeing of an individual, including the individual's opportunity to have sleep, relaxation and conversation without unreasonable interference from intrusive noise.

The same sensitive receptors, as those identified for air, apply to noise, i.e. the nearest residences.

The principal current sources of noise emissions include:

- traffic on the various local roads;
- general farming traffic (tractors, trucks, light vehicles);
- cattle; and
- activities at the surrounding mines including rail movements and rail siding facilities.

The major operational noise and vibration sources at the IIPP will result from:

- dragline or truck and shovel operation in the pit;
- rockdrilling and blasting;
- coal haulage trucks between the Expansion Area ROM stockpile and CHPP, comprising B-doubles with prime mover and trailer configurations that would satisfy the ADR28 certification;
- dump trucks, loaders dozers etc; and
- various surface earth working machines.

There is also a railway line to Peak Downs 10 km to the east and south of the site and the Peak Downs Highway is 5 km north of the Expansion Area.

The CHPP and rail load-out facility are the same as those already approved for the existing Isaac Plains mining operations. However, the plant and equipment will be operated for longer durations to handle the IIPP mine throughput. These sources have not been modelled as the assessment for the existing Isaac Plains Coal Mine assumed that the CHPP and rail loader operates continuously, that is, operations in excess of the proposed case have already been assessed and approved.

The existing environment, with respect to noise and vibration, has been monitored over a number of years (since 2004). Analysis suggests that traffic noise is still the major source of noise that is experienced by residences within several hundred metres of the Peak Downs Highway, despite the significant development of mines within the area. It is anticipated that construction and operational mine noise from the large number of mines in the area may be heard at some residences during the quieter periods of the evening and night.

The calculated noise levels from activities within the pit and coal haulage complies with the noise level criteria during the day at all noise sensitive locations and for either shovel or dragline operations.

The calculated noise levels from pit operations complies with the day, evening and night noise level criteria at noise sensitive locations S2, S3 and S4 for either shovel or dragline operations. However, as the operations progress to the southern half of the Expansion Area pit, the noise levels during the evening and night exceed the noise level criteria. To provide attenuation operational control will be required to allow haul truck operations on the surface or on top of the out-of-pit spoil during the evening and night when mining progresses south in the Expansion Area. This would enable the noise level criteria to be met for all noise sensitive receptors for all time periods, including both shovel and or dragline operations.

IPCM also intend to implement a shut down procedure in the event of significant and sustained adverse meteorological conditions. These shutdown limits will be based on the limits described in this report and the appropriate meteorological conditions will be established following an analysis of the emissions and propagation characteristics of the operational mine.

The haulage operations will potentially exceed the night criteria under some conditions. Since there are likely to be of the order of 40 trips per weekday, these operations will mostly be limited to daytime only and during the period Monday to Friday. In the unlikely event that night operations occur, the

exceedence of the night noise level criterion only occurs at S2. S2 is located adjacent to Peak Downs Highway and is currently subjected to much higher noise levels from existing road traffic. Since the haul trucks are road trucks operating on a private road the noise is lower in noise level and virtually indistinguishable from road traffic on Peak Downs Highway.

The impact noise from the dragline sheaves has not been specifically included in the noise model. It is recommended that this be addressed prior to commencement in southern pit. Furthermore while there is still some possibility of impact noise, the dragline operator will be trained to ensure it is operated to avoid impact noise while still maintaining suitable productivity rates.

Other acoustic control measures which may be incorporated into the IIPP include:

- low noise specifications for all plant, equipment and vehicles;
- design work areas to reduce noise generation and minimise the periods of time that mobile plant must reverse;
- designing pit and spoil areas to avoid operating dump trucks in open areas or elevated areas at night;
- limiting operational characteristics of vehicles (i.e. limit operation of air brakes except in cases of emergency);
- temporary local noise barriers (earth berms etc) to reduce noise at noise sensitive receptors;
- using squawker (white noise) reversing alarms or reversing strobe lights;
- developing a program of activities (e.g. hours of work at particular locations); and
- fitting high-performance mufflers and similar measures to vehicles, plant and equipment.

The proposal as described (including abatement measures) complies with:

- the low frequency noise limits;
- blasting noise and vibration limits;
- day and evening noise level goals;
- sleep disturbance limits; and
- railway noise limits.

Nature Conservation

Detailed ecological investigations were undertaken for the IIPP using desktop assessments, literature reviews, aerial photography and interpretation, and field assessments.

Terrestrial Ecology

The IIPP area is located within cattle grazing properties and consequently, the majority of the areas within the IIPP to be disturbed are highly modified, i.e. cleared grazing land, parts of which may have been sown to improve pasture, providing limited habitat opportunities for native woodland fauna. These cleared areas generally provide habitat for some native grassland species but do not (or are unlikely to) exhibit the characteristics required for them to qualify as native grassland communities, given the dominance of the introduced pasture species and the low diversity of other grasses and herbs. Much of the area that has been cleared to accommodate pasture production in the vicinity of the pit areas previously supported stands of Brigalow (*Acacia harpophylla*) and Eucalypt woodland.

Remnant vegetation is restricted largely to relatively robust tracts of riparian and frontage woodland along the Isaac River and Cherwell Creek, a narrow band of riparian vegetation along Conrock Gully, and a riparian corridor along Smoky Creek. There is limited riparian vegetation along Billy's Gully. These remnant areas are in poor-moderate ecological condition. Some dieback of River Red Gum (*Eucalyptus camaldulensis*) and Carabeen (*Corymbia tessellaris*) is evident along Smoky Creek. Remnant vegetation throughout the IIPP site is in poor-moderate ecological condition with the impacts of grazing evident, i.e. in reduced groundcover and shrub diversity, replacement of the native groundcover flora with Buffel grass (*Cenchrus spp.*) in most areas, and replacement of native ground cover along the Isaac River, with Guinea grass.

Canopy dieback is widespread throughout the Expansion Area, including the access/haul road alignment. It is especially prolific within the woodland in the southern part of the Expansion Area, i.e. along Conrock Gully and adjacent to Cherwell Creek, and has had a profound effect on the vegetation in some areas where major, and in some cases total, canopy dieback has recently occurred.

Given the limited extent and poor condition of remnant habitats in those components of the Expansion Area to be disturbed, and the areas to be disturbed along Smoky Creek, both of which are highly degraded, it is not anticipated that these areas currently represent any critical habitat.

Five threatened flora species were identified as potentially occurring within the Expansion Area, although all, with the exception of one, *Desmodium macrocarpum* (Fabaceae), are considered unlikely to be found. *Desmodium macrocarpum*, is known to occur in the poplar box woodland with a shrubby groundcover, however, given the poor condition of vegetation throughout the IIPP site it is not expected that this species occurs in the area of proposed disturbance.

Two rare or threatened fauna species, the Squatter Pigeon and the Little Pied Bat, were detected during field assessments. The Grey Goshawk, Red Goshawk and Square-tailed Kite are rare species that are expected to utilise the IIPP site as part of a wider habitat area, but are not expected to use it for nesting. The Squatter Pigeon was observed in riparian woodland adjacent to the Isaac River and is also likely to utilise riparian and non-riparian grassy woodland habitats throughout the Expansion Area. It was also observed foraging along Billy's Gully and is expected to utilise the small alluvial pockets along Smoky Creek. The Little Pied Bat was detected along Conrock Gully, Smoky Creek and Billy's Gully during Anabat surveys conducted as part of the riparian fauna surveys in these areas. Given the vegetation present, this species is likely to also be present in the general vicinity of the Isaac River.

Mining activities and infrastructure will largely avoid the remnant vegetation along the Isaac River. The majority of the pit and spoil dump areas in the Expansion Area will be located within the highly-modified grazing land, however, approximately 67.7 ha of remnant vegetation will be affected by the IIPP. Approximately 24.9 ha of the endangered Brigalow (both dominant and subdominant), which is protected under State and Commonwealth legislation, is also likely to be affected. The area of Brigalow to be cleared represents a small proportion (i.e. 0.005%) of the area of Brigalow available in the bio-region.

As these areas cannot be avoided and will require clearing, consequently, no mitigation measures are possible except for the provision of compensatory habitat. Apart from Brigalow, no other Endangered Ecological Communities protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were found to exist in the area. A 24.9 ha area (equivalent to the area of Brigalow to be disturbed) not required for mining, will be allowed for the natural regeneration of Brigalow. Dependant on the location of this area consent may be required from the landowner prior to implementation of this strategy.

The existing Isaac Plains Coal Mine on ML70342, as originally planned, was referred and assessed under the EPBC Act (referral submitted on 5 April 2005) by the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA)³. It was decided on the 6 May 2005, by the delegate of the then Federal Minister for the Environment and Heritage, that the existing Isaac Plains Coal Mine would not to be a controlled action. In addition, an EPBC Act referral for the IIPP was submitted for assessment by the DEWHA on 8 September 2006. On the 6 October 2006 it was determined that the IIPP would not to be a controlled action.

Weeds/Feral Animals

Environmental weeds, including introduced pasture species, are abundant in the remnant vegetation areas and have displaced natural groundcover species within the study area. Buffel grass is particularly widespread, being the main pasture species established in the area. Throughout the entire IIPP site, ground habitat values have been diminished by the virtual monoculture of Buffel grass and the consequent lack of floristic and structural diversity.

There is the potential for weeds/pest plant species to be spread both throughout the IIPP site and off site to neighbouring properties or regions through vehicle movements associated with mining activities. During the construction and operation of the IIPP, all vehicles will undergo a thorough wash-down, prior to entering and leaving the IIPP.

Five introduced animal species were recorded during the surveys, all of which are commonly encountered throughout the Central Highlands area and a number of which are listed as Class 2

³ The DEWHA was previously known as the Department of the Environment and Heritage (DEH) Water.

pests. Both the Nebo Shire Council and Belyando Shire Council's Pest Management Plans address Class 2 pests. The Plans provide a legal and administrative framework for the enforcement and removal of declared animals from private property. As for weed control, Council, in consultation with IPCM and landholders, will develop a property pest management plans for the MLs.

Aquatic Ecology

A one-off aquatic survey in April/May 2007 was conducted of waterways within the IIPP area where pooled water was present. Aquatic flora (macrophytes only) and aquatic fauna (macroinvertebrates, freshwater fish, platypus and turtles) were chosen as biodiversity indicators. The waterways within the IIPP are all ephemeral and receive flows for relatively brief periods of time during and shortly after rain.

The defining features of these temporary drainages are the aridity of the environment, alternating with high energy flow in storm events. The aridity also makes them prone to degradation. Based on the one-off survey conducted, and on information from literature searches from State, National and International conservation databases, there would appear to be no threatened or endangered aquatic macrophytes or aquatic fauna (macroinvertebrates, fish, turtles, platypus) existing within the waterways of the IIPP area and adjoining waterways outside of the IIPP area.

As the majority of macroinvertebrates colonise water through mobile adult oviposition, the proposed diversions are not likely to impact greatly on these communities in the long-term. Short to medium term impacts to aquatic fauna will result from the removal of potential food sources and habitat provided by the riparian zone. In waterways where aquatic plants are absent, an important food and habitat source comes from the riparian zone through inputs such as leaf and twig litter, and terrestrial organisms such as insects. Exposed tree roots, often present on the inside of bends where water tends to pool after scouring flows occur, can also provide important shelter. The riparian zone along Conrock Gully is in very poor condition.

Indirect impacts on aquatic communities have the potential to occur during the diversion works, for example if downstream water quality and habitat diversity is reduced through an increase in sediment or salinity resulting from earthworks. Appropriate erosion and sediment control will be incorporated into the design and construction of the diversions.

Aside from the proposed stream diversions, releases from the mine are designed to only occur when there is sufficient flow in the Isaac River and that the quantity of discharges may only be 1/10th (10%) of the streamflow. A discharge regime of this nature is likely to have minimal impact on aquatic communities. Furthermore, aquatic communities will be protected during operation by ensuring the proper management of areas used to store fuel, oil and other hazardous substances. With appropriate controls in place there is a low likelihood of spills occurring from these areas.

The diversions will be mostly undertaken during the dry season to minimise the potential impacts to aquatic communities. During the dry season, the majority of species encountered will either relocate to permanent water elsewhere or aestivate within the dry stream channel. Potential impacts from sedimentation will be minimised if high rainfall does not coincide with the proposed works and containment measures are implemented.

NATIVE TITLE and CULTURAL HERITAGE

A search of the National Native Title Tribunal register indicates that there are two registered native title claims on the IIPP area:

- Barada Barna Kabalbara and Yetimarla People (BBKY) # 3 (Federal Court No. Q6011/01; NNTT No. QC01/13 – registered from 20 April 2001); and
- BBKY # 4 (Federal Court No. Q6023/01; NNTT No. QC01/25 – registered from 5 April 2002).

A native title claim has the effect of triggering a right to negotiate under the *Native Title Act 1993*. If native title is found to have been extinguished then such rights are also extinguished. If native title does exist, the nature and extent of the associated rights will vary with the circumstances of the claim, but may create a compensable interest in favour of the native title holders.

Historical searches show that the quarry area was formally a Grazing Homestead Freeholding Lease (GHFL) under the *Land Act 1962*. The grant of GHFL over the land, that now comprises the quarry area, extinguished native title. Therefore, with the exception of Lot 9 GV33, native title has been extinguished by the prior grant of interests inconsistent with native title.

It is intended to implement a Cultural Heritage Management Plan (CHMP) for the IIPP, developed in consultation with relevant Traditional Owner groups, to take all reasonable and practicable measures to avoid or minimise risk the potential for impact to indigenous cultural heritage. IPCM has previously developed an informal CHMP with the BBKY for the existing Isaac Plains Coal Mine which will be used as a basis for the IIPP and to meet the formal requirements of the *Aboriginal Cultural Heritage Act 2003*.

VISUAL AMENITY

An assessment of the Expansion Area identified that the proposed mine infrastructure is unlikely to be seen from homestead vantage points (3) Prejudice the protection of an individuals right to privacy from the nature and topography of the intervening vegetation. The proposed access/haul road will be seen from the homestead and the proposed out-of-pit spoil dumps and associated lighting may be visible from the homestead. The access/haul road will be visible from the Peak Downs Highway and will look similar in appearance to the existing Carborough Downs Mine underpass.

No visual impact from the proposed Expansion Area infrastructure is expected on users of the Federation Walk and the Grosvenor Park picnic spot, near the township of Moranbah.

WASTE MANAGEMENT

General and Regulated Waste

Quantities of waste from the existing Isaac Plains Coal Mine and estimates of waste produced by the IIPP were assessed cumulatively and it is concluded that the waste can be adequately managed to avoid potential adverse impacts. All regulated and general waste will be removed by a licensed contractor.

The EM Plan for the IIPP incorporates procedures for identifying regulated wastes and managing the wastes produced on site.

Spoil

The findings of the geochemical assessment indicates that the pH of the spoil samples ranged from 6.2 to 9.7 pH units indicating that the spoil materials are likely to be quasi-neutral to moderately alkaline. Spoil materials in the Expansion Area are expected to be predominantly non-acid forming (NAF) with a low sulphide (pyrite) content. Some of the carbonaceous materials occurring immediately above and below the Leichhardt Coal Seam may be potentially acid forming (PAF) due to an increased sulphide (pyrite) content.

Although these materials are likely to only have a low capacity to generate acid, they will need to be managed correctly in order to minimise the risk of creating acidic conditions or ARD.

A significant proportion of the spoil is likely to be moderately sodic and dispersive and if these materials are left exposed for long periods of time, problems with stability, erosion and revegetation may arise. Therefore it is important that they be progressively rehabilitated, as will be the case.

The spoil is likely to contain relatively high concentrations of Arsenic (As), Antimony (Sb) and Selenium (Se), and of these, Se is likely to be relatively soluble. Cobalt (Co) and Molybdenum (Mo) are also relatively soluble, however, these elements were not found to occur in high concentrations in the spoil.

The out-of-pit spoil dumps, containing spoil from the initial box-cuts, are not expected to present an ARD or salinity risk provided the identified low risk PAF material from immediately above and below the Leichhardt Coal Seam is isolated. Post mining, this material will be buried deep within the in-pit spoil dumps to reduce the risk of unacceptable levels of As and Se release and to ensure that there is decreased risk of the material dispersing (due to its moderate sodicity). In addition, for rehabilitation purposes the dumps will:

- not be placed within or on any natural watercourses; and
- require a soil cover designed to adequately protect the spoil from potential wind and surface water erosion, and for long-term vegetation support.

In-pit spoil dumps are not expected to present an ARD or salinity risk provided the identified low risk PAF material from immediately above and below the Leichhardt Coal Seam is buried deep within the dumps. To reduce the risk of unacceptable As and Se release to the environment, and to ensure that the dispersiveness of the material does not increase to an unacceptable level:

- dust suppression (watering) may be required during dump construction, and
- the final landform will incorporate soil covers and drainage works to ensure long-term stability of the soil cover.

Rejects

Using the system employed currently at the existing Isaac Plains Coal Mine, coarse and fine coal rejects from the Expansion Area will be recombined and disposed of in-pit at a moisture content of approximately 30% along with the coal rejects and overburden from the existing Isaac Plains Coal Mine operations. The fine coal management system will be used as an alternative method to the belt filter press, if the current system fails or if it is planned to recover good quality fine coal from the rejects flow. Drying associated with the fine coal management system will further reduce the moisture content of these fine rejects approximately 20% prior to disposal as in-pit overburden.

The results from the assessment of samples indicate that some of the coarse and fine rejects from the Expansion Area operations are likely to be PAF. Some of the materials may also be significantly acid consuming.

Due to the expected large variation in the acid forming characteristics of these materials, and the expected occurrence of PAF rejects from the existing Isaac Plains Coal Mine operations, further geochemical testing on coarse and fine reject materials will be undertaken to further evaluate the acid forming characteristics of the material and to evaluate appropriate management strategies. Testing of rejects for PAF will be conducted every six months.

Geotechnical testing found that the coal rejects (coarse and fine) are expected to contain high concentrations of Se compared to the average crustal abundance. The contained Se content is expected to be relatively soluble and therefore not an issue.

If PAF materials occur in the blended coarse and fine reject materials and these materials are not managed correctly, acid generation may occur resulting in low pH conditions. If low pH conditions are allowed to occur in these materials, metal solubilities will increase resulting in unacceptable releases of at least As, Co, Fe and Se in surface water runoff and ultimately into the release dam. Water quality monitoring will be conducted, as detailed in the EM Plan.

TRANSPORT

A pavement impact assessment from traffic generated from the IIPP on the Peak Downs Highway, a state controlled road, was undertaken for the EIS. The assessment indicates that the IIPP is not expected to significantly increase equivalent standard axles (ESAs) on the Peak Downs Highway during full operation. This result is not unexpected, given that coal from the Expansion Area will be transported by truck to the existing rail-head on the northern side of the Peak Downs Highway via the proposed underpass, i.e. the Peak Downs Highway will not be used for the transport of coal.

However, a 6.2% increase in ESAs is forecast for the section of the Peak Downs Highway, east of the subject site, approximately halfway during the construction period of the IIPP. IPCM will contribute a monetary sum to the upkeep of the eastern section of the Peak Downs Highway for this period. However, no ongoing annual contributions would be required.

To mitigate against impacts on road traffic and driver fatigue, buses will continue to be provided for transporting some workers between the Coppabella Camp and the mine. NB: The additional workforce will be housed in camp accommodation to alleviate further pressure on the housing shortages in Nebo and Belyando Shires.

SOCIAL AND ECONOMIC ENVIRONMENT

A socio-economic assessment undertaken, for the IIPP, concluded that the IIPP will provide a significant monetary injection into the local, Regional and State economies through employment and capital works expenditure. The construction phase will see the employment of to approximately 70 contractors for a period of approximately nine to 12 months, while the number of staff required to operate the IIPP will increase by 40 persons from the current workforce of 70 persons.

Assembly of the dragline will also require a peak workforce of up to 70 persons during the 12 month construction phase.

The cumulative impacts to Nebo and Belyando shires have been addressed in direct and indirect terms. The direct impact on incomes is identified, as is the favourable relationship with housing affordability. The indirect impacts include increased State Government investment in infrastructure and improved access to vocational training.

The works required for the IIPP will require significant additional capital and operational expenditure. The additional economic impacts can be conservatively estimated as:

- employment of 40 additional full time equivalent employees during the operational phase, approximately 80% of whom will be sourced from the Mackay region and 5% locally;
- capital expenditure of \$103.25 M of which approximately \$82.25 M will flow to Queensland businesses;
- estimated additional annual operating costs of \$135 M;
- annual operational expenditure of \$4.76 M (direct) and a further \$1.1 M (indirect) to be spent in the Nebo Shire;
- annual direct operating expenditure to be spent outside of the Nebo shire of \$92 M with estimated further indirect benefits of \$73.6 M;
- substantial annual payments to be made to the State Government in the form of Royalties \$12.6 M per year and rail freight will amount to approximately \$7.6 M; and
- port charges will amount to approximately \$7.7 M per year.

It is evident that the IIPP will add a significant monetary injection into the local, regional and State economies.

Any major development in a community by its very existence is accompanied by a degree of involuntary change and additional pressures to change. This impacts on and challenges prevailing community identities as there will be many competing influences which will challenge community cohesion. In the case of the IIPP it is unlikely that significant social and/or environmental impacts will occur on the amenity of residents closest to the Expansion Area or the existing Isaac Plains Coal Mine.

HEALTH, SAFETY, HAZARD AND RISK

The Safety and Health Management System employed at the existing Isaac Plains Coal Mine addresses on-site and off-site safety requirements. The existing Safety and Health Management System, which is aligned with Australian Standard (AS) 4801:2001, and meets the requirements of the coal mine safety legislation, *Coal Mining Safety and Health Act 1999*, will also apply to the IIPP.

COMMUNITY CONSULTATION

IPCM have undertaken, and will continue to undertake, a community consultation program in order to adequately address the various environmental, social and economic interests of the community within the Nebo and Belyando Shires. The program undertaken to date has involved IPCM personnel and its consultants working with stakeholders to identify and work towards the achievement of the best practicable environmental, social and economic outcomes for the local community.

During the preparation of the EIS community consultation was initially conducted via telephone interviews with interested persons, small meetings and one-on-one interviews. Directly affected landowners and Traditional Owners were met in person.

Consultation was undertaken for the draft ToR from 6 November to 15 December 2006. A total of 13 submissions were received on the draft ToR from stakeholders.

On the 24 October 2007 the Director of the Integrated Assessment Branch of the EPA, confirmed the decision by the chief executive to allow the EIS to proceed to the public notification stage of the EIS process. The EIS public comment period commenced Monday 12 November 2007 and was proposed to end on Tuesday 8 January 2008 (advertised in the public notices section of the Mackay Daily Mercury, Mid-Week and the Courier Mail on Saturday 10 November 2007). The comment period was informally extended, at the discretion of the EPA, to Tuesday 19 February 2008 to allow for further

collation of stakeholder comments. Consultation during the EIS public comment period comprised the following:

- open day workshops during the public comment period on the draft EIS, where the community were invited to meet with the EIS Consultant and IPCM personnel to ask any questions about the project. No community members or other stakeholders attended either open day;
- a presentation of the IIPP EIS findings to government agency stakeholders in Mackay on Friday 7 December 2007;
- a meeting with Belyando, Nebo and Mackay Councils on Tuesday 11 December 2007;
- a meeting with DNRW on 14 December 2007; and
- telephone discussions with various stakeholders regarding the content of the EIS throughout the public comment period.

A total of 16 formal submissions, providing comments on the EIS, were made. Stakeholder comments that are relevant have been addressed in this Final EIS.

One-to-one meetings will be conducted with individual stakeholders, as necessary, throughout the life of the project.

REHABILITATION AND DECOMMISSIONING

The potential impacts on land from the IIPP predominantly relate to the development of an additional pit and spoil dumps and the construction of two watercourse diversions, water infrastructure including levees and water storages, a heavy vehicle construction pad, an access/haul road and an underpass of the Peak Downs Highway.

The objectives of the post-mine land use are to ensure that the:

- post-mine rehabilitated areas are self sustaining and require no ongoing maintenance while protecting the physical and biological integrity of the surrounding environment after mining activities have ceased; and
- existing and potential beneficial uses of the area are preserved, where possible, after mining activities have ceased.

Based on the findings of the soil and land suitability assessment, the post-mine land use for areas disturbed by IIPP mining activities will be returned to a self-sustaining native vegetation using appropriate native tree, shrub and grass species based on site specific trials during progressive rehabilitation⁴. The rehabilitated mine areas will aim to be complementary to the nearby remnant vegetation to facilitate regional conservation. Other areas, not disturbed by the mine pit or out-of-pit spoil dumps, could be returned to the pre-mine land use of 'grazing' as long as the rehabilitated spoil areas are fenced off from cattle. Appropriate conditions of use on the affected areas will be negotiated with the landholder prior to end of mine life.

On completion of mining, the last strip that is mined in an open-cut mining operation is typically left as a final void. This is because there will be no further overburden to fill the void and it is not feasible to push spoil back into the void. With the exception of a portion of the Expansion Area pit as discussed below, final voids will not be backfilled. Consequently, final mining voids will form a significant feature of the post-mining land form.

~~Feedback received on the EIS raised concerns over the risk of levee failure and migration of an erosion channel into the Isaac River. Such feedback has necessitated further assessment to minimise this risk of catastrophic failure of the levee and to provide a long term self sustaining landform. Therefore, with~~

The final void will be approximately 2,750 m long and will have the following general geometry:

- The width of the pit base – 55 m;
- The height to the top of the high wall – 80 m;

⁴ The criteria for achieving a self-sustaining vegetation community is currently being developed with progressive rehabilitation having commenced at the existing Isaac Plains Coal Mine. The rehabilitation design proposed below will be used as a trial until monitoring results indicate positive outcomes.

- The slope of the high wall batter - 70°; and
- The slope of the low wall batter - 36°.

The final void will be located above the predicted level of the Probable Maximum Flood (PMF) and will therefore not potentially be filled by flood water from the Isaac River.

the northern end of the Expansion Area pit and a 1.2 km section of the final void adjacent to the Isaac River within the floodplain, will be backfilled. The final void that runs perpendicular to the Isaac River, at the easternmost side of the Expansion Area pit, will remain as an open void until closure. It will be backfilled up to the 202 m AHD contour during the decommissioning and closure phase. Backfilling up to the 202 m AHD contour has been chosen to provide flood immunity for the 1% AEP plus 1 m, which is estimated to provide immunity for the 0.5% to 0.1% AEP.

A mine closure plan will be developed well in advance of closure and decommissioning. This plan will document how disturbed areas will be rehabilitated to meet closure and relinquishment requirements. It will be developed in consultation with appropriate stakeholders and the EPA.

The infrastructure to be left on-site following mine closure will depend on landowner requests, e.g. roads, water storages etc. However, it is currently envisaged that all buildings, offices, plant equipment, workshops, the septic systems and transpiration trenches, stockpiles and associated facilities will be decommissioned and removed from site.

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1

INTRODUCTION

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT



Introduction

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1 INTRODUCTION

This Amalgamated Environmental Impact Statement (EIS) has been prepared by Matrix+ Consulting Pty Limited (Matrix+) on behalf of Isaac Plains Coal Management Pty Ltd (IPCM), manager of the existing Isaac Plains Coal Mine.

The initial Environmental Impact Statement (EIS) (v 2.0) for the Integrated Isaac Plains Project (IIPP) was submitted to the Queensland's Environmental Protection Agency (EPA) on 5 September 2007. An amended EIS (v 3.0 dated 6 November 2007) was subsequently submitted to the EPA and included amendments requested by the EPA to address the EIS Terms of Reference (TOR). This amended EIS was placed on public exhibition from 12 November 2007 until 8 January 2008. A Supplementary EIS (v 4.0 dated 6 June 2008) was submitted to the EPA following the EIS public exhibition period. This Supplementary EIS included amendments related to IPCM's response to public submissions.

The following additional information in relation to the project was provided to the EPA after the submission of the Supplementary EIS (v 4.0 dated 6 June 2008) to the 26 February 2009:

- IPCM Response to EPA Comments (Supplementary IIPP EIS) dated 29 August 2008 in response to additional information requirements specified in the EPA's Notice of extension of decision period dated 4 July 2008;
- IPCM letter dated 10 November 2008 in response to additional information requirements specified the EPA's email dated 10 October 2008;
- IPCM letter dated 28 November 2008 and WRM's Conrock Gully Diversion Concept Design report dated 26 November 2008 in response to additional information requirements specified the EPA's Notice of extension of decision period dated 18 November 2008; and
- IPCM letter dated 26 February 2008 in response to additional information requirements specified the EPA's Notice of extension of decision period dated 19 December 2008 and the outcomes from a meeting with the EPA on 10 February 2009.

The EPA's Notice of extension of decision period dated 19 December 2008 requested the compilation of an Amalgamated EIS to replace all previous versions of the EIS and to include the latest version of all EIS information included in the additional information provided (listed above). This Amalgamated EIS provides the final description of environmental impact assessment of the project and supersedes and replaces all previous EIS versions and additional information correspondence submitted to the EPA.

The EIS has been prepared to facilitate approval for an increase in the area to be mined and an increase in the rate of run-of-mine (ROM) coal production from the existing approved mining rate of 1.9 million tonnes per annum (Mtpa) up to approximately 4 Mtpa ROM coal. The additional area to be mined, the Expansion Area, lies within the southern portion of Exploration Permit for Coal 755 (EPC755) and EPC548 but outside the current Mining Lease (ML) 70342 (ML70342). The Expansion Area is located 10 to 12 km south-east from Moranbah in the Bowen Basin (refer to **Figure 1-1**, **Figure 1-2** and **Figure 1-3**).

An increase in coal production will be achieved by increasing the throughput of the existing approved Coal Handling and Preparation Plant (CHPP) at the existing Isaac Plains Coal Mine (i.e. an additional CHPP will not be required to be constructed). The main infrastructure for the Expansion Area, including the proposed mine pit, will be located within two mining lease applications (MLa) MLa70361 and MLa70381. In order to facilitate the use of this CHPP, an access/haul road will be required to link the Expansion Area to the existing Isaac Plains Coal Mine. The proposed access/haul road will be contained within two MLAs for infrastructure only, MLa70380 and MLa70382 which cover parts of EPC755, EPC602 and EPC548. Vale Australia (IP) Pty Ltd (Vale) and IP Coal Pty Ltd (IP Coal) hold EPC755 while Anglo Coal (Grosvenor) Pty Ltd (Anglo Coal) and Exxaro Australia Pty Ltd (Exxaro) are the principal holders of EPC602 and EPC548. Anglo Coal Australia is exploring in EPC602 and EPC548 to ascertain the suitability of a potential underground coal mine. Accordingly, IPCM are in negotiation with Anglo Coal and Exxaro to obtain the conditional consent for mine infrastructure to be established in the inundation area of Conrock Gully Dam on those tenements not held by Vale. IPCM will also be applying for an MLA over the small triangle of land where the proposed MIA and MIA dam are located (on EPC755 between MLa70380, EPC548 and EPC602).



Introduction

The existing Isaac Plains Coal Mine uses a truck and shovel method for mining the coal. IPCM proposes to use a dragline to create greater efficiency in the mining at this site. It is proposed that the dragline will commence operating in the existing Isaac Plains Coal Mine and on completion of mining in this area, will be walked to the Expansion Area, from the existing Isaac Plains Coal Mine, in approximately 2016. The construction and operation of the dragline is considered in this EIS as part of the IIPP.

1.1 PROJECT TITLE

The title of this project is the 'Integrated Isaac Plains Project' (IIPP) which refers to the existing Isaac Plains Coal Mine as supplemented by the Expansion Area.

1.2 PROJECT PROPONENT

The IIPP will be operated as an unincorporated joint venture with IPCM being the management company responsible for all operations undertaken as part of the IIPP on behalf of the joint venture participants, i.e. IP Coal Pty Ltd (50 %) and Vale (50 %). For the sake of simplicity, the term IPCM is used throughout this document to refer to the joint venture participants and the Manager of the IIPP.

Further information concerning the IIPP can be obtained from:

Isaac Plains Coal Management Pty Ltd

Level 2, 43 River Street

Mackay QLD 4740

(PO Box 8703, Mt Pleasant Qld 4744)

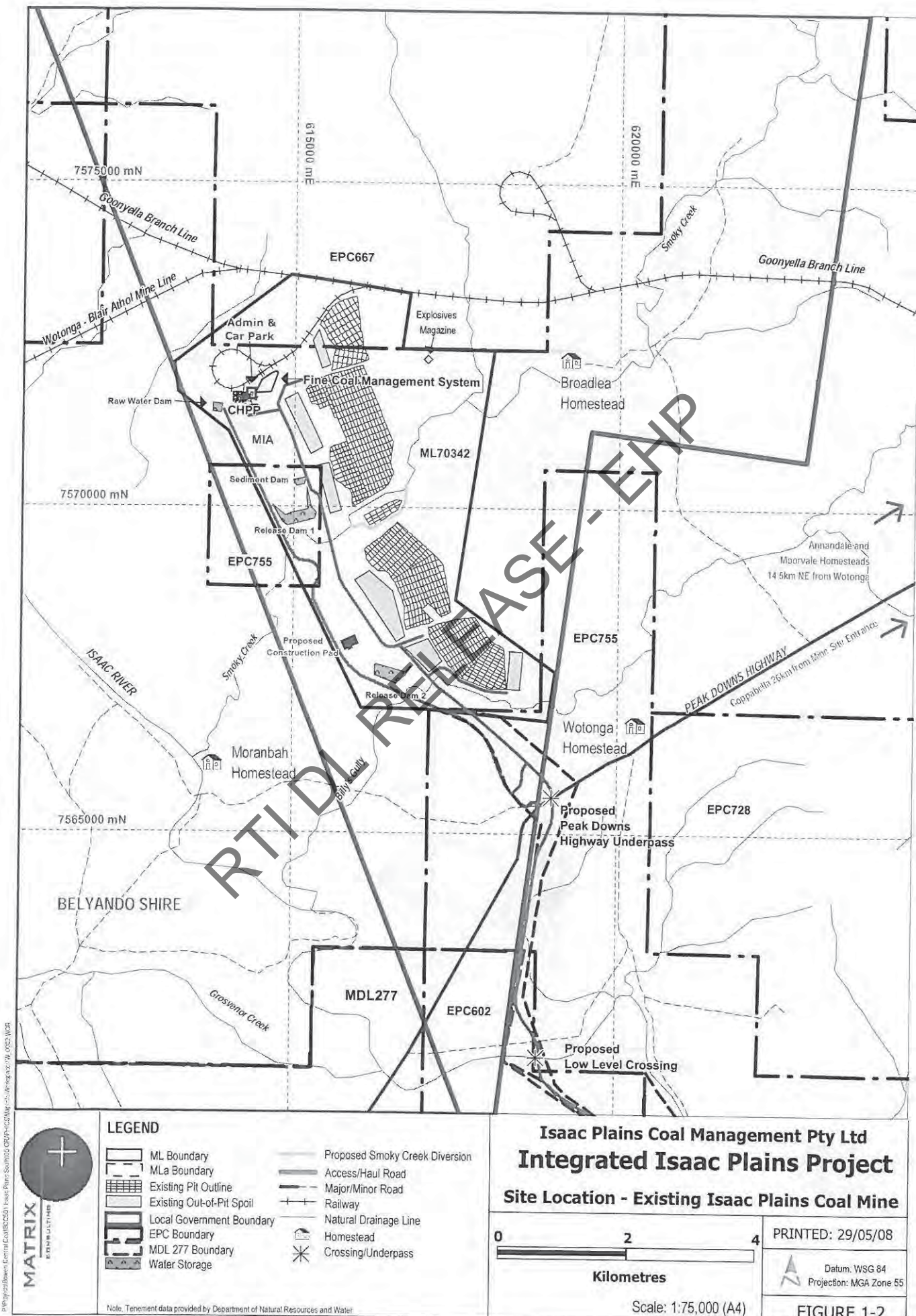
Ph: +61 7 4940 0500

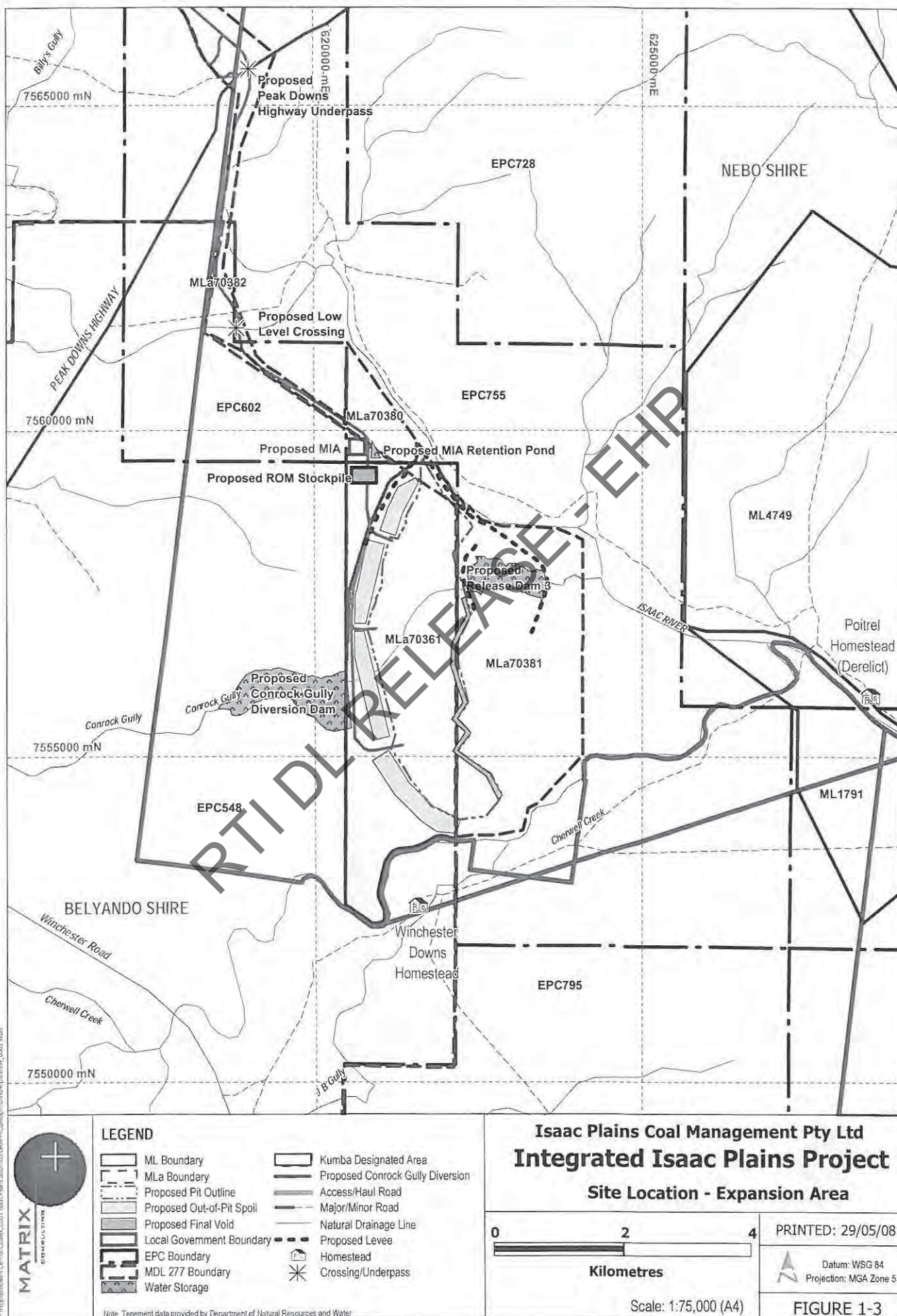
Fax: +61 7 4944 0653

ABN 76 114 277 315

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1.3 PROJECT OVERVIEW

1.3.1 Project Background

The existing approved Isaac Plains Coal Mine is located in ML70342 and an Environmental Authority (EA) (Permit # MIN100329505) was granted on 25 August 2005. The EA was recently reissued on 21 December 2007 following an administrative amendment made by the EPA. The existing Isaac Plains Coal Mine currently has approval to mine at a rate of 1.9 Mtpa ROM. The existing Isaac Plains Coal Mine commenced mining operations in the third quarter of 2006 with the first coal railed on 27 October 2006.

The major components of the existing Isaac Plains Coal Mine include:

- five contiguous open cut pits;
- out-of-pit spoil dumps;
- access and haul roads;
- a ROM coal stockpile;
- a CHPP including crushing facility, a coal stockpile pad, a temporary reject stockpile, a rail loop and rail loading facilities;
- a fine coal management system;
- mine infrastructure areas including office buildings, workshops, controlled access gate and a septic system and transpiration trench; and
- mine water management structures.

1.3.2 Integrated Isaac Plains Project

IPCM, on behalf of the joint venture participants, has applied for MLs under the *Mineral Resources Act 1989* (MRA) for an extension to the existing Isaac Plains Coal Mine onto the southern part of EPC755, and onto an adjoining area to the west known as the Kumba Designated Area (KDA)¹, and for an access/haul road linking the Expansion Area to the existing Isaac Plains Coal Mine. These areas are collectively referred to as the 'Expansion Area'. The proposed project, referred to as the IIPP, will comprise some changes to the existing Isaac Plains Coal Mine located on ML70342, and activities within the Expansion Area as further described below.

The major components of the IIPP, located either wholly or partially within the Expansion Area, in addition to those identified above, will include:

- open cut pit(s);
- out-of-pit spoil dumps;
- access and haul roads;
- ROM coal stockpile;
- a dragline (initially in the existing Isaac Plains Coal Mine);
- mine infrastructure area including office buildings, controlled access gate and septic system and transpiration trench;
- an underpass beneath the Peak Downs Highway;
- a low level crossing of the Isaac River;
- water management structures; and
- installation of flood levees as part of the pre-strip operation, at the commencement of mining..

¹ The KDA is an area of EPC 548 that adjoins the western boundary of EPC 755 over which Kumba Australia Pty Ltd has granted exclusive rights to IPCM, for a period of 4 years, to prospect, explore and investigate the Rangal Coal Measures and to apply for additional mining tenements required to mine any resource identified within it.

Introduction

In addition, a heavy equipment construction pad will be built at the existing Isaac Plains Coal Mine. The pad, which is approximately 4 ha, will be used initially to assemble a dragline and then periodically over the life of the mine for refurbishment work that needs to take place on larger items of mining equipment. The dragline will be initially used in the existing mine, prior to moving to the Expansion Area in 2016.

The IIPP include the diversion of two waterways, namely Smoky Creek within the existing Isaac Plains Coal Mine site, and Conrock Gully, within the Expansion Area. The approval of the diversions within ML70342, ML Application (MLa) 70361, MLa70380, MLa70381 and EPC755 form part of the EIS.

Conrock Gully is the name adopted for the formerly unnamed waterway which traverses the Expansion Area, and is consistent with that used by the landholders. The Department of Natural Resources and Water (DNRW) has determined that Conrock Gully is not classified as a watercourse under the provisions of the *Water Act 2000*.

Based on the current resource estimates and mine planning, ROM coal production from the IIPP will increase from the currently approved rate of 1.9 Mtpa up to approximately 4 Mtpa (ROM) for a period of approximately 15 years. IPCM commenced development of the existing Isaac Plains Coal Mine in late 2005 and coal production commenced in the third quarter of 2006. Mined coal from the Expansion Area will be hauled along an access/haul road, over a low level crossing of the Isaac River and through an underpass beneath the Peak Downs Highway, to the CHPP on ML70342. Processed and washed coal from the IIPP will be railed to Dalrymple Bay Coal Terminal for export and possible domestic use. IPCM are investigating opportunities to export processed and washed coal from other ports in Queensland including Abbot Point (near Bowen) and Barney Point (near Gladstone). In order to take advantage of these alternate ports, IPCM have underwritten the cost of designs being prepared by Queensland Rail (QR) Network Access, to change the connection point of the IPCM Rail Loop to the Goonyella Rail system, which will enable coal to be railed north to Abbot Point. The Owners of IPCM are signatories to the underwriting of the Goonyella to Abbott Point Expansion Project. The existing Isaac Plains Coal Mine CHPP has the capacity to accommodate the planned increase in ROM coal production of up to 4 Mtpa. The increased throughput of ROM coal will be achieved through increased operating hours, i.e. the CHPP will not require an upgrade to process the increased volume of coal. The CHPP was approved based on conservative modelling for a 24 hr, 7 days per week operation.

As part of the IIPP approval process, IPCM will apply to amend the approved EA for the existing Isaac Plains Coal Mine to form a single Project Authority combining ML70342 and the MLAs for the Expansion Area, under the *Environmental Protection Act 1994* (EP Act).

The existing Isaac Plains Coal Mine on ML70342, as originally planned, was referred and assessed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (referral submitted on 5 April 2005) by the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA)². It was decided on the 6 May 2005, by the delegate of the then Federal Minister for the Environment and Heritage, that the existing Isaac Plains Coal Mine would not to be a controlled action.

In the period since that referral, IPCM identified sufficient coal reserves in the Expansion Area that they subsequently deem feasible to proceed with the development of the Expansion Area. The coal reserves under Smoky Creek were also deemed of sufficient economic value to feasibly divert Smoky Creek to mine the underlying coal.

An EPBC Act referral for the IIPP was submitted for assessment by the DEH on 8 September 2006. On the 6 October 2006 it was decided by the delegate of the Federal Minister for the Environment and Heritage that the IIPP would not to be a controlled action.

1.4 PROJECT OBJECTIVES AND SCOPE OF THE IIPP

1.4.1 Objectives

IPCM plans to develop the IIPP to extract approximately 4 Mtpa ROM (IIPP total product). The IIPP will produce, for the export and domestic market, 3.3 Mtpa of product coal (25 % coking coal, 50 % pulverised coal injection (PCI) and 25 % thermal coal).

² The DEWHA was previously known as the Department of the Environment and Heritage (DEH) Water.

The key objectives of the IIPP are to:

- produce increased tonnages of coking, PCI and thermal coal in response to the increasing world demand for these products and to enhance IPCM's competitiveness as a coal provider;
- operate the mine in a manner which minimises impacts on surrounding residents and the local physical, biological and socio-economic environment;
- implement a level of management control and mitigation measures that comply with or exceed, both appropriate environmental criteria and reasonable community expectations;
- develop and operate the IIPP in compliance with all relevant statutory requirements;
- continue to maintain an open and honest relationship with stakeholders; and
- achieve the above objectives in an economically, environmentally and socially acceptable manner which benefits stakeholders and ensures the Proponent's continued economic viability.

1.4.2 Scope

The scope for the IIPP is as follows:

- the extension of the existing Isaac Plains Coal Mine into the Expansion Area;
- an increase in ROM coal production from approximately 1.9 Mtpa to up to approximately 4 Mtpa resulting in an increase in product coal from approximately 1.6 Mtpa to approximately 3.3 Mtpa;
- construction of an underpass beneath the Peak Downs Highway;
- construction of a low level crossing of the Isaac River;
- diversion of Smoky Creek and Conrock Gully to access economic coal reserves;
- continued use of, and some refinement to existing infrastructure and services; and
- construction of additional infrastructure in the Expansion Area.

The anticipated mine life is approximately 15 years.

1.5 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The existing approved Isaac Plains Coal Mine is located in the northern section of EPC755 over which ML70342 and EA (Permit # MIN100329505) were granted (i.e. this part of EPC755 is extinguished). It was assessed via an application for an EA (non-standard mining) activity under the EP Act and supported by an Environmental Assessment Report (EAR) incorporating an Environmental Management Overview Strategy (EMOS) (now referred to as an Environmental Management Plan (EM Plan)). The EPA deemed the existing Isaac Plains Coal Mine as not requiring an EIS. The existing Isaac Plains Coal Mine also has an approved Plan of Operations (PoO) for December 2007 to December 2008.

As mentioned in **Section 1.3.2**, IPCM is planning to secure MLs under the MRA for an extension to the existing Isaac Plains Coal Mine onto the southern part of EPC755, onto an adjoining area to the west known as the KDA, areas to the east (extending just under 2 km and bordered to the north by the Isaac River and to the south by Cherwell Creek) and an area north bordered by the Isaac River, and an ML for an access/haul road linking the Expansion Area to the existing Isaac Plains Coal Mine. **Figure 1-3** illustrates the location of the proposed MLs.

To obtain the MLs an amendment to an existing EA is required under the EP Act. IPCM will incorporate all MLs under one EA.

Introduction

The Environmental Protection Agency (EPA) EIS triggers were assessed using EPA Guideline 4 *Deciding the level of impact assessment for the mining industry*. It was found that the project is likely to trigger the requirement to conduct an EIS in two instances: the clearing of an area of Brigalow Regional Ecosystem (RE) (the integrity of which is questionable); and mining of more than 2 Mtpa of ROM coal, i.e. mining within ML70342 and the Expansion Area will produce approximately 4 Mtpa ROM coal, thereby exceeding the 2 Mtpa threshold. The diversion of Smoky Creek and Conrock Gully is also a potential EIS trigger. Considering these triggers, IPCM lodged an application for a voluntary EIS, which was accepted by the EPA on 21 June 2006.

1.5.1 Purpose of the EIS

The purpose of the EIS process is to provide public information on the need for, and likely effects of, mining projects.

This EIS has been prepared under the EP Act. Section 40 of the EP Act states that the purpose of the EIS, and the EIS process, are to:

- i. assess the potential adverse and beneficial environmental, economic and social impacts of the project;
- ii. assess the management, monitoring, planning and other measures proposed to minimise any adverse environmental impacts of the project;
- iii. consider feasible alternative ways to carry out the project;
- iv. provide enough information about the matters mentioned in items (i) and (ii) above to the Commonwealth and State authorities and the public;
- v. prepare or propose an environmental management plan for the project;
- vi. help the administering authority decide the environmental authority application for which the EIS is required; and
- vii. provide information to other Commonwealth and State authorities to help them make informed decisions.

The EIS process under the EP Act can be divided into four stages, each with component activities as described below.

Stage 1 - Terms of Reference (ToR)

- i. The Proponent submits the draft Terms of Reference (ToR) to the Chief Executive of the EPA and within 15 business days of submission, the Chief Executive gives the Proponent written notice about the public notification.
- ii. The comment period for the draft ToR is no less than 30 business days after the public notice has been published.
- iii. Within five business days, the Proponent must provide a copy of the public notice to affected people, interested people and any other person whom the Chief Executive has specified.
- iv. Within 10 business days after the comment period has ended, the Chief Executive provides the Proponent with a copy of the comments received within the comment period.
- v. The Proponent must provide the Chief Executive a summary of the comments, the Proponent's response and any amendments to the draft ToR in response to the comments.
- vi. The final ToR (refer to **Appendix A**) is published once the Chief Executive has considered the documents mentioned above, prepared the final ToR and given a copy of the final ToR to the Proponent.

Stage 2 - EIS Submission Stage

- i. The Proponent has two years to submit the EIS after the final ToR are received from the Chief Executive.
- ii. Following submission of the EIS, the Chief Executive considers the document and a decision is made as to whether the project is to proceed to the public notification stage.
- iii. The EIS is allowed to proceed to the public notification stage only if the Chief Executive believes it addresses the final ToR in an acceptable form.
- iv. If the project is allowed to proceed, the Chief Executive must decide on the period for submissions to be made regarding the EIS. However, this must be a minimum of 20 business days.
- v. Once the submission period has been decided, the Chief Executive must inform the Proponent within 10 business days of the decision.
- vi. Within 20 business days of receiving the decision, the Proponent must provide a written notice to affected persons, interested persons and any other person decided by the Chief Executive stating the description of the project and the operational land, where the EIS can be inspected, where a copy can be obtained and information on submission period, and how to make a submission.
- vii. Within 10 days of the end of the submission period, the Chief Executive must provide a copy of the comments accepted by the Chief Executive.
- viii. Within 20 days, the Proponent must then provide the Chief Executive with a summary of the submissions, the Proponent's response, and any amendments to the EIS as a result of the comments.
- ix. Within 20 business days, the Chief Executive must consider the EIS and decide whether to allow the EIS to proceed or be refused.

Stage 3 - EIS Assessment Report

- i. If the project is allowed to proceed, the Chief Executive must, within 30 business days, provide the Proponent with a report about the submitted EIS. When writing the report, the Chief Executive considers the final ToR, the submitted EIS, submissions and the standard criteria (as detailed in Schedule 3 of the EP Act).

Stage 4 - Completion of Process

- i. The process is complete when the Proponent is given an EIS assessment report for the EIS.

The IIPP has completed Stage 1 and is currently in Stage 2 of the process.

1.5.2 Objectives of the EIS

The objectives of the IIPP EIS are as follows:

- to provide a basis for interested bodies and persons to understand the IIPP and alternatives and preferred solutions; the existing environment that it would effect both on and off the site; the impacts that may occur; and the measures to be taken to mitigate all adverse impacts;
- to provide the advisory agencies with a framework for assessing the impacts of the IIPP, in view of legislative and policy provisions;
- to present a definitive statement of measures or actions to be undertaken to mitigate any adverse impacts occurring during construction, operation and following decommissioning of the IIPP. The EP Act requires that this is achieved by the inclusion of a draft EM Plan (refer to **Section 20**) in the EIS which describes acceptable impacts and environmental management strategies designed to meet agreed performance criteria; and

- where possible, to present information in a clear, logical, objective, and concise manner avoiding the use of technical jargon, so that non-technical persons may easily understand it and members of the public, the assessing agencies, and the determining authority are able to properly understand the environmental consequences of the proposed development.

1.5.3 Structure of the EIS

The EIS is presented in 21 sections, as listed below. The EIS also includes an Executive Summary and a Glossary.

PART A: BACKGROUND

Section 1 – Introduction

Section 2 – Project Approvals and Legislative Framework

PART B: THE PROPOSED PROJECT

Section 3 – Description of the Project

PART C: ENVIRONMENTAL SETTING, FEATURES, IMPACTS AND MITIGATION MEASURES

Section 4 – Climate and Natural Disasters

Section 5 – Land

Section 6 – Hydrology

Section 7 – Hydrogeology

Section 8 – Air Quality

Section 9 – Noise and Vibration

Section 10 – Nature Conservation

Section 11 – Cultural Heritage

Section 12 – Visual Amenity

Section 13 – Waste Management

Section 14 – Transport

Section 15 – Social Environment

Section 16 – Economic Environment

Section 17 – Health, Safety, Hazard and Risk

Section 18 – Community Consultation

Section 19 – Rehabilitation and Decommissioning

Section 20 – Environmental Management Plan

PART D: REFERENCES

Section 21 – References

All sections address the objectives of the EIS as outlined above. Additional information, including the final ToR, details of the study team and specialist study reports are presented as appendices.

The content of this EIS has been prepared in accordance with the final ToR. A checklist is provided in **Appendix B** which provides a cross-reference with the section in this EIS where the matter raised in the ToR has been addressed. **Appendix C** presents the Study Team used in the development of the EIS and EM Plan.

1.6 SUBMISSIONS

Copies of the draft EIS were submitted to the EPA and distributed by Matrix+ to affected and interested parties and placed on public display for comment at the Nebo Shire Council, Moranbah Town Library and at the EPA offices in Emerald and Brisbane. Copies were made available, upon request, on either CD ROM or hard copy format.

The document was also made available on the Matrix+ website at: <http://www.matrixplusinternational.com/community.php> and was made available for viewing at the Matrix+ office at Level 4/127 Creek Street, Brisbane. For further information about the EIS process for this proposed project, the EPA's EIS Co-ordinator can be contacted on (07) 4982 4555.

Any person, group or organisation was able to make a written submission about the EIS to the EPA within the comment period as advertised in the public notice about the EIS. Such submissions were not required to relate to the whole of the EIS, i.e. were able to relate to any aspect or section of the document. It was not necessary for persons making a submission to be an expert in any of the issues assessed in the EIS.

The EPA and advisory bodies considered all public submissions in making decisions in relation to the project and the EPA co-ordinated the consultation process between IPCM, the advisory bodies and the public. The EPA also collated and reviewed all comments received on the EIS and provided them to IPCM. This version of the EIS addresses those comments.

The EPA is required to prepare an EIS Assessment Report once this version of the EIS has been received and reviewed.

1.7 PUBLIC CONSULTATION

From the outset, IPCM have recognised the importance of consultation with, and involvement of, local stakeholders and for them to be an integral component of the planning and approvals process for the IIPP.

This process commenced with the identification and early engagement of a number of stakeholders in order to identify broad issues of concern. This process included meetings with Council representatives, directly affected landholders, surrounding landowners, permit and leaseholders, State government agencies, and Traditional Owner groups. IPCM will continue consultation from the planning phase through the IIPP operations to final rehabilitation.

Section 18 further outlines the community consultation process undertaken to date by IPCM for the IIPP and also provides for proposed future consultation for the IIPP.

1.8 PROJECT JUSTIFICATION

It is felt that given the current demands for coal world-wide the expansion of the existing Isaac Plains Coal Mine is justified. The IIPP will produce coking, PCI and thermal coal for the export market.

1.8.1 Coal Market

The IIPP will produce coking, PCI and thermal coal for the export market. Coking coal is used for the manufacture of coke which in turn is used in blast furnaces for pig iron production. PCI coal is injected directly into blast furnaces also as part of the manufacture of pig iron. Thermal coal is used primarily for its heating value and tends not to have the carbonisation properties possessed by coking coals. Most thermal coal is used to produce electricity in thermal power plants.

Australia is the world's largest exporter of coal, with Queensland accounting for over two thirds of Australia's export tonnage. In the 2005/2006 financial year, Queensland exported 143 million tonnes (Mt) of coal, comprising of 100 Mt of coking coal and 43 Mt of thermal coal. Average sale prices for coking and thermal coal are around Freight on Board (FOB) A\$150/t and FOB A\$67 respectively. The export of Queensland coal generated revenue in excess of A\$17.8 billion in 2005/2006 (DME, 2006).

The demand for coking coal is determined principally by steel production. World steel production has increased at an average rate of 5 % per annum since 1995. In 2005, world steel production was 1,129 Mt. It is expected to increase further to 1,500 Mtpa by 2010. This will generate continued growth in the demand for coking coal.

Introduction

Currently, the major markets for Australian coking coal are Japan (which consumes 49 % of our exports), 43.19 % is exported to the rest of Asia and 24 % to Europe. Major increases in demand are expected in China, South Korea and India, all of which are target markets for coal from the IIPP.

The demand for thermal coal is determined by electricity generation. Approximately 34 % of all global electricity is generated from coal. The World Coal Institute (2005) predicts global electricity generation to remain steady over the next 30 years.

Currently, 49 % of Australia's thermal coal exports are to Japan. 43.19 % is exported to the rest of Asia and 5.02 % to Europe (DME, 2006). The demand for thermal coal will rise in line with electricity generation in China and India. China will construct 55 % of the world's coal fired power stations over the next 23 years, and India 15 %.

1.8.2 Benefits to the Proponent

This project justification is based on the incremental benefits of the IIPP over that of the existing Isaac Plains Coal Mine, without the Expansion Area.

Ownership of the Proponent joint venture is provided in **Section 1.2**. With the increase in production from 1.6 Mtpa to 3.3 Mtpa of product coal annually, the IIPP represents a significant phase in the further growth of Vale and IP Coal's operations.

1.8.3 Benefits to the Region

The IIPP is located within both Nebo and Belyando Shires in Central Queensland³. During both the construction and operations phase of the project, both Nebo and Belyando Shires, the surrounding region, and Queensland will benefit from this development. Major benefits to the Shire and Central Queensland region will be as follows:

- employment of 20 to 40 contractors during the construction phase who will be principally sourced from Queensland and 40 additional full time employees during the operational phase, approximately 80 % of whom will be sourced from the Mackay region, with the remaining 20 % likely to be sourced from the rest of Queensland;
- peak employment will occur during the dragline construction phase when 70 contractors will be employed for a period of twelve months. The additional contractors used for this task will also be sourced from the Mackay region (80 %) and 20 % from other parts of Queensland;
- capital expenditure of \$103.25 M, of which approximately \$82.25 M will flow to Queensland businesses;
- estimated additional annual operating expenditure of \$135 M;
- annual operational expenditure of \$4.76 M (direct) and a further \$1.1 M (indirect) to be spent in the Nebo and Belyando Shires; and
- annual direct operating expenditure to be spent outside of the Nebo and Belyando shires of \$92 M with estimated further indirect benefits of \$73.6 M.

1.8.4 Benefits to the State of Queensland

Overall the Queensland State Government will benefit from the IIPP in the form of additional royalties estimated at approximately \$12.6 M per year, and additional rail freight charges of \$7.6 M per year. Port charges are estimated to reach \$7.7 M per year.

1.8.5 Ecologically Sustainable Development

The objective of the EP Act is to 'protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development (ESD))'.

³ NB: Since the release of the final EIS for public comment Belyando, Nebo and Broadsound Shires have been amalgamated into the Isaac Regional Council. This revised EIS has not been amended to reflect this as the intention of this version of the EIS is to address comments from stakeholders at the time of public release, including both Belyando and Nebo Shire Councils.

In 1990, the Commonwealth Government suggested the following definition for ESD in Australia:

- 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'
(<http://www.environment.gov.au/esd/national/nsesd/>).

ESD is development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations.

The Intergovernmental Agreement on the Environment (May 1992) between the Commonwealth and the States, Territories and Local Governments of Australia identified four principles for ESD. An assessment of the IIPP against each of these principles is contained in **Section 1.8.5.1** to **Section 1.8.5.4** below.

IPCM's Environment Policy provides a commitment to acting in an environmentally responsible manner at both a corporate and operational level (refer to **Appendix D**).

1.8.5.1 Precautionary Principle

Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty will not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions will be guided by:

- careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment; and
- an assessment of the risk-weighted consequences of various options.

Specialist consultants were engaged for the IIPP to conduct detailed studies, assess any potential impacts, and examine options in order to prevent environmental damage. A number of features incorporated into the IIPP which address the precautionary principle include:

- placement of the access/haul road at a location which did not impact on any significant areas of vegetation; had limited requirement for further clearing or disturbance of 'not of concern' vegetation and that was at a location acceptable to the landowner;
- use of dry reject disposal as well as a conventional fine coal management system made of three individual cells to maximise the potential for water recovery; all water encapsulated in the site water management system to minimise the potential for groundwater and surface water contamination;
- dry reject disposal areas placed in areas where no disturbance of vegetation will occur;
- implementation of on-site procedures for the monitoring of dust, groundwater, surface water, noise and vibration;
- progressive rehabilitation of the mine, with the final land use returned to predominantly natural ecosystem with enhanced Brigalow patches that have been protected over the life of the mine; and
- development of emergency response processes and the use of risk analysis techniques to identify risks and appropriate controls.

1.8.5.2 Intergenerational Equity

To address this principle, the present generation will ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations. Intergenerational equity is addressed through the design of the project and the implementation of monitoring and on-site measures to address the environmental and social impacts on the community. These measures include:

Introduction

- economic benefits and employment opportunities for the local community;
- consultation with stakeholders;
- emissions monitoring;
- protecting and enhancing Brigalow communities;
- progressive mine site rehabilitation;
- preservation of cultural heritage sites; and
- water recycling on-site, e.g. dry reject disposal and reuse of water within the system.

1.8.5.3 *Conservation of Biological Diversity and Ecological Integrity*

To conserve biological diversity and ecological integrity, IPCM will continue to undertake activities in an environmentally aware and responsible manner by minimising impacts to flora and fauna. These measures include:

- monitoring to reduce impacts on the ecological integrity of both surface and groundwater;
- fencing off Brigalow areas to remove grazing pressures and encourage the development of the floral and faunal assemblage;
- maintenance of progressive rehabilitation through fencing off areas;
- location of dry reject disposal areas within historically cleared areas; and
- weed and feral animal management.

1.8.5.4 *Improved Valuation, Pricing and Incentive Mechanisms*

This 'polluter pays' principle asks that the mine project developer pays and that environmental factors should be included in the valuation of assets and services. The concept suggests that the users of goods and services will pay prices based on the full life cycle costs of providing those goods and services (including the use of natural resources and assets and the ultimate disposal of any wastes). Furthermore, IPCM will continue to establish environmental goals which will be pursued in the most cost effective way, e.g. by establishing incentive structures which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.

Mitigation measures for the IIPP, which were developed from the specialist studies undertaken in the project planning and design phase that address this principle, include:

- significant benefits to the State and Commonwealth through taxation, royalty and transport payments;
- flow-on effects to local communities from expenditure in the Shires and Region;
- paying for its infrastructure;
- responsible water management through recycling and reuse of water resources on-site to ensure sustainability of supply (e.g. a closed fine coal management system with recovered water being recycled back to the plant);
- topsoil is removed in advance of mining coal strips and is immediately placed onto spoil backfill enabling progressive rehabilitation; and
- addressing driver fatigue and additional traffic on local roads by providing buses as an alternative to employees driving to the site from the camp accommodation.

1.9 ALTERNATIVES TO THE PROJECT

1.9.1 Coking Coal and Steel Making

Over 66 % of the world's steel production depends on coking and PCI coals. Standard steel production technology depends on a blast furnace for the reduction of iron ore to crude steel. This technology in turn requires coking and PCI coals. Alternative technologies such as Direct Reduction (based on thermal coal), recycling of scrap steel through Basic Oxygen Furnaces (BOF) and Electric Arc Furnaces (EAF), do play a part in world steel production, but have not proven to be as successful on technical, commercial and environmental bases. The blast furnace continues to be the preferred method for steel production throughout the world. New blast furnaces are currently under construction in Japan, Korea, India, China, Brazil and Europe.

1.9.2 Thermal Coal and Power Production

Approximately 39 % of the power produced globally is derived from coal and this rate is expected to remain steady over the next 30 years (World Coal Institute, 2005). Electricity generation from coal requires the pulverising of thermal coal to a fine powder. It is then burnt at high temperatures which converts water into steam. The steam causes large blades to rotate which, in turn, cause wire coils in a generator to rotate and produce electricity. This type of electricity generation is called Pulverised Coal Combustion (PCC), and is used in over 90 % of coal fired electricity (World Coal Institute, 2005a).

Coal is affordable, safe to transport and store, and the technology to convert coal into electricity is well established and reliable (World Coal Institute, 2005b). The overall construction and operating costs for coal fired power stations are typically lower than alternative power generation and therefore coal tends to be the preferred choice for electricity generation, compared to oil, natural gas, etc.

1.9.3 Mining Methods

The IIPP was initially proposed to be mined using the truck and shovel method only. However, as a dragline was being purchased for use in the existing Isaac Plains Coal Mine, it was determined, that in order to mine the Expansion Area more efficiently, the dragline would be utilised in this area, following the completion of mining in the existing Isaac Plains Coal Mine (by approximately 2016).

Further details on the mining methods are provided in **Section 3**.

1.9.4 Water Supply

The existing Isaac Plains Coal Mine had three options in regards to water supply. These options were either to:

1. minimise external raw water consumption from the Eastern Spur Pipeline and Burdekin Pipeline by maximising the percentage of on-site recycling;
2. take a larger volume from the pipeline and recycle smaller volumes on-site; or
3. take an allocation from the nearby Broadlea Borefield during site construction.

Strategy 1 was adopted and is proposed to be implemented for the IIPP. Under this option, water usage in the CHPP is minimised by utilising dry reject disposal as the preferred option for reject management (refer to **Section 3.5.2**) and recycling water wherever possible/practical throughout the integrated operation. An additional water supply is also available through the Burdekin River Pipeline Agreement (refer to **Section 3.5.6**).

1.9.5 Waste Management and Emissions

1.9.5.1 CHPP Reject

IPCM had a number of options available in regards to the disposal of CHPP reject material from the CHPP. These options included:

- trucking of coarse rejects to a suitable disposal site and pumping of fine tailings to a conventional tailings dam with decanted water to be returned to the CHPP;
- co-disposal of rejects, i.e. pumping both coarse rejects and fine tailings to a co-disposal dam, with decanted water to be returned to the CHPP; and

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- dry reject disposal, by which the CHPP fine tailings are dewatered in the plant using mechanical filters and the dried product is mixed with the coarse reject, conveyed from the plant and then trucked to a suitable disposal site.

Currently the existing Isaac Plains Coal Mine utilises a filter press dry reject disposal method in the CHPP. As there is no requirement to use water to dispose of rejects, water consumption is minimised. There are also minimal losses due to evaporation, seepage or pumping.

Should issues arise regarding the efficiency of producing dry rejects, IPCM will use the fine coal management system approved for use at the existing Isaac Plains Coal Mine. In this system, fine coal rejects are captured and processed in a system separate from coarse rejects. This system is further described in **Section 3.5.2**. This system will continue to be used for the IIPP.

1.9.5.2 General Waste

Cleaner production measures are implemented where possible on-site. Waste management practices for the existing Isaac Plains Coal Mine and the Expansion Area are further discussed in **Section 13**.

1.9.5.3 Coal Seam Gas and Greenhouse Emissions

Under current Queensland legislation, a mining lease for coal does not bestow upon the holder of the lease any general rights to produce Coal Seam Gas (CSG) which may be present within the lease. Incidental CSG, however, may be extracted.

To commercially produce CSG, a Petroleum Lease is required. An application for Petroleum Lease (PLA) PLA222 over the KDA and PL191 over a section of the proposed access/haul road intersection in the vicinity of the Peak Downs Highway are held by CH4 Pty Ltd (a subsidiary of Arrow Energy Ltd). IPCM has consulted Arrow Energy with respect to any potential for the use of CSG. Arrow Energy has determined that there are no appreciable methane reserves present and it currently has no plans for the commercial capture of gas in the area.

Greenhouse gas generated by the IIPP is discussed in **Section 8.7**.

1.9.6 Diversions

1.9.6.1 Smoky Creek

Subsequent to the approval of the existing Isaac Plains Coal Mine, IPCM have identified an economic quantity of coal reserves under Smoky Creek in the existing Isaac Plains Coal Mine. To mine the coal seam under Smoky Creek, the creek will be diverted to a new alignment to the south for a length of about 1.2 km. The diversion does not change the catchment area contributing to the creek or any other waterway and accordingly, flood flows will remain unaltered.

The Smoky Creek diversion will have no significant impact on stream flows because the diversion will involve a partial realignment of the creek rather than diversion to another catchment. Refer to **Section 6** for a detailed assessment of this diversion.

1.9.6.2 Conrock Gully

To enable efficient mining of the coal resources to the north of, south of and beneath Conrock Gully, a diversion of Conrock Gully from its current course will be required to allow development of the mine pit in the Expansion Area. Under current conditions, approximately ~~44~~⁴⁵ km² of the Conrock Gully catchment and a further ~~16~~¹⁷ km² of the catchment to the north of Conrock Gully, drains to the Expansion Area.

Two diversion options were considered:

- a 4 km diversion to the south to Cherwell Creek; and
- a 2.4 km diversion to the north to the Isaac River.

For both options, it is necessary to construct a dam across Conrock Gully at the western boundary of the Expansion Area, within the ML, to raise water levels sufficiently so that water can discharge under gravity into the diversion channel. The water storage reservoir area of Conrock Gully Dam will be outside MLA70361. Therefore IPCM are in negotiation with Anglo Coal and Exxaro for consent for an MLA over the dam reservoir area. The raised upstream end of the diversion channel will minimise cut

volumes but will also cause water to pond on the adjoining property to the west for extended periods and reduce flows draining along Conrock Gully to the Isaac River.

Based on a number of considerations, further detailed in **Section 6.7.5**, the option of the diversion north to the Isaac River was chosen.

1.9.7 Access/Haul Road Location

The decision process for the siting of the access/haul road linking the Expansion Area and the existing Isaac Plains Coal Mine was made based on balancing land use and environmental and engineering requirements. IPCM met on several occasions with the affected landholders in order to ascertain the best alignment option which would have a positive outcome for all parties. The potential impacts on flora and fauna were also considered in the final alignment, including avoiding endangered Brigalow where possible.

1.9.8 Low Level Crossing

The decision process for the siting of the low level crossing over the Isaac River, as part of the access/haul road linking the Expansion Area and the existing Isaac Plains Coal Mine, was made based on balancing land use and environmental and engineering requirements. The potential impacts on flora and fauna was the main consideration for the final alignment, including avoiding endangered Brigalow and minimising the removal of riparian vegetation where possible.

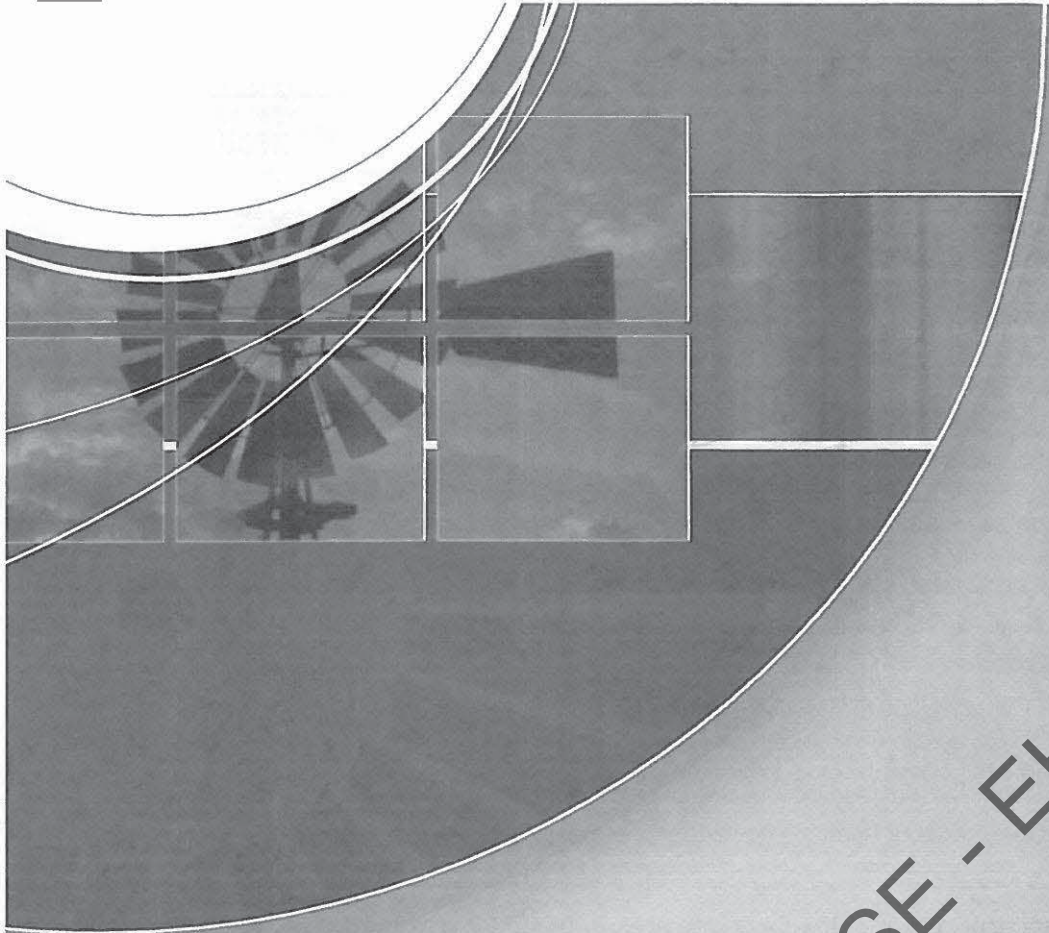
1.9.9 Transport

Two options for the transport of coal from the Expansion Area to the CHPP area for processing were investigated at the feasibility stage of the Expansion Area. The first was by coal haulage trucks carrying the coal along the internal haul road, and the other, by overland conveyor. Given the distance from the Expansion Area ROM stockpile to the CHPP at the existing Isaac Plains Coal Mine, and the need cross the Isaac River, it was determined that the conveyor option was not economically viable.

1.9.10 No Project

The consequences of not proceeding with the IIPP are:

- limiting IPCM's ability to supply market demand;
- loss of short and long-term employment opportunities; and
- loss of revenue to the Proponent, employees, Nebo and Belyando Shires, the Mackay region and the State and the Commonwealth Government.



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2

PROJECT APPROVALS & LEGISLATIVE FRAMEWORK

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT



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2 PROJECT APPROVALS AND LEGISLATIVE FRAMEWORK

2.1 COMMONWEALTH

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

Under the assessment and approval provisions of this Act, actions that are likely to have a significant impact on a Matter of National Environmental Significance (MNES) are subject to a rigorous assessment and approval process.

The MNES identified in the EPBC Act as triggers for the Commonwealth assessment and approval regime are:

1. World Heritage properties;
2. National Heritage places;
3. Ramsar Wetlands;
4. nationally threatened species and ecological communities;
5. migratory species;
6. Commonwealth marine areas; and
7. nuclear actions (including uranium mining).

The existing Isaac Plains Coal Mine, as originally planned, was referred under the EPBC Act on 5 April 2005. A delegate of the Federal Minister for Environment and Heritage¹, decided on 6 May 2005 that the mine was not a controlled action (EPBC Reference: 2005/2070).

The IIPP was referred under the EPBC Act on 8 September 2006. A delegate of the Federal Minister for Environment and Heritage decided on 6 October 2006 that the project was not a controlled action (EPBC Reference: 2006/3043).

2.1.2 Native Title Act 1993

The *Native Title Act 1993* (NT Act) aims to provide for the recognition and protection of native title and contains the relevant processes for native title claims with the main objectives being:

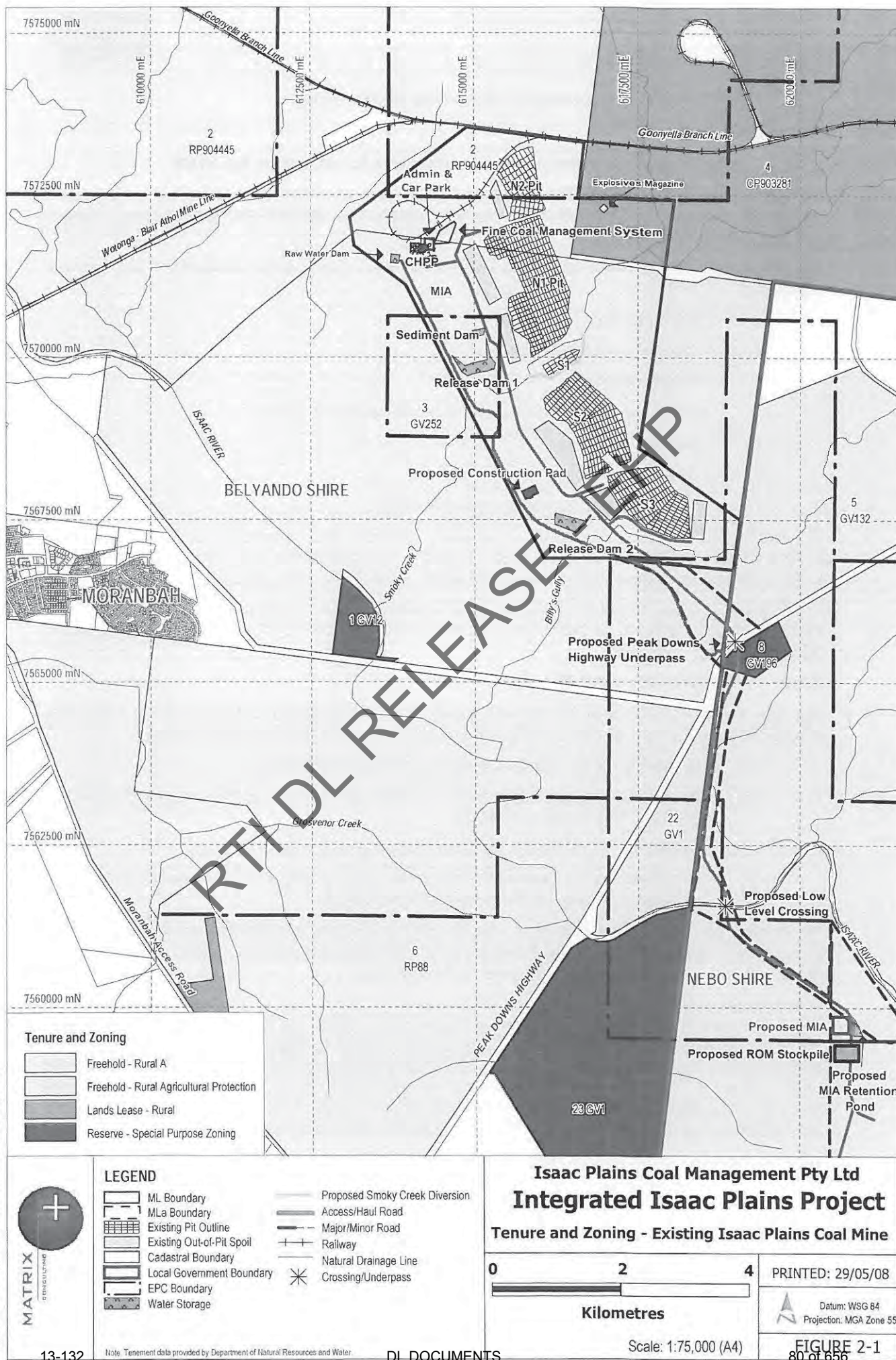
- (a) to provide for the recognition and protection of native title;
- (b) to establish ways in which future dealings affecting native title may proceed and to set standards for those dealings;
- (c) to establish a mechanism for determining claims to native title; and
- (d) to provide for, or permit, the validation of past acts, and intermediate period acts, invalidated because of the existence of native title.

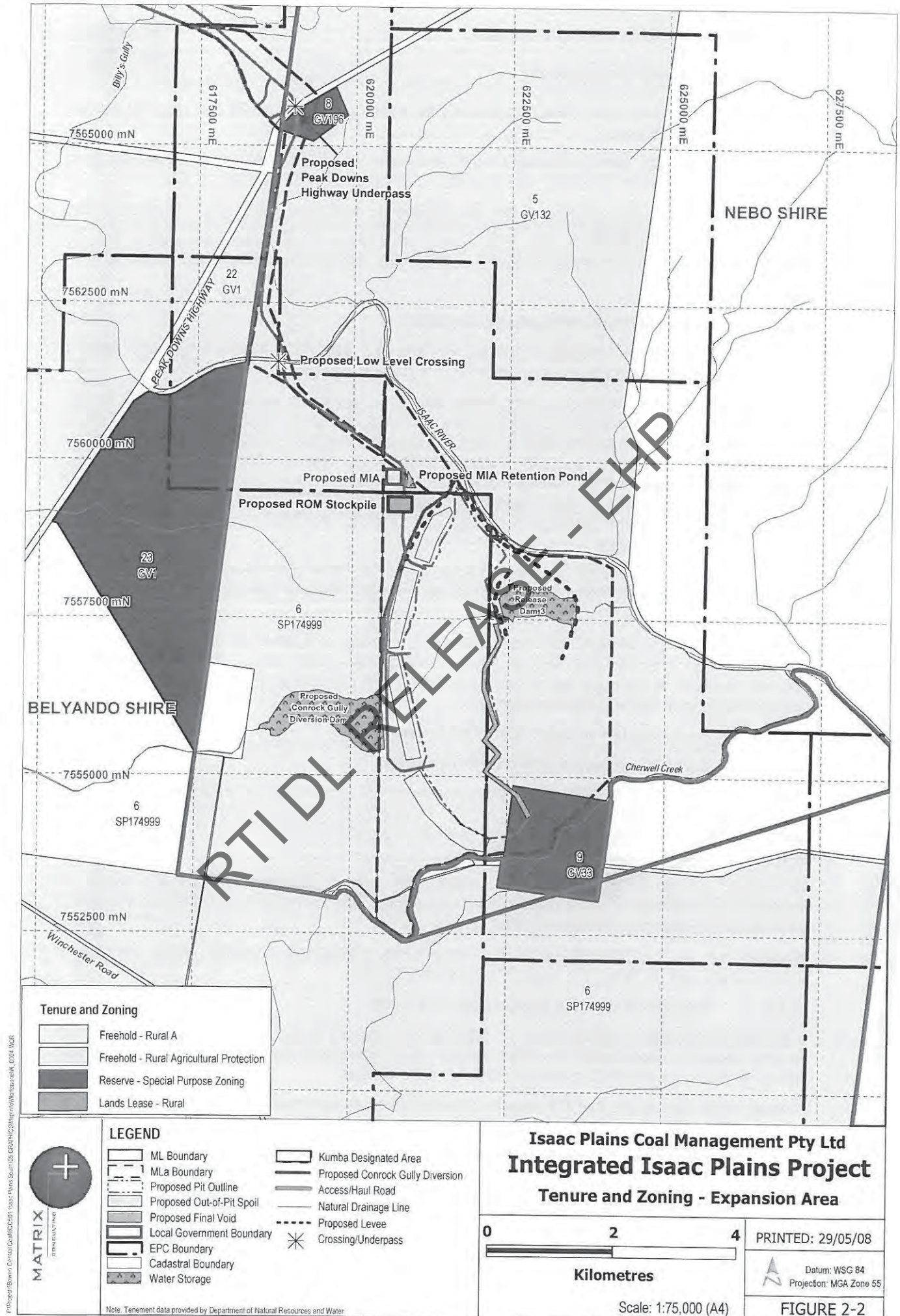
The existing Isaac Plains Coal Mine is located on Lot 3 GV252, Lot 2 RP904445, Lot 4 CP903281 and an unnamed road. Lots 3 and 2 are Freehold, while Lot 4 is State Leasehold land. Smoky Creek and Billy's Gully are located on Lot 3 GV252 (refer to **Figure 2-1**).

The Expansion Area traverses Lot 5 GV132, Lot 6 SP174999, Lot 9 GV33 and Lot 8 GV196. Lots 5 and 6 are Freehold and comprise the principal land holdings; Lot 9 is Reserve land for camping, water and roads and Lot 8 is Reserve land for a quarry (refer to **Figure 2-2**). Title searches show that the quarry area was formerly a Grazing Homestead Freeholding Lease (GHFL) under the *Land Act 1962*. The grant of the GHFL over the land that now comprises the quarry area extinguished native title and is validated as a scheduled interest under Section 22(2) of Part 3 of Schedule 1 to the NT Act. Therefore, there are no native title issues in respect of the quarry area.

With the exception of Lot 9 GV33, native title is extinguished.

¹ Now referred to as the Federal Minister for the Environment, Water, Heritage and the Arts.





A search of the National Native Title Tribunal register indicates that there are two registered native title claims on the IIPP area:

- Barada Barna Kabalbara and Yetimarla People (BBKY) # 3 (Federal Court No. Q6011/01; NNTT No. QC01/13 – registered from 20 April 2001); and
- BBKY # 4 (Federal Court No. Q6023/01; NNTT No. QC01/25 – registered from 5 April 2002).

Section 11 provides further details on both native title and cultural heritage in relation to the IIPP.

2.2 STATE

2.2.1 Aboriginal Cultural Heritage Act 2003

The main purpose of the *Aboriginal Cultural Heritage Act 2003* (ACH Act) is to provide effective recognition, protection and conservation of Aboriginal cultural heritage.

Under Section 23 of the ACH Act, a person who carries out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage (the 'cultural heritage duty of care'). Under the ACH Act, IPCM has a statutory duty of care to take all reasonable and practicable measures to avoid or minimise impacts on items of Aboriginal cultural heritage significance. A Cultural Heritage Management Plan (CHMP), or agreement, is required to be prepared for the protection of items of Aboriginal cultural heritage significance, known or unknown, with the relevant Traditional Owner group(s), if an approval of other authority is required and an EIS is required for the development.

Although not legally required for the existing Isaac Plains Coal Mine, a CHMP has been developed and executed by IPCM and the BBKY. The CHMP is not, however, formally registered in accordance with the ACH Act.

IPCM is working with the BBKY Traditional Owners to develop a CHMP to be formally registered for the IIPP in order to ensure that items of cultural heritage significance, should they be found to exist, are not disturbed or removed during the construction and operational phases of the IIPP, that is, without the consent of the Traditional Owners.

Cultural heritage for the IIPP is further discussed in **Section 11**.

2.2.2 Coal Mining Safety and Health Act 1999

The intent of this Act is to protect the safety and health of persons at coal mines and persons who may be affected by coal mining operations, and to require that the risk of injury or illness to any person resulting from coal mining operations be at an acceptable level.

This is achieved by imposing safety and health obligations on persons who operate, design, construct, or work as contractors at coal mines. It provides for safety and health management systems to manage risks effectively, making regulations and recognised standards for the coal mining industry to require and promote risk management and control.

Section 17 of the EIS addresses the Proponent's obligations, ongoing safety and health commitments, and its Safety and Hazard Management System.

2.2.3 Energy Efficiencies Opportunity Act 2006

The *Energy Efficiencies Opportunity Act 2006* aims to improve the identification and evaluation of energy efficiency opportunities by large energy using businesses and, as a result, to encourage implementation of cost effective energy efficiency opportunities.

In order to achieve its aim, the Act requires large energy using businesses to:

- undertake an assessment of their energy efficiency opportunities to a minimum standard in order to improve the way in which opportunities are identified and evaluated; and
- report publicly on the outcomes of that assessment in order to demonstrate to the community that those businesses are effectively managing their energy.

2.2.4 Environmental Protection Act 1994

The objective of the EP Act is the protection of the environment within the scope of ESD. Tools to achieve this objective include the *Environmental Protection Regulation 1998* (EPR), *Environmental Protection (Waste Management) Regulation 2000* (EP Waste Regulation) and Environmental Protection Policies (EPPs) for Air, Noise, Water and Waste Management, this EIS, the EM Plan and PoO.

Chapter 5, Part 8 of the EP Act provides assessment and approval provisions for an amendment application for an EA for mining activities. Part 2 of Chapter 3 outlines the process for obtaining an EA, including the assessment level decision and whether an EIS is required. The criteria for a standard mining activity are outlined in Section 151 of the EP Act and Schedule 1A of the EPR. The IIPP is considered a non-standard mining activity as it involves the mining of coal and will require disturbance of more than 10 ha of land at any one time. Under Section 246 of the EP Act, the EPA must make an 'assessment level decision' for the amendment application as to whether or not the project requires assessment through an EIS.

A discussion on the triggers for whether an EIS is required is provided in **Section 1.5**. All potential triggers were considered and IPCM lodged an application with the EPA for a voluntary EIS which was accepted by the EPA on 21 June 2006.

Once MLs are secured for the Expansion Area, IPCM will integrate the activities in all of its MLs into a single authority through an application to amend the existing approved EA (Permit # MIN100329505) for the Isaac Plains Coal Mine, under the EP Act. The EIS and EM Plan will be used as supporting documentation for the application.

An EMOS, now referred to under the EP Act as an EM Plan, and PoO (December 2007 to December 2008) currently exist for the Isaac Plains Coal Mine. The EM Plan has been amended to incorporate mining activities for the entire IIPP (refer to **Section 20**). A revised PoO will also be provided for approval by the EPA prior to obtaining project approval from the Minister.

Notifiable activities are listed in Schedule 2 of the EP Act. Under the EP Act, landowners and local government must inform the EPA that land has been or is being used for a notifiable activity. Land that has been or is being used for a notifiable activity is recorded on the Environmental Management Register, which is maintained by the EPA. **Section 3.14** lists the notifiable activities relevant to the IIPP.

2.2.5 Explosives Act 1999

The objective of this Act is to provide guidance for the handling, use, transport, storage and manufacturing of explosives. An authority must be sought in order to work with explosives that are required for blasting.

2.2.6 Integrated Planning Act 1997

The purpose of the *Integrated Planning Act 1997* (IPA) is to seek to achieve ESD via three main principles:

- (a) 'coordinating and integrating planning at the local, regional and State levels;
- (b) managing the process by which development occurs; and
- (c) managing the effects of development on the environment'.

Schedule 9 of the IPA states that mining is exempt from assessment against a planning scheme. The MRA provides an exemption from the provisions of the IPA and therefore no activity authorised on the MLs requires approval under the IPA.

The development of bores required to extract water from an aquifer is an assessable development under the IPA and requires operational works approval. Works constructed or installed to take subartesian water in declared subartesian areas, other than works constructed or installed solely for a purpose mentioned in Schedule 11 (stock or domestic use) of the *Water Regulation 2002* (WR), constitute an assessable development under the IPA.

Any structure that interferes with water from a waterway is an assessable development under the IPA, requiring operational works approval. The construction of the proposed low level crossing over the Isaac River could potentially act as a barrier across a waterway that stops, or forms a significant barrier to the flow of water and fish movement. The construction of the crossing is likely to require an operational works approval under the IPA. As part of the decision making process for this approval, an assessment under the *Fisheries Act 1994* will also be required.

2.2.6.1 *Fisheries Act 1994*

This Act provides for the management, use, development and protection of fisheries resources and fish habitats and the management of aquaculture activities. The main purpose of the Act is to provide for the 'use, conservation and enhancement' of fisheries resources and fish habitats through the application of the principles of ESD. The Act provides for the appropriate powers of the Chief Executive such that this purpose may be attained (s 3A). These powers include those necessary for the management of commercial, recreational and indigenous fishing.

2.2.7 **Land Protection (Pest and Stock Route Management) Act 2002**

This Act provides a framework for improved management of weeds, pest animals and the stock route network. This is achieved by:

- establishing management principles for pests, land and stock routes;
- restricting the introduction, keeping or selling and the spread of pests; and
- construction of infrastructure to prevent uncontrolled movement of pests and stock.

Measures such as vehicle wash down and the spraying of weeds are employed by IPCM at the existing Isaac Plains Coal Mine site to control pests on-site and to prevent movement of pests off-site. These measures and others will be implemented across the entire IIPP site. These are further discussed under **Section 10** and the IIPP EM Plan provided in **Section 20**.

2.2.8 **Mineral Resources Act 1989**

The principle objectives of this Act are to:

- 'encourage and facilitate prospecting and exploring for and mining of minerals;
- enhance knowledge of the mineral resources of the State;
- minimise land use conflict with respect to prospecting, exploring and mining;
- encourage environmental responsibility in prospecting, exploring and mining;
- ensure an appropriate financial return to the State from mining;
- provide an administrative framework to expedite and regulate prospecting and exploring for and mining of minerals; and
- encourage responsible land care management in prospecting, exploring and mining'.

New MLs for the Expansion Area and access/haul road linking the Expansion Area to the existing Isaac Plains Coal Mine, are being applied for under Part 7 of the MRA. The proposed access/haul road required to link the Expansion Area to the existing Isaac Plains Coal Mine currently traverses EPC755, EPC602 and EPC548. Vale are the principal holders of EPC755 while Anglo Coal and Exxaro are the holders of EPC602 and EPC548. Anglo Coal Australia is conducting exploration works in EPC602 and EPC548 to ascertain the suitability of a potential underground coal mine. Accordingly, IPCM are in negotiation with Anglo Coal and Exxaro Australia Pty Ltd (Exxaro) to obtain the conditional consent for mine infrastructure to be established on those tenements not held by Vale.

2.2.9 **Nature Conservation Act 1992**

The *Nature Conservation Act 1992* (NCA) was developed to ensure the conservation of nature. This is achieved through a variety of mechanisms including dedicating and declaring protected areas for those parts of Queensland with outstanding biological diversity, natural features and wilderness values, and through research and monitoring, etc. It also provides protection of rare, vulnerable and endangered animals and plants.

No significant impacts on protected animals and plants within the IIPP are likely, and there are no areas designated as National Parks, State Forests or conservation zones within the IIPP area, or within the adjacent area. Further information is provided in **Section 10**.

2.2.10 Petroleum and Gas (Production and Safety) Act 2004

In Queensland, a ML for coal does not bestow upon the holder of the lease general rights to produce CSG which may be within the ML area (although there are restricted rights to extract 'incidental' CSG, being CSG which is necessarily extracted in association with safe coal mining practices). CSG production is now primarily regulated under the *Petroleum and Gas (Production and Safety) Act 2004*, and a petroleum lease issued under that Act is required in order to commercially produce CSG.

CH4, a subsidiary of Arrow Energy, holds PLa222 (application only) over the KDA, PL196 over the existing mine and PL191 over a section of the proposed access/haul road intersection with the Peak Downs Highway. An authority to prospect, EPP364, also held by CH4, covers the remainder of the Expansion Area. The occurrence of petroleum tenements over the proposed MLs has relevance to the ML process under the MRA whereby IPCM, as a minimum, will be required to consult with the petroleum tenement holder, and an agreement will possibly be required with the tenement holder. Existing agreements between the parties give Arrow Energy priority to coal seam gas where the PL overlap the proposed ML area, but Arrow Energy has resolved that no appreciable methane reserves are present and it currently has no plans for the commercial capture of gas in the area.

2.2.11 Queensland Heritage Act 1992

This Act provides for the conservation and protection of places and items of historical or non-indigenous cultural heritage. There are no places on the Queensland Heritage Register of historical or non-indigenous heritage within the footprint of the IIPP.

2.2.12 Transport Infrastructure Act 1994

The objectives of the *Transport Infrastructure Act 1994* (TI Act) this Act are to permit and promote integrated planning and management of transport infrastructure. It outlines the various regimes for all modes of transport including air, rail, sea, busways and light rail. It is the primary legislation administered by the Department of Main Roads (DMR) in that it sets out the powers the DMR has for managing the State Controlled Road (SCR) network. A permit is required under the TI Act if there is interference with a SCR.

An assessment of the potential to impact on transport infrastructure is discussed in **Section 14** of this EIS. Minor increases in traffic volume on the Peak Downs Highway, a SCR, will be generated by the IIPP during the construction phase. This will not constitute significant interference within the meaning of the TI Act. No interference is proposed to the SCR during the operational phase. Interference will result from the construction of an underpass beneath the Peak Downs Highway (refer to **Section 3** and **Section 14**). The duration of the construction phase will be approximately 12 months.

2.2.13 Transport Operation (Road Use Management) Act 1995

The overall objectives of this Act are to provide for the effective and efficient management of road use in the State; provide a scheme for managing the use of the State's roads that will promote the effective and efficient movement of people, goods and services, and contribute to the strategic management of road infrastructure in ways consistent with the TI Act. It also provides mechanisms to improve road safety and the environmental impact of road use in ways that contribute to overall transport effectiveness and efficiency.

The potential impacts of the minor increases in traffic on the SCR, as a consequence of the IIPP, are discussed further in **Section 14** of this EIS.

2.2.14 Transport Planning and Coordination Act 1994

The objectives of this Act are to improve the economic, trade and regional development performance of Queensland, and the quality of life of Queenslanders, by achieving overall transport effectiveness and efficiency through strategic planning and management of transport resources.

The IIPP will achieve the objectives of the Act through effective and efficient transport that contributes to regional development as discussed in **Section 14**.

2.2.15 Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VMA) applies to freehold tenure only. The VMA aims to:

- regulate the clearing of vegetation to ensure the conservation of endangered and remnant regional ecosystems;
- prevent land degradation;
- prevent loss of biodiversity; and
- ensure ecologically sustainable processes continue.

Clearing of remnant vegetation on freehold land requires approval under the VMA and is administered through the IPA via an application for operational works for clearing of native vegetation. Mining activities are exempt from obtaining approval for the clearing of vegetation due to the provisions of the MRA and Schedule 8 of IPA. Clearing an area of remnant vegetation is proposed for the IIPP (refer to **Section 10**).

2.2.16 Water Act 2000

The *Water Act 2000* (Water Act) provides a structure to regulate the use of surface waters and groundwaters through Water Resource Plans. Under Section 808 of the Water Act "A person must not take, supply or interfere with water under this Act unless authorised under the Act". A licence is required for the removal of water.

The IIPP area is located within the Highlands Declared Subartesian Area (DNR, 2000). Within the Highlands Declared Subartesian Area a water licence (through Department of Natural Resources and Water (DNRW)) is required for taking or interfering with subartesian water for all works except stock or domestic water supply, therefore a licence is required for the extraction of subartesian water for the mining project. The construction of bores to extract such water also requires an operational works approval under the IPA.

A Riverine Protection Permit may be required for the diversions and for the low level crossing of the Isaac River.

Under the Water Act, the DNRW has the authority to direct the licensee to provide and maintain access to alternative water supplies for other water entitlement holders who would be affected by the granting of the licence. DNRW are also responsible for ensuring that the requirements of the Fitzroy Basin Water Resources Plan (WRP) are achieved (refer to **Section 2.3.14**).

A referable dam is defined under Section 481 of the Water Act as a dam that after construction will require a failure impact assessment and the assessment states the dam has the potential, after its construction, to have a category 1 or category 2 failure impact rating depending upon the population at risk. Referable dams also constitute assessable development under the IPA and require operational works approval.

The conceptual design of release dams proposed for the Expansion Area are not considered referable dams under the Water Act as they will not have a population at risk. Therefore, permit/approval under the Water Act and the IPA for a referable dam will not be required, based on the current design.

2.3 PLANNING POLICIES AND STANDARDS

2.3.1 Environmental Protection (Air) Policy 1997

This policy aims to achieve the objectives of the EP Act in relation to Queensland's air quality environment. It achieves this by:

- enhancing and protecting identified environmental values;
- involving the community; and
- ensuring the consistency of management decisions.

The IIPP will meet the objectives of this policy as outlined in **Section 8** and the EM Plan provided in **Section 20**.

2.3.2 Environmental Protection (Noise) Policy 1997

The EPP Noise aims to achieve the objectives of the EP Act in relation to Queensland's noise environment. This is achieved by:

- identifying the environmental values that need to be enhanced and/or protected;
- providing the framework for management programs and noise assessments; and
- providing information about noise to the community.

The IIPP proposes to meet the objectives of this policy as outlined in **Section 9** and the EM Plan provided in **Section 20**.

2.3.3 Environmental Protection Regulation 1998

Schedule 1 of the *Environmental Protection Regulation 1998* (EPR) lists 85 Environmentally Relevant Activities (ERAs); provides a regulatory regime for minor issues involving environmental nuisance as well as implementing National Environment Protection Measures (NEPMs) for the National Pollutant Inventory (NPI); prescribes emission standards for petrol and diesel emissions, and defines regulated wastes and provides for the management of used packaging materials.

The development of the Expansion Area is likely to result in the duplication of some ERAs for the IIPP, as further discussed in **Section 3.15**.

2.3.4 Environmental Protection (Waste Management) Policy 2000

The EPP Waste aims to achieve the objectives of the EP Act in relation to waste management. It achieves this by:

- providing the framework for minimising waste generation, maximising the usage of waste, efficient use of resources and maintaining ecologically sustainable principles;
- identifying the environmental values, i.e. life, health and wellbeing, diversity of ecological processes and ecosystems, land use to be enhanced and protected; and
- providing the framework for waste management programs.

IPCM proposes to comply with the objectives of this policy.

Section 13 of this EIS, and the EM Plan included in **Section 20**, discusses the existing and proposed waste strategies and management for the IIPP.

2.3.5 Environmental Protection (Waste Management) Regulation 2000

This Regulation aims to protect the environment by utilising the principles of ESD and by minimising the impact of waste on the environment. The regulation came into effect on 1 January, 2008, but had been anticipated in the formulation of the EIS.

Section 13 of this EIS, and the EM Plan included in **Section 20**, discusses the existing and proposed waste strategies and management for the IIPP.

2.3.6 Environmental Protection (Water) Policy 1997

The purpose of the EPP Water is to achieve the objectives of the EP Act, i.e. ESD, in relation to Queensland's waters. This is achieved by providing the framework for water quality guidelines (e.g. Australian and New Zealand Environment Conservation Council (ANZECC) guidelines) and ensuring management is implemented throughout the life of the IIPP. **Section 6** and **Section 7** discuss the potential impacts on surface and groundwater resources, respectively, within and around the IIPP. The EM Plan, included in **Section 20**, presents the existing and proposed mitigation and management strategies for potential impacts.

2.3.7 Mackay Region ACC Strategic Regional Plan (2004-2007)

The national network of Area Consultative Committees (ACCs) provide a link between the Australian Government and rural and metropolitan Australia. ACCs are volunteer community-based organisations which respond to issues in their regions, and provide a conduit to government on local, social and economic conditions. In Queensland, the ACCs work in partnership with the Departments of Transport and Regional Services to identify opportunities, priorities and development strategies for their regions.

The 2004–2007 ACC Strategic Regional Plan for the Mackay region has the primary objective of linking government, business and community to address strategic issues such as skills shortages, insufficient housing in mining areas, tourism development etc., and to identify opportunities, priorities and strategies for the region.

2.3.8 Mineral Resources Regulation 2003

This Regulation prescribes royalty payments, describes exploration permit requirements and outlines the various mining districts. The approval of the IIPP will result in an increase in the existing royalty payments made to the State.

2.3.9 Nature Conservation (Wildlife) Regulation 2006

The purpose of this regulation is to:

- classify native wildlife as:
 - extinct in the wild;
 - endangered;
 - vulnerable;
 - rare;
 - near threatened; or
 - least concern wildlife;
- classify particular other wildlife as either:
 - international wildlife; or
 - prohibited wildlife;
- state the declared management intent for each of the classes of wildlife.

Section 10 and **Section 20** of the EIS discuss the potential impacts and mitigation measures for wildlife identified under this regulation.

2.3.10 Nature Conservation Regulation 1994

Under this Regulation, recreational and commercial activities in National Parks are managed or controlled to minimise their impact. All activities on National Parks must be consistent with the management principles and with any management plan.

This Regulation is not applicable to the IIPP as there are no National Parks on, or in the vicinity of, the site.

2.3.11 Transport Infrastructure (State Controlled Roads) Regulation 2006

This regulation controls the movement of traffic on roads, the types of traffic permitted on motorways, the use of land on/near SCRs for camping and public utility plants. Refer to **Section 14** for further details.

2.3.12 Transport Operations (Road Use Management - Fatigue Management) Regulation 1998

The main objective of this regulation is to manage driver fatigue and to ensure drivers of heavy vehicles are healthy and in a fit state of wellbeing. It achieves this through a variety of mechanisms, including the use of logbooks and controls on the driving hours.

2.3.13 Transport Operations (Road Use Management - Road Rules) Regulation 1995 (Queensland Road Rules)

This regulation provides broad powers for signage (traffic control devices) that may be placed on roads. The IIPP will not increase traffic levels significantly along the SCR and therefore will not require additional traffic control devices.



2.3.14 Water Resource (Fitzroy Basin) Plan 1999

The purpose of this Water Resource (Fitzroy Basin) Plan (WRP) is to sustainably manage water resources within the Fitzroy Basin, i.e. the catchment in which the IIPP site is located, and provide frameworks and regulations, administered by DNRW, to manage the taking of water, including overland flow. The outcomes that are to be achieved from the WRP include security for water users, and to allow future water-related development within the basin.

The Fitzroy Basin Resource Operations Plan (Fitzroy Basin ROP) defines the rules that guide the allocation and management of water in the catchment.

The IIPP is located in the northern part of the basin and is expected to have little impact on the objectives of the WRP.

2.4 STATE PLANNING POLICIES AND MANAGEMENT PLANS

This section provides an assessment of the current and draft State Planning Policies (SPPs) which potentially apply to the IIPP. Mining activities are, however, exempt from requiring a development application for material change of use when SPPs require consideration. The following SPPs are current.

- SPP 1/92 - *Development and the Conservation of Agricultural Land.*
- SPP 1/02 - *Development in the Vicinity of Certain Aerodromes and Aviation Facilities.*
- Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006 -2016.
- SPP 2/02 - *Planning and Management of Acid Sulfate Soils.*
- SPP 1/03 - *Mitigating the Adverse Impacts of Flood, Bushfire and Landslide.*
- SPP 2/07 - *Protection of Extractive Industries.*
- SPP 1/07 - *Housing and Residential Development.*
- State and Regional Coastal Management Plans.

2.4.1 SPP 1/92 - Development and Conservation of Agricultural Land

The purpose of this SPP is to provide local government with guidance on the conservation of good quality agricultural land (GQAL) and how this matter is to be addressed when carrying out assessments of development proposals. In brief, SPP 1/92 is primarily focussed on:

- protecting GQAL;
- preventing alienation of GQAL by incompatible uses; and
- accepting loss of GQAL only if there is an overriding community need for the development and where the particular development has specific locational requirements.

Approximately 60 % of the existing Isaac Plains Coal Mine and approximately 75 % of the Expansion Area has been categorised as C1 - land suitable for improved pastures due to limitations, which preclude continuous cultivation for crop production. There are no class A or B GQAL cropping lands in the area. GQAL is further discussed in **Section 5.7**.

2.4.2 SPP 1/02 - Development in the Vicinity of Certain Aerodromes and Aviation Facilities

SPP 1/02 sets out the State's interests concerning development in the vicinity of those aerodromes and aviation facilities considered essential for the State's transport infrastructure or the national defence system.

Moranbah Airport is located approximately 9.5 km from the Expansion Area and approximately 8 km from the existing Isaac Plains Coal Mine. There are a number of other unnamed airstrips located between 6 to 17.5 km from the Expansion Area and the existing Isaac Plains Coal Mine. Moranbah Airport and the private airstrips are not listed in SPP 1/02 as airports and aviation facilities to which the SPP applies, therefore SPP 1/02 does not apply to the IIPP. In any case, the IIPP is well separated from these facilities.

2.4.3 Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006

The *Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016* (the Koala Plan) came into effect on 2 October, 2006. The Koala Plan sets out a comprehensive strategy to stop the decline in koala numbers and recover the species. The main issues addressed in the management plan are habitat protection, research, public education, development controls, cars, dogs and the extractive industry.

The IIPP site is located in District C in the Koala Plan. This district covers 77 local government areas where Koalas are known to occur in Queensland. The koala is listed as 'least concern wildlife' under the NCA in this district. Under the Koala Plan, the threat to koalas in this district is considered to be moderate to low.

2.4.4 SPP 2/02 - Planning and Management of Acid Sulfate Soils

State Planning Policy 2/02 applies to local government areas listed in Annex 1 and applies to all land, soil and sediment at or below 5 m Australian Height Datum (AHD) where the natural ground level is below 20 m AHD.

As elevations in the IIPP site are in the order of 200 m AHD to 230 m AHD, SPP 2/02 does not apply to this project.

2.4.5 SPP 1/03 - Mitigating the adverse impacts of Flood, Bushfire and Landslide

SPP 1/03 addresses development issues associated with minimising the adverse impacts of floods, bushfires and landslides, and provides guidelines to mitigate their adverse effects. To decrease the risk of the natural disaster, the development should:

- minimise the potential damage from flooding to property;
- ensure that public safety and the environment are not adversely affected by the detrimental impacts of floodwater on hazardous materials stored in bulk;
- ensure the essential services infrastructure (e.g. on-site electricity, gas, water supply, sewerage and telecommunications) maintain their function during a Defined Flood Event (DFE);
- maintain the safety of people and property by including firebreaks that provide adequate setbacks between building/structures and hazardous vegetation, and access for fire-fighting or other emergency vehicles;
- provide an adequate and accessible water supply for fire-fighting purposes; and
- provide adequate road access for fire-fighting/other emergency vehicles and safe evacuation.

There is potential for some flooding of areas within the IIPP site. To ensure minimisation of impacts from flooding on mining activities, levee banks will be constructed as detailed in **Section 4.2.1** and **Section 6**.

There is potential for bushfires to occur in the Moranbah area (refer to **Section 4.2.2**).

It is unlikely that landslides will occur within the majority of the IIPP site given the topography, some slippage may occur naturally in waterways (refer to **Section 4.2.3**).

IPCM will aim to meet the objectives of this SPP. **Section 6**, **Section 17** and **Section 20** provide further details on achieving these objectives.

2.4.6 SPP 2/07 - Protection of Extractive Industries

The objective of this SPP is to prevent incompatible land developments in the vicinity of State significant extractive resources. It aims to influence planning decisions so as to ensure extractive resources are protected and reduce the effects of the extraction on the surrounding communities.

No state significant extractive resources occur on or adjacent to the IIPP site. Therefore, this SPP is not applicable.

2.4.7 SPP 1/07- Housing and Residential Development

The aim of this SPP is to ensure that planning schemes make provision for a wide range of housing options on the basis of identified existing and future housing needs and increased opportunities for the delivery of housing diversity.

The SPP may be considered as indirectly applicable to this project due to the increased pressure on Nebo and Belyando Shire Councils to meet current and future housing demands. A detailed assessment of potential impacts on social infrastructure is provided in **Section 15**.

2.4.8 State and Regional Coastal Management Plans

Under the *Coastal Protection and Management Act 1995*, the State Coastal Management Plan (SCMP) and associated Regional Coastal Management Plans have the status of SPPs for the purpose of making and amending planning schemes, and assessing and deciding development applications. The draft Mackay-Whitsunday Regional Coastal Management Plan (M-WRCMP) covers the coastal zone within the local government areas of Whitsunday Shire, Mackay City and Sarina Shire and extends westward to include State waters within these Local Government Areas (LGAs). However, it does not include the Nebo or Belyando Shires.

The Expansion Area of the IIPP site is located wholly within the Nebo Shire Local Government Area and the existing Isaac Plains Coal Mine, on ML70342, is located within Belyando Shire Local Government Area, therefore the M-WRCMP is not applicable.

2.5 LOCAL GOVERNMENT AREAS

The IIPP is located within the Nebo Shire Council and Belyando Shire Council LGAs. The Expansion Area is located within the Nebo Shire Council LGA, while the existing Isaac Plains Coal Mine, on ML70342, is located within the Belyando Shire Council LGA².

2.5.1 Nebo Shire Council

2.5.1.1 Local Planning Provisions

Developments in the Nebo Shire are typically assessed under the Nebo Shire Planning Scheme which was gazetted on 23 November 2000. However, under Schedule 9 of the IPA, mining activities are exempt from the assessable development provisions of a local government planning scheme.

Notwithstanding the exemption afforded under the IPA, IPCM recognises the importance of the scheme to local planning and, to the extent practicable, has endeavoured to design the IIPP in a manner which satisfies the objectives of the scheme.

2.5.1.2 Strategic Designation

The Expansion Area is located on four parcels of land designated as Rural Agricultural Protection (RAP) and Special Government Use (refer to **Figure 2-3** and **Table 2-1**) under the Nebo Shire Planning scheme. The Scheme's objective for RAP land is:

- 'to protect GQAL from the development of non-agricultural uses, where such development may limit the continued use or viability of the land for agricultural purposes;
- to ensure that existing and potential mineral and construction material resources remain available for extraction; and

² NB: Since the release of the final EIS for public comment Belyando, Nebo and Broadsound Shires have been amalgamated into the Isaac Regional Council. This revised EIS has not been amended to reflect this as the intention of this version of the EIS is to address comments from stakeholders at the time of public release, including both Belyando and Nebo Shire Councils.

- to ensure that potential land use conflicts for ancillary and non-related rural activities, particularly with regard to agriculture and intensive animal husbandry pursuits, are minimised or otherwise appropriately buffered from such pursuits’.

The Scheme’s objective for Special Government Use is:

- ‘to allocate areas of land for the exclusive use of that land for government purposes; and
- to ensure that the development of non-government uses does not detrimentally impact on uses envisaged for government land.’

Table 2-1 Strategic Designation for the Expansion Area

Description	Strategic Designation
Lot 5 GV132	RAP
Lot 9 GV33	Special Purpose Zoning – Strategic Special Government Use
Lot 6 SP174999	RAP
Lot 8 GV196	RAP

According to the Nebo Shire Planning Scheme, Lot 8 GV196 is zoned as Special Purpose Zoning, but strategically designated as RAP. The intent of the RAP is for the council to “maintain and encourage the continued use of this land for appropriate rural pursuits”. However, the economic benefits of utilising a sought after resource to the local, State and Federal economics and the predominance of mining activities in similar land use areas demonstrate an overriding need for the project.

The intent for Special Government Use is for the council “to ensure that sufficient land is available so that an appropriate range of government services and facilities is available to the community”.

2.5.2 Belyando Shire Council

2.5.2.1 Local Planning Provisions

As stated above, under Schedule 9 of IPA, mining activities are exempt from provisions contained within a local government planning scheme. IPCM however recognises the importance of the scheme and has endeavoured to design the IIPP to satisfy this scheme.

2.5.2.2 Strategic Designation

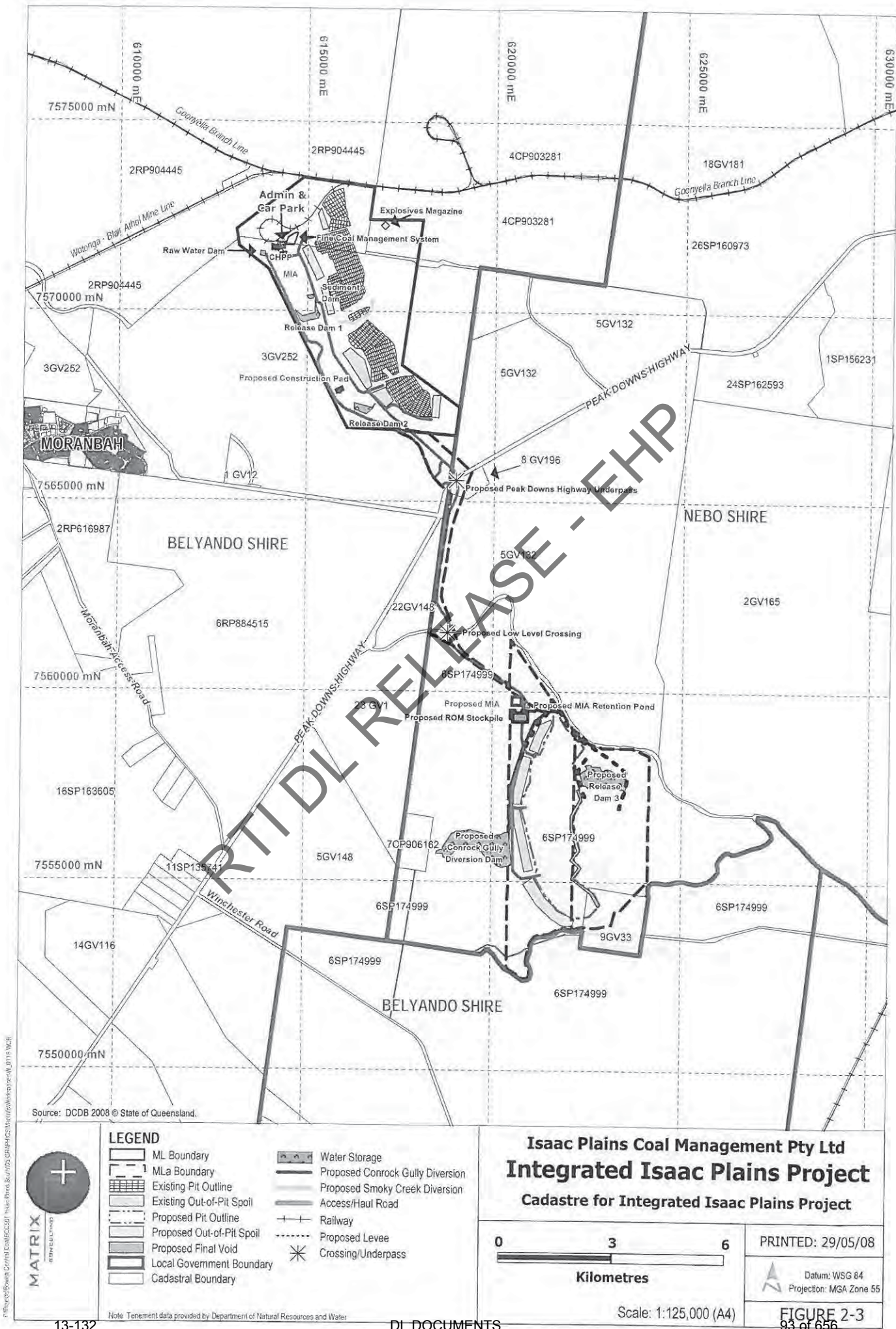
The existing Isaac Plains Coal Mine is located within the Belyando Shire on Rural A and Rural land (refer to **Figure 2-3** and **Table 2-2**). According to the planning scheme, the objective of Rural and Rural A land is:

- ‘to prevent fragmentation of farming and grazing land into uneconomic allotment sizes’.

Table 2-2 Strategic Designation for the existing Isaac Plains Coal Mine

Description	Strategic Designation
Lot 2 RP904445	Rural A
Lot 3 GV252	Rural A
Lot 4 CP903281	Rural

As discussed above in **Section 2.5.1.2**, an overriding need exists to enable the use of a sought after natural resource. The underlying landholders are duly compensated as required under the MRA.



2.6 GUIDELINES

2.6.1 Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000

This document updates the Australian water quality guidelines for fresh and marine waters released in 1992 using data, relevant literature, and other information available to at least 1996. The primary objective of the guidelines is to maintain fresh and marine water quality objectives required to sustain current or likely future environmental values for natural and semi-natural waterways in Australia and New Zealand. The guidelines:

- outline the important principles, objectives and philosophical basis underpinning the development and application of the guidelines;
- outline the management framework recommended for applying the water quality guidelines to the natural and semi-natural marine and fresh water resources in Australia and New Zealand;
- provide a summary of the water quality guidelines proposed to protect and manage the environmental values supported by the water resources; and
- provide advice on designing and implementing water quality monitoring and assessment programs.

The guidelines also relate to primary industries, the amalgamated agriculture, aquaculture and human consumption of foods.

These guidelines will be used for the assessment of water quality potentially impacted by mining activities at the IIPP.

2.6.2 Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code) 2004

The code establishes minimum standards, recommendations and guidelines for the public reporting of exploration results, mineral resources and ore reserves in Australasia and guidelines for reporting to government agencies and non-public organisations. It provides the framework for consistent and expert communication by which high levels of confidence can be ensured. The JORC Code applies to the IIPP through the description of the resource/reserve for the project (refer to **Section 3.4**).

2.6.3 Biodiversity Planning Assessments

This assessment identifies three levels of Biodiversity Significance (Local, State and Regional) and is the implementation of the Biodiversity Assessment and Mapping Methodology for Queensland. This results in a map and database information for each of the bioregions in Queensland which can be used for a range of planning or decision-making processes. Biodiversity and planning assessment information was used in the assessment of the ecological environment of the IIPP (refer to **Section 10**).

2.6.4 Bowen Basin River Diversions Design and Rehabilitation Criteria (ACARP, 2002)

This ACARP report was completed in three stages: Stage 1, Maintenance of Geomorphic Processes in Bowen Basin River Diversion; Stage 2, Monitoring Geomorphic Processes in Bowen Basin River Diversions; and Stage 3, Bowen Basin River Diversions - Design and Rehabilitation Criteria.

The report's aim was to investigate the form and processes of streams similar to those affected by mining operations in the Bowen Basin. From this, research was undertaken to determine the key parameters that affect and influence the shape and form of rivers and streams. These parameters provide the foundation for criteria which can be applied to the diversions as a result of mining operations in the Bowen Basin.

As part of the IIPP, it is proposed that two waterways are diverted to access coal reserves, Smoky Creek in ML70342, and Conrock Gully, in the proposed Expansion Area. The Bowen Basin River Diversions Design and Rehabilitation Criteria have been used in the development of the proposed diversions. Refer to **Section 3.10.1** and **Section 6** for further detail.



2.6.5 The Central Queensland Strategy for Sustainability – 2004 and Beyond

This document provides for the management of catchments in Central Queensland to improve and maintain the health of the natural ecosystems. This is achieved through a variety of goals including the integration of natural resource management, environmental management, economic development and community development. IPCM will aim to appropriately manage their activities so as not to not adversely impact on the catchments and sub-catchments within which it lies.

2.6.6 Department of Main Roads (DMR) Guidelines for Assessment of Road Impacts of Development (2006)

These guidelines outline the steps involved in assessing the impacts of a proposed development project on roads, identify measures to mitigate any road impacts, and provide assistance in the development of Road Impact Assessments (RIA) which are required if there is the potential for adverse impacts on the SCR.

There are nine principles which guide the assessment of road impacts. Principle three states that only projects which will increase traffic on a SCR by 5 % or more are classified as significant and therefore require an assessment of road impacts. The operation of the IIPP will not increase traffic by 5 % and therefore a RIA is not required. **Section 14** provides further detail on the likely traffic impacts resulting from the IIPP, including the likely increase resulting from the project during both the construction and operations phases.

2.6.7 Determining Dams Containing Hazardous Waste – Ecoaccess Information Sheet

This Ecoaccess information sheet outlines the steps in determining if a dam contains hazardous wastes, and if it is classified as a low hazard or high hazard dam. It provides the trigger concentrations of various parameters including Arsenic, Cadmium, Lead and Mercury, and provides a set of criteria which are used to determine the level of hazard based on risk. The three cells within the fine coal management system are classified as high hazardous dams as the system is located in a declared catchment or subartesian area and has a surface area greater than 2 ha. Testing conducted indicates that the cells also marginally exceed the Hazardous Dams Acceptance criteria for arsenic, copper and pH. No other hazardous dams will be on the IIPP site. Note that the proposed Release Dam 3 in the Expansion Area will be designed assuming that it is a high hazard dam given the potential risks to the Isaac River should the dam fail, particularly during low flow periods.

2.6.8 Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland (1995)

These guidelines were developed for the assessment and management of contaminated land in Queensland. The aim of these guidelines is to:

- 'establish best practice for managing land contamination through the planning and development control process'.

They are designed to be used by local government, landowners, developers and environmental consultants in the management of contaminated land. It achieves this through a variety of information provided, including:

- a summary of legislation;
- management techniques to reduce the environmental impacts;
- mitigation measures; and
- methods of disposal of contaminated soil.

There are a number of Schedule 1 notifiable non-mining activities which are currently carried out on the existing Isaac Plains Coal Mine that will be duplicated on the Expansion Area site, some of which have potential to contaminate land and water (refer to **Section 3.14**). No Schedule 2 activities will be carried out on the IIPP site.

2.6.9 Environmental Management Policy for Mining in Queensland (1991)

The Department of Mines and Energy (DME) adopted a policy in 1991 that activities on exploration permits, (Mineral Development Lease) MDLs and MLs should be managed in a responsible manner to achieve the following environmental objectives:

- achievement of acceptable post-disturbance land use capability;
- stable post-disturbance landform; and
- preservation of down stream water quality.

This policy aims to assist the mining industry in meeting environmental responsibilities under the MRA, and any conditions applied to exploration, mineral development and mining activities. The long-term goal is to achieve industry self-regulation with the DME providing technical guidelines, advice and an inspectorate role in overseeing the development and implementation of this Policy.

2.6.10 EPA Ecoaccess Guideline – Planning For Noise Control

The Guideline contains methods and procedures that are applicable for setting conditions relating to noise emitted from industrial premises, commercial premises and mining operations, and are intended for planning purposes. The Guideline is applicable to sounds from all sources, individually and in combination, which contribute to the total noise from a site.

This Guideline also includes criteria for estimating the probability of sleep disturbance from transient noise, such as heavy truck or rail operations, for various window types and settings. It may be used for assessing noises that contain impulsive components but it is not suitable for assessing noise that consists solely of discrete impulses, for example gunfire or blasting.

Section 9 of this EIS discusses the relevance of this Guideline to the IIPP.

2.6.11 EPA Ecoaccess Guideline - Noise and Vibration from Blasting

Blasting operations, and other mining activities such as dragline operations, CHPP, truck and shovel movements and trains have the potential to cause excessive noise and vibration impacts that can result in damage to, or failure of, a structure if not appropriately managed. The criteria set out in the Ecoaccess guideline "Noise and Vibration from Blasting" assist in minimising annoyance and discomfort that may be caused by blasting during mining, quarrying, construction and other operations which involve the use of explosives for fragmenting rock.

Section 9 of this EIS discusses the relevance of this Guideline to the IIPP.

2.6.12 The National Water Quality Management Strategy

The National Water Quality Management Strategy (NWQMS) has three major areas (policies, processes and guidelines) which provide assistance for the management of water bodies within Australia. The main aim is to achieve sustainable use of the water resources by protecting and enhancing water quality without decreasing economic and social development. The guidelines include drinking water quality, monitoring, groundwater, stormwater and sewage. Through NWQMS, 19 guidelines have been developed.

2.6.13 Queensland Water Quality Guidelines (2006)

This document provides the guidelines and the framework for their application for water quality in Queensland. Each region within Queensland has been assigned specific guidelines with more specification than the national guidelines. For each region, water types are further particularised (i.e. lakes, wetlands, estuaries etc.) and in certain cases, guidelines for local waters have been specified.

2.6.14 Planning Guidelines - The Identification of Good Quality Agricultural Land (1993)

This document aims to support government and private companies to identify GQAL. Agricultural land has been separated into four categories according to its suitability for pastures, crops, etc. The factors used in assessing its suitability for agriculture are the soil, topographic and climatic limitations. This guideline is to be read in conjunction with SPP 1/92 *Development and the Conservation of Agricultural Land*. The potential impacts on the quality of land for agricultural purposes have been assessed against this guideline and policy (refer to **Section 2.4.1** and **Section 5.7**). The assessments have revealed that the IIPP has historically been used for grazing activities and would fit into the category of Class C1 - land suitable for improved pastures.

2.6.15 A Policy Framework to Encourage the Progressive Rehabilitation of Large Mines (2004)

This report outlines the issues of rehabilitation and provides a framework to encourage progressive rehabilitation as opposed to final rehabilitation. It summarises the need for legislation and criteria in determining what rehabilitation is required and the timeframes in which it should occur. It also provides a set of criteria which can be used in determining if the rehabilitation has been successful.

2.6.16 Road Planning and Design Manual - Department of Main Roads (2001 to 2006)

This manual provides the guidelines for the planning and design for new and upgraded roads in Queensland. Included are guidelines for the planning and design of roundabouts, interchanges, lighting, alignments (horizontal and vertical), traffic signals and railway crossings.

2.6.17 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland (1995)

These guidelines provide assistance on sound environmental management through all the phases of a mining project. There are two main objectives for the guidelines. They are:

1. to provide advice about mine planning, water management and rehabilitation which can assist the mining industry to manage its exploration, mining operation and rehabilitation activities, so as to satisfy the environmental objectives of the MRA and the Environmental Management Policy for Mining in Queensland; and
2. to assist Proponents and operators in the preparation of EMOS (now EM Plans), PoOs and Environmental Audits required for planning for and managing environmental impacts generated by mining operations.

2.7 SUMMARY OF LEGISLATIVE REQUIREMENTS

Planning and environmental licences, permits and approvals that may be applicable to the IIPP are summarised below in **Table 2-3**.

Table 2-3 Summary Table of Legislative Requirements

Legislation	Responsible Authority	Activity	Legislative Requirement	Time Frame
<i>Aboriginal Cultural Heritage Act 2003</i>	DNRW	Protection of Aboriginal Cultural Heritage from surface disturbance works.	Approved CHMP/CH Agreement required.	CHMP must be approved prior to commencing soil disturbing activities.
<i>Coal Mining Safety and Health Act 1999</i>	DME	Safety and health.	Obligations under the Act.	Throughout the life of the project.
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth)	DEWHA	Submission of a referral for activities that have the potential to impact on matters of national environmental significance.	Referrals made for the existing Isaac Plains Coal Mine and for the IIPP – both were determined to be 'not a controlled action'.	N/A

IIPP Amalgamated Environmental Impact Statement



Project Approvals and Legislative Framework

Legislation	Responsible Authority	Activity	Legislative Requirement	Time Frame
<i>Environmental Protection Act 1994</i>	EPA	Where 'serious and material environmental harm' is caused or threatened.	Duty to Notify EPA.	As soon as reasonably practicable after becoming aware of the event involving the harm.
		Contamination of land or identification of land that is likely to be contaminated.	Duty to Notify EPA.	S371 of the EP Act 1994 Within 22 business days.
		Conduct of an environmentally relevant mining or non-mining activity.	Environmental Authority.	Prior to commencing activity.
		Abatement of nuisance noise or dust.	Complaint resolution in response to complaints.	In accordance with EA conditions.
		Requirement to undertake an EIS for activities that have the potential for environmental harm.	Approval of this EIS.	Prior to commencing activity.
<i>Explosives Act 1999 and AS2187 'Explosives-Storage and use'.</i>	DME	Storage, transport and use.	Permit (existing).	N/A
<i>Integrated Planning Act 1997</i>	Nebo Shire Council/ Belyando Shire Council	Mining Activities - assessment under the planning scheme.	All 'mining activities' are exempt developments. Other development under Schedule 8 may still be required (refer below).	N/A
	DNRW	Clearing of vegetation - operational works approval for clearing of remnant vegetation, except where the clearing is for a 'mining activity'.	Not required due to exemptions for a 'specified activity.' Mining activities are included in the definition of a specified activity (refer definitions in IPA).	N/A
	DNRW	Groundwater extraction - taking of artesian water or subartesian water in a declared subartesian area.	An operational works approval is required under the IPA for constructing bores and taking water from artesian or subartesian aquifers (site is located in declared subartesian area) aquifers.	Prior to commencing activity.
<i>Integrated Planning Act 1997 & Fisheries Act 1994</i>	Department of Primary Industries and Fisheries (DPI&F)	Construction of a barrier across a waterway that stops, or forms a significant barrier to the flow of water and fish movement.	Potential to require Waterway Barriers Works Approvals for the construction of the low level crossing of the Isaac Plains River, the proposed diversions of Smoky Creek and Conrock Gully and any dams proposed for the project. This requirement will be dependent on final engineering design. (Applications will be made through IDAS and assessed under the <i>Fisheries Act 1994</i>).	Prior to commencing activity.
<i>Dangerous Goods Safety Management Act 2001</i>	Nebo Shire Council	Storage of flammable and combustible liquids.	Coal mines are exempt.	N/A

Legislation	Responsible Authority	Activity	Legislative Requirement	Time Frame
<i>Native Title Act 1992</i> (Commonwealth)	Commonwealth of Australia – National Native Title Tribunal	Activities on lands where native title has not been extinguished. Provides a register of approved native title claimant groups for the purpose of the CHMP.	Native title is extinguished on freehold or GHFL tenures. With the exception of Lot 9 GV33, native title is extinguished.	N/A
<i>Nature Conservation Act 1992</i>	EPA	Interference with species listed under the <i>Nature Conservation (Wildlife) Regulation 1994</i> .	No permit required as there will be no disturbance or interference with species protected under this Act.	N/A
<i>Queensland Heritage Act 1992</i>	Queensland Heritage Council	Impacts to Heritage listed sites.	N/A as there were no heritage records identified.	N/A
<i>Vegetation Management Act 1999</i>	DNRW	Vegetation clearing.	N/A due to exemptions for mining activities under the IPA no permit for the clearing of remnant vegetation is required.	N/A
<i>Water Act 2000</i>	DNRW	Taking water or interfering with waterways, licensing of bores and dams.	Within the Highlands Declared Subartesian Area a water licence (through DNRW) is required for taking or interfering with subartesian water for all works except stock or domestic water supply, therefore a licence is required for the extraction of subartesian water for the mining project. The construction of bores to extract such water also requires an operational works approval under the IPA. A Riverine Protection Permit will be required for: any geotechnical assessment within the Isaac River, the construction of the low level crossing over the Isaac River in addition to the diversion of Smoky Creek and Conrock Gully.	Prior to commencing activity.

2.7.1 Approvals

Current mining activities are carried out under the following approvals/documents:

- ML70342 issued under the MRA (granted 1 December 2005);
- EA Permit # MIN100329505 issued under the EP Act;
- EMOS – November 2005 approved under the EP Act; and
- PoO – December 2007 to December 2008, approved under the EP Act.

The IIPP will require the following approvals:

- amendment of the EM Plan and EA;
- additional MLs;
- Riverine Protection Permit for the development of the low level crossing on the Isaac River and for the diversion of waterways; and
- EIS approval as part of the EA assessment process.

A Waterway Barrier Works Approval may also be required for the development of the low level crossing of the Isaac River dependent on the final engineering design.

RTI DL RELEASE - EHP

3

DESCRIPTION
OF THE PROJECT

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT



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3 DESCRIPTION OF THE PROJECT

3.1 PROJECT LOCATION

The existing Isaac Plains Coal Mine is located approximately 7 km north-east of Moranbah in the Bowen Basin, Central Queensland (refer to **Figure 1-1**). The southern extent of the approved operations open cut pits is approximately 2 km north of the Peak Downs Highway. A locality map showing the ML for the existing Isaac Plains Coal Mine is displayed on **Figure 1-2**.

The proposed Expansion Area is located approximately 10 to 12 km south-east of the township of Moranbah (refer to **Figure 1-1**), south of the Peak Downs Highway and south of the Isaac River (refer to **Figure 1-3**).

As part of the IIPP, an access/haul road is proposed to be constructed which will act as the primary access linking the Expansion Area to the existing Isaac Plains Coal Mine. The access/haul road will include a low level crossing of the Isaac River and the construction of an underpass beneath the Peak Downs Highway (refer to **Figure 1-3**).

The southern boundary of the Expansion Area is bordered by Cherwell Creek, a tributary of the Isaac River. Neither Cherwell Creek nor the Isaac River requires diversion. An unnamed watercourse known locally as Conrock Gully, also a tributary of the Isaac River passes through the middle of the Expansion Area in a general west-east direction and is proposed to be diverted to allow recovery of the underlying resource.

The nearest residences to the IIPP are:

- sch4p3(3) Prejudice the protection of an individuals right to privacy of the existing Isaac Plains Coal Mine and 13 km from the Expansion Area;
- sch4p3(3) Prejudice the protection of an individuals right to privacy of the proposed Expansion Area boundary and approximately 1 km from the proposed southern extent of the open cut development;
- sch4p3(3) Prejudice the protection of an individuals right to privacy of the proposed access/haul road crossing of the Peak Downs Highway, 2 km from the existing Isaac Plains Coal Mine and 7 km from the Expansion Area;
- sch4p3(3) Prejudice the protection of an individuals right to privacy of the Expansion Area and 3 km from the existing Isaac Plains Coal Mine;
- the sch4p3(3) Prejudice the protection of an individuals right to privacy of the Expansion Area and 6 km from the Expansion Area, on the Poitrel ML; and
- sch4p3(3) Prejudice the protection of an individuals right to privacy for the Expansion Area and 16 km from the Peak Downs Highway underpass.

Figure 1-2 and **Figure 1-3** illustrate the location of the nearest residences and the township of Moranbah with respect to the IIPP.

3.1.1 Expansion Area – Area of Impact

The proposed MLs for the Expansion Area and associated infrastructure cover an area of approximately 2,293 ha. Based on current mine plans, an area of approximately 1,477 ha will be subject to disturbance associated with open cut operations, roads, water management structures and mine infrastructure.

3.2 TENURE, ZONING AND TENEMENTS

3.2.1 Local Government Areas

The Expansion Area is located within the Nebo Shire Council LGA, while the existing Isaac Plains Coal Mine is located within the Belyando Shire Council LGA.¹

3.2.2 Tenure

The existing Isaac Plains Coal Mine is located on Lot 3 GV252 (Freehold – Rural A), Lot 2 RP904445 (Freehold – Rural A), Lot 4 CP903281 (Lands Lease – Rural) and an unnamed road. Smoky Creek is located on Lot 3 GV252 (refer to **Figure 2-1** and **Figure 2-3**).

The Expansion Area incorporates all or part of Lot 5 GV132 (Freehold – Rural Agricultural Protection), Lot 6 SP174999 (Freehold – Rural Agricultural Protection), Lot 9 GV33 (Reserve – Special Purpose Zoning for camping, water and roads) and Lot 8 GV196 (zoned as a Reserve – Special Purpose Zoning, however, it is strategically designated as Rural Agricultural Protection). The principal landholdings are Lot 5 and Lot 6 (refer to **Figure 2-2** and **Figure 2-3**).

Property ownership details for the existing Isaac Plains Coal Mine ML, i.e. ML70342, and the proposed MLs associated with the IIPP are listed in **Table 3-1**. **Table 3-1** also lists the easements affecting each parcel.

3.2.3 Mining and Petroleum Tenements

The existing Isaac Plains Coal Mine is contained within ML70342.

The Expansion Area is located within the southern portion of EPC755 (held by Vale and IP Coal) and within the KDA, which is located on the eastern boundary of EPC548 (held by Anglo Coal and Exxaro Australia Pty Ltd (Exxaro)). Under the terms of an agreement with Vale and IP Coal, the holders of EPC548 have consented to the lodging of MLa 70361 over the KDA. The Eastern portion of the Expansion Area (within EPC755) will be contained within MLa70382.

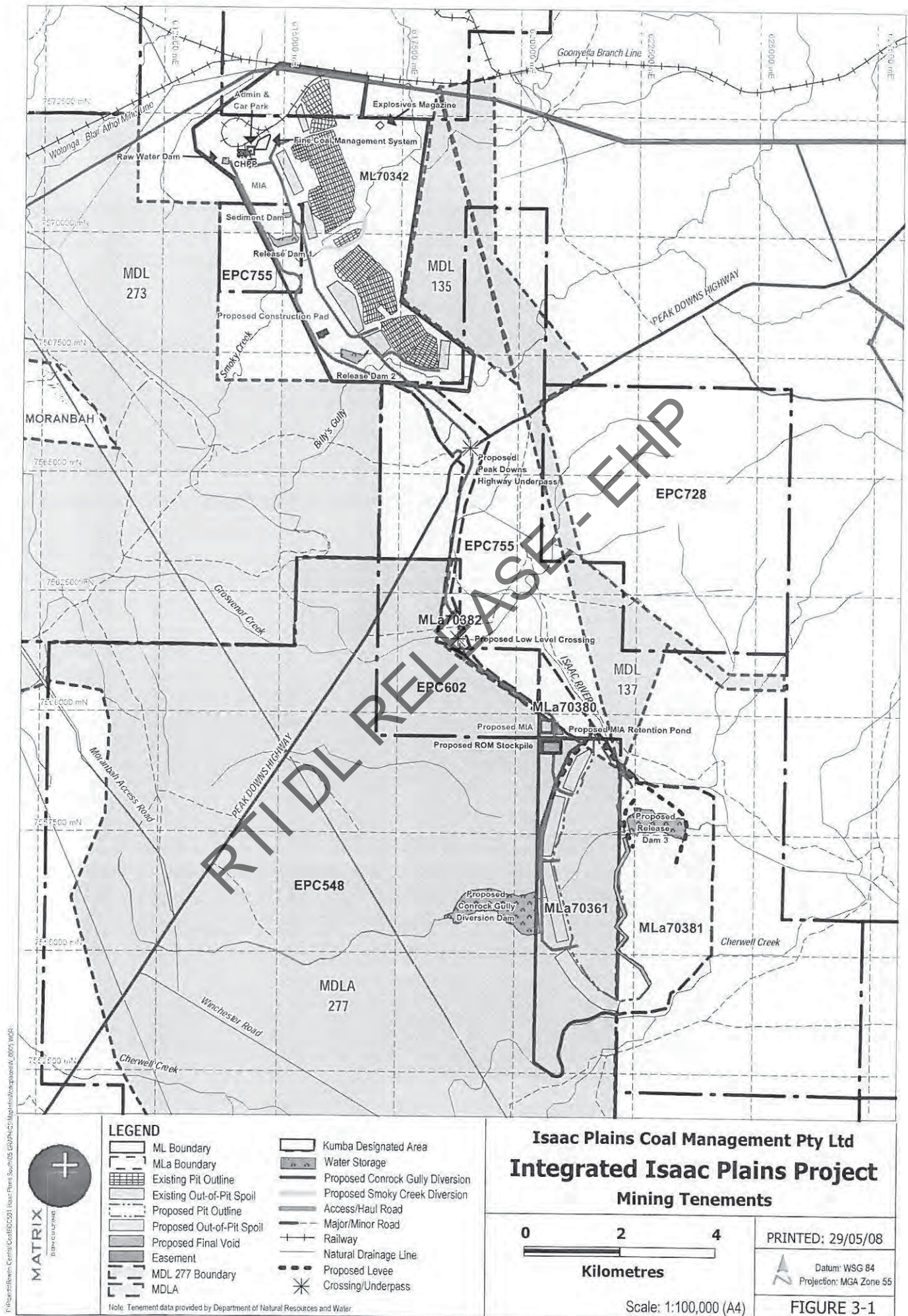
Mineral Development Licence application (MDLa) 277, also held by Exxaro, overlaps the KDA.

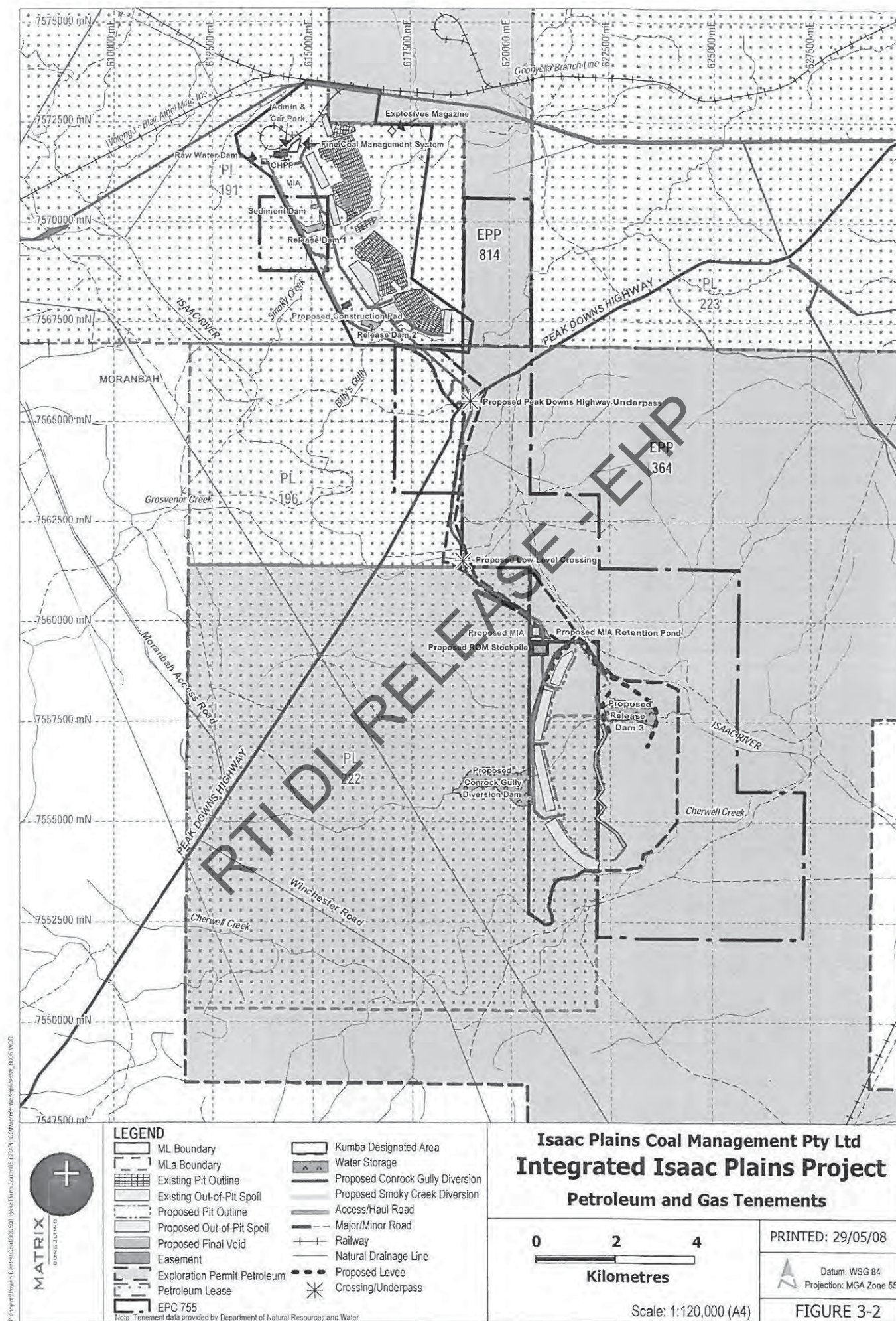
The proposed access/haul road required to link the Expansion Area to the existing Isaac Plains Coal Mine will be contained within two MLAs for infrastructure only, MLa70380 and MLa70381, which cover parts of EPC755, EPC602 (held by Anglo Coal and Exxaro) and EPC548. Anglo Coal is conducting exploration works in EPC602 and EPC548 to ascertain the suitability of a potential underground coal mine. IPCM is negotiating an agreement with Anglo Coal and Exxaro to obtain consent for mine infrastructure to be established on those tenements not held by the Applicants.

CH4 Pty Ltd, a subsidiary of Arrow Energy Ltd, holds Petroleum Lease application (PLa) 222 over part of the KDA, Petroleum Lease (PL) 196 over the existing mine and PL191 over a section of the proposed access/haul road in the vicinity of the Peak Downs Highway. An Authority to Prospect, (EPP) 364 (held by AGL Energy Ltd (99%) and CH4 (1%)) covers the remainder of the Expansion Area. The occurrence of petroleum tenements over the proposed MLAs has relevance to the ML application process under the MRA whereby the Applicants, are required to consult with the petroleum tenement holders and need their consent for the grant of the MLs where they are overlapped by PLs. Existing agreements between the parties give CH4 priority to coal seam gas where the PLs overlap the proposed ML area, but Arrow Energy has determined that no appreciable methane reserves are present and it currently has no plans for the commercial capture of gas in the area.

Figure 3-1 and **Figure 3-2** illustrate the mining and petroleum tenements respectively that exist over the IIPP.

¹ NB: Since the release of the EIS for public comment, Belyando, Nebo and Broadsound Shires have been amalgamated. This revised EIS has not been amended to reflect this as the intention of this version of the EIS is to address comments from stakeholders at the time of public release, including both Belyando and Nebo Shire Councils..





Description of the Project

Table 3-1 Property Ownership Details

Description	Landowner	Tenure	County	Parish	Easements
sch4p3(3) Prejudice the protection of an individuals right to privacy		Freehold	Grosvenor	Stalbridge and Wallanbah	Rights and interests reserved to the Crown by Deed of Grant No. 17770130 (Lot 5 on CP GV132). Sec 147A Notation No. 601083730 (147A) 31/12/1984. The provisions of section 174(1) of the Land Act 1994 apply to a transfer of the whole part of the land. Easement No 710069744 3/11/2006 burdening the land to Lots 3 and 4 on SP190252 over Easement D on SP190252. Easement No 710090791 10/11/2006 burdening the land to Lots 3 and 4 on SP190266 over Easement Q on SP184914 and easement V on SP189490.
Lot 9 GV33	Nebo Shire Council	Reserve – Camping, water and road	Grosvenor	Stalbridge	State Permit No 708621519. A State Permit has been created.
sch4p3(3) Prejudice the protection of an individuals right to privacy		Freehold	Grosvenor	Wallanbah	Rights and interests reserved to the Crown by Deed of Grant No. 17770130 (Lot 2 on CP GV320). Sec 147A notation No 601083730 (147A) 31/12/1984. The provisions of Section 174(1) of the <i>Land Act 1994</i> apply to a transfer of the whole or part of the land. Easement in Gross No 700853202 13/09/1995 burdening the land to the Northern Electricity Authority of Queensland over easement in Portion 2 on Crown Plan GV41 under Section 467(2) of the <i>Land Act 1994</i> identifying easement No A433. Transfer No 703627424 13/10/1999 Easement in Gross: 700853202 Queensland Electricity Transmission Corporation Limited. Easement in Gross No 700853230 13/09/1995 burdening the land to the Queensland Electricity Commission over easement A and B on Crown Plan GV152 under Section 467(2) of the <i>Land Act 1994</i> identifying easement No A1248. Transfer No 703675354 05/11/1999 Easement in Gross: 700853230 Queensland Electricity Transmission Corporation Limited. Easement in Gross No 700853239 13/09/1995 burdening the land to Thiess Dampier Mitsui Coal Pty Ltd over easements F and G on Crown Plan GV199 under Section 467(2) of the <i>Land Act 1994</i> identifying easement No A1940 recorded 06/06/1985. Easement in Gross No 707022330 25/09/2003 burdening the land to Ergon Energy Corporation Limited over Easement H on SP164056. Easement in Gross No 710039300 24/10/2006 burdening the land to Ergon Energy Corporation Limited over Easement J on SP190209.

Description of the Project

Description	Landowner	Tenure	County	Parish	Easements
sch4p3(3) Prejudice the protection of an individuals right to privacy		Freehold	Grosvenor	Ingsdon	<p>Rights and interests reserved to the Crown by Deed of Grant No. 18781244 (Lot 3 on CP GV252).</p> <p>Easement in Gross No 700147615 04/08/1994 burdening the land to the Northern Electric Authority of Queensland over Easement on Plan GV66 under Section 285 of the <i>Land Act 1962</i>.²</p> <p>Transfer No 703627424 13/10/1999 Easement in Gross: 700147615 Queensland Electricity Transmission Corporation Limited.</p> <p>Stock route agreement No 700147618 04/08/1994 pursuant to the provisions of the <i>Stock Routes and Rural Land Protection Act 1985</i> under Section 285 of the <i>Land Act 1962</i>.</p> <p>Easement No 700147623 04/08/1994 burdening the land to Utah Development Company and Mitsubishi Development Pty Ltd over easements A and B on plan GV78 under Section 285 of the <i>Land Act 1962</i>.</p> <p>Easement No 700147625 04/08/1994 burdening the land to Utah Development Company and Mitsubishi Development Pty Ltd over Easements C, D, G and I on Plan GV76 under Section 285 of the <i>Land Act 1962</i>.</p> <p>Easement No 700147626 04/08/1994 burdening the land to Thiess Dampier Mitsui Coal Pty Ltd over Easements E and F on Plan GV193 and Easement N on Plan GV198 under Section 285 of the <i>Land Act 1962</i>.</p> <p>Easement in Gross No 700147630 04/08/1994 burdening the land to the Crown in right of the State of Queensland over Easement A on Plan GV203 under Section 285 of the <i>Land Act 1962</i>.</p> <p>Sec 147A Notation No 700584787 03/04/1995. The provisions of Section 157A of the Land Act 1962-1990 apply to a Transfer of the whole or part of the land.</p> <p>Easement in Gross No 707022316 burdening the land to Ergon Energy Corporation Limited over Easement W on SP162577.</p> <p>Easement No 710090810 10/11/2006 burdening the land to Lots 3 and 4 on SP190266 over Easements S, U and Z on SP184916.</p>
Lot 4 CP903281	Queensland State Government	GHPL	Grosvenor	Ingsdon	<p>Resumption Easement No 602803066 (R1163) 26/02/1974 Easement pursuant to notice dated the 2nd September 1971 over an area of approximately 17 acres 1 road of the within-described holding is taken by the commissioner for railways as from the fourth date of September 1971 for the purpose of access to Mallawa Siding on the Hay Point to Goonyella Railway (plan GV106).</p> <p>Resumption Easement No 602803067 (R1164) 26/02/1974 Easement pursuant to notice dated the 30 March 1972 over an area of approximately 17 acres 32 perches of the within-described holding is taken by the Commissioner for Railways as from the first day of April 1972 for the purpose of the construction of a water pipeline from Moranbah to Coopabella at the junction of the Goonyella and Peak Downs railway lines (GV109).</p> <p>Easement No 602803068 (A1709) 08/08/1983 Easement in pursuance of an agreement dated the 9th day of December, 1982 between the lessee of the within-described holding and Thiess Dampier Mitsui Coal Pty Ltd for purposes as defined in such agreement.</p> <p>Resumption Easement No 602803069 (R1165) 01/06/1987 Easement pursuant to proclamation dated 10th July, 1986 under Section 306 of the Land Act 1962-1987 over an area of 16.86 hectares as shown as Easement J in Lot 4 on Plan GV173 on Plan GV279 deposited in the department of mapping and surveying for the purpose of electrical works (transmission line) is hereby resumed and shall vest in the Queensland Electricity Commission as from 12th July 1986.</p>

² Superseded by *Land Act 1994*

Description of the Project

Description	Landowner	Tenure	County	Parish	Easements
					<p>Transfer No 703437140 07/07/1999 resumption Easement: 602803069 (R1165) Queensland Electricity Transmission Corporation Limited.</p> <p>Resumption Easement No 703015328 18/11/1998 burdening the land to the State of Queensland over Easements K and L on SP106036.</p> <p>Easement No 706947253 02/09/2003 burdening the land to Lot 1 on SP107309 over Easement M on SP156232.</p> <p>Easement No 707148824 31/10/2003 burdening the land to Lot 1 on SP158697 over Easement M on SP156232.</p> <p>Easement in Gross No 707716772 13/05/2004 burdening the land to Ergon Energy Corporation Limited over Easement N on SP164057.</p>
sch4p3(3) Prejudice the protection of an individuals right to privacy		Freehold	Grosvenor Grosvenor Cairns	Moranbah Stalbridge Winchester	<p>Rights and interests reserved to the Crown by Deed of Grant No. 40016509 (Lot 6 on CP906162).</p> <p>Easement No 602803035 (A610) 28/03/1972 Easement in pursuance of an agreement dated the 10th day of August, 1971 between the lessee of the within-holding and the Queensland Electricity Commission for purposes as defined in such agreement.</p> <p>Easement No 602798666 (A623) 21/08/1972 burdening the land to the Queensland Electricity Commission over Easement on Plan GV62.</p> <p>Easement No 602798667 (A624) 21/08/1972 burdening the land to the Queensland Electricity Commission over Easement on Plan CNS45.</p> <p>Easement No 602798668 (A1241A) 15/05/1979 burdening the land to the Queensland Electricity Commission over Easements A, B and C on Plan CNS151.</p> <p>Resumption Easement No 602798669 (R1269) 13/05/1988 burdening the land to the Queensland Electricity Commission over Easement D on Plan CNS365.</p> <p>Resumption of Easement No 602798671 (K465128F) 19/11/1990 burdening the land to the Commissioner for Railways over Easement E on Plan CNS406.</p> <p>Resumption of Easement No 602798672 (K465131V) 19/11/1990 burdening the land to the Commissioner for Railways over Easement A on Plan CNS399 and Easements F and G on Plan CNS400.</p> <p>Easement in Gross No 702805453 23/07/1998 burdening the land to the Queensland Electricity Transmission Corporation Limited over Easement D on CP906162.</p> <p>Easement No 702960290 benefiting the land owner Easement A on SP111551.</p> <p>Easement No 706546130 burdening the land to Lot 5 on SP110795 over Easement A on SP156917.</p>
Lot 8 GV196	Commissioner of Main Roads	Quarry	Grosvenor	Stalbridge	Nil

3.3 PROJECT HISTORY

The current EPC755 had been explored in a number of phases of activity, which are summarised as follows:

- the Utah Development Company Pty Ltd recorded exploration in the area in the 1960s. Although coal was intersected at shallow depths, it was not investigated further. Some six holes transected the existing Isaac Plains Coal Mine area, but did not intersect the Leichhardt seam (LHD) due to a maximum drill hole depth of 60 m and the spacing between holes;
- Thiess Peabody Mitsui Pty Ltd conducted traverses in the area from the mid 1960s into the 1970's;
- Queensland Mines Department drilled some regional exploration holes in the south of EPC755, outside the existing Isaac Plains Coal Mine area in the 1970's;
- Iscor Australia Pty Ltd, as the holder of EPC602 at that time, drilled six holes in the southern part of the area, all of which targeted the deeper Moranbah Measures. The potential of the Rangal and Fort Cooper Measures was not investigated although coal was intersected at very shallow depths in one of these holes. These holes were south of the existing Isaac Plains Coal Mine area; and
- MGC Resources Australia Pty Ltd conducted 2D dynamite seismic surveys across the area, and followed this up with some gas/oil exploration holes. Moranbah 1S was completed in November 1993 to a depth of 636 m. This hole is not within the existing Isaac Plains Coal Mine area, but was spudded in the Fort Cooper Measures some 1.5 km south west of the site.

Aquila drilled 26 holes in EPC755 between September 2002 and April 2003, some of which are within the Expansion Area. In 2003 five chip drill holes were completed in EPC755 by Nebo Central Coal Pty Ltd, the holder of EPC667 immediately north of EPC755. These indicated that there was a coalescing of the LHD and LHD Lower working section (LHL) split and the main LHD seam in EPC755. Two of these holes (BC095 and 096) were in the existing Isaac Plains Coal Mine area.

In January 2004 Aquila (50 %) and Bowen Central Coal Pty Ltd (BCC) (50 %) formed the Bowen Central Coal Joint Venture (BCCJV) for the purposes of exploration and subsequent development of the exploration permits for coal granted to Aquila since 2001, including EPC755. Bowen Central Coal Management Pty Ltd (BCCM) was appointed as the manager of the BCCJV.

From April 2004 to September 2004, BCCM drilled some 316 drill holes in EPC755 with 298 within the existing Isaac Plains Coal Mine area. These included rotary chip drilling, 100 mm core drilling, continuous 62 mm diamond coring, and Lox reverse circulation drilling using modern coal exploration drill rigs. Some 23,000 m of drilling was completed, with 301 m of 100 mm coring and 281 m of 62 mm coring undertaken for later geotechnical evaluation. The drill program initially consisted of chip holes to determine the lateral extent of the potential resource and some initial coring to test for coal quality.

In July 2005 IP Coal (50 %) and AMCI (IP) Pty Ltd (AMCI (IP)) (50 %) formed the Isaac Plains Coal Joint Venture (IPCJV) for the purposes of developing and operating the Isaac Plains project within EPC755 and the KDA. IPCM was appointed as the Manager of IPCJV. In 2007, Vale acquired AMCI (IP) which was renamed Vale (IP) Pty Ltd.

3.4 GEOLOGY AND RESOURCES

3.4.1 Regional Geology

The deposit being mined at the existing Isaac Plains Coal Mine and proposed to be mined in the Expansion Area is located in the northern part of the Permo-Triassic Bowen Basin which principally comprises fluvial and some marine sediments. The Bowen Basin is part of a connected group of Permo-Triassic basins in eastern Australia which includes the Sydney and Gunnedah Basins. The Bowen Basin's axis orientation is north north-west to south south-east roughly parallel to the Paleozoic continental margin. Tectonically, the Bowen Basin can be divided into north north-west to south south-east trending platforms or shelves separated by sedimentary troughs. The units from west to east are the Springsure Shelf, Denison Trough, Collinsville Shelf/Comet Platform, Taroom Trough, Connors and Auburn Arches (interrupted by the Gogango Overfolded Zone) and the Marlborough Trough. Development of the basin in the Early Permian was in the form of half grabens which subsequently became areas of regional crustal sag. Variations in depositional patterns and deformation styles occur along strike suggesting the possibility of north-east trending deep seated crustal transfer faults referred to as transfer corridor by Hammond (1987).

The basin has suffered north-east to south-west oriented extensional and compressional faults. Structurally, the deposit lies on the western boundary of the deformed Nebo Synclinorium immediately west of a regional thrust fault system-the Burton Range Thrust. To the east of the thrust, seams are repeated in the Wotonga and Moranbah deposits. Further to the west is the structurally simple Collinsville Shelf.

The economic seams are contained in the Late Permian Rangel Coal Measures which are approximately 100 m thick. The Rangel Coal Measures are underlain by the Fort Cooper Coal Measures and overlain by the Late Permian to Early Triassic Rewan Group. **Table 3-2** details the regional stratigraphy of the North Bowen Basin.

The Rangel Coal Measures comprise light grey, cross bedded, fine to medium grained labile sandstones, grey siltstones, mudstones and coal seams. Cemented sections are common in the sandstones. The transition from the Rangel Coal Measures to the Rewan Formation is generally difficult to define and is often based on the change from the green-grey colour of the Rewan sandstones to the blue-grey colour of the Rangel sandstones. The transition between the formations is located 15 to 60 m above the first major coal seam in the Rangel Coal Measures LHD Seam.

Table 3-2 Permian –Triassic Stratigraphy of the North Bowen Basin

Moolayember Formation		
Clematis Group	Expedition Sandstone Glenidal Formation	
Rewan Group	Arcadia Formation Sagittarius Sandstone	
Blackwater Group	Rangel Coal Measures Fort Cooper Coal Measures Moranbah Coal Measures	
Back Creek Group	Exmore Formation	German Creek Formation
	Blenheim Formation Gebbie Formation Tiverton Formation	Maria Formation Undiff, Back Creek Group

Source: Matheson, 1990.

The Fort Cooper Coal Measures comprise typically tuffaceous sandstones, siltstones, mudstones and coal seams. The transition between the Rangel Coal Measures and the Fort Cooper Coal Measures is generally clearly marked by the Yarrabee Tuff-a basin-wide marker bed comprising a weak, brown tuffaceous claystone.

3.4.2 Local Geology

The following interpretation of site geology is compiled from resource exploration programs³ and findings from the hydrogeologic field program (refer to **Appendix E**).

3.4.2.1 Tertiary Sediments

There are no significant Tertiary or Quaternary sediments in the Isaac Plains deposit area. Soil and sub-soil derived from Permian sediments are 2 to 5 m thick. A small amount of Quaternary alluvium exists in the Smoky Creek area in the centre of the deposit. By contrast, the deposit in the Expansion Area contains Quaternary sediments ranging in thickness from 2 to 20 m (average 7.8 m). To the west, close to the sub-crop of the Vermont (VER) seam, Quaternary sediments appear to thicken. Some thicker Quaternary sediments are seen along the banks of the Isaac River in the north and a minor amount is seen along Cherwell Creek to the south.

3.4.2.2 Unconsolidated Sediments

Drilling across the Expansion Area encountered unconsolidated Quaternary sediments that range between 1 m and over 20 m thick, with an average thickness of 8 m. Quaternary sediments appear to thicken (up to 20 m) to the west, close to the sub-crop of the VER seam. Minor thickening occurs along Cherwell Creek to the south with a peak thickness of 8 m.

3.4.2.3 Alluvial Sediments

Drilling in the north of the Expansion Area encountered Quaternary alluvial sediments (near the Isaac River) which range in thickness between 10 and 23 m.

3.4.3 Existing Isaac Plains Coal Mine Deposit – Overview

Coal resources in the existing Isaac Plains Coal Mine area are contained in the LHD seam and the LHD Lower seam split (LHL) in the north of the area. There is also a potential resource in the underlying VER seam, 20 to 25 m below the LHD seam. However, its exploitation is dependent upon defining the resource at an acceptable yield and quality. To date the VER has not been reported as part of the resource. **Figure 3-3** presents a diagrammatic section of the typical seam stratigraphy of the area.

The LHD seam averages 3.6 m thickness and the LHL seam, 0.8 m. The drilling program had a drill hole spacing of approximately 250 m (excluding the limit of oxidation (Lox) drilling) and 500 m for cored holes. Cored hole spacing is sufficient to classify most of the resources as "Measured" status.

The maximum depth suitable for mining at this stage is anticipated to be approximately 70 m based on a strip ratio of 15 bank cubic metres per tonne (bcm/t).

Tertiary sediments are thin (2 to 5 m). Tertiary basalts in particular occur to the east and north-east of the existing Isaac Plains Coal Mine area. Drill holes have some sill or dyke like material at depth, usually distant from the LHD seam. However, other than these minor intrusives, the exploration data indicates that the project area is free of such structures.

Early operations in the existing Isaac Plains Coal Mine area have revealed two small vertical intrusions adjacent to the faulting in the northern area. No ballooning of the intrusions within the coal seam has occurred, thereby limiting coal losses. No other evidence of intrusions has been found.

The LHD seam has been divided into two working sections (Tops and Bottoms) which average 2.01 and 1.56 m thick respectively. The LHD can be classified as a medium volatile bituminous coal with a mean maximum reflectance⁴ (Romax) of 1.0.

The full seam raw ash percentage is relatively low (average 15.5 % air dried basis (adb) with some spikes at 20 % adb), raw sulphur is low (generally <0.4 % adb) and raw specific energy is medium to high (6800-7000 kcal adb). The coal is amenable to washing to produce a low ash, low swell (Crucible Swell Number (CSN) 4.5) coking coal and either PCI or thermal coal.

³ JB Mining Services Pty Ltd and Hewitt, G. R. (2005). *Isaac Plains South Deposit. Resource Statement as at September 2005. Volume 1 and Appendices*. Technical Report for Isaac Plains Coal Management Pty Ltd.

⁴ A coal quality indicator related to coking characteristics.

Description of the Project

The LHD seam dips gently to the east at 3 to 6 degrees and up to 14 degrees close to fault zones. Immediately east of the deposit is a major thrust system (100 m plus throw) which limits the down dip extent of the resources. Smaller faults (up to 10 m throw) occur in the deposit; however, more work is required to identify these in detail. A seam absence zone which may be structurally controlled occurs in the southern part of the area (and has been excluded from any resource calculations).

The depth of weathering over the Isaac Plains deposit ranges from 10 to 48 m averaging 21 m and averages 17 m in the seam sub-crop zone. Deeper weathering zones are generally related to faulting. Overall, there is no trend apparent in the weathering depth. Operational experience to date indicates that the definition drilling has defined the Lox-line well (defined as half the seam its thickness being fresh coal). This will limit unnecessary excavation above weathered and sooty coal and therefore reducing potential operating costs and land disturbance.

3.4.4 Expansion Area Deposit – Overview

The resource in the Expansion Area contains the LHD and is underlain by the VER. The LHD and the VER (and its sub-plys – V1, V2, V31, V32) of the Rangal and Fort Cooper Coal Measures form the principal economic coal resources in this area.

The LHD seam is typically 2.5 m thick and splits down dip into two seams LHD 1 (L1) and LHD 2 (L2). The L1 seam is typically 0.8 m thick, and L2 is 0.4 m thick. At depth, the L2 seam disappears within a strong coarse sandstone sequence. The coalesced LHD seam has some stone bands that are consistent over relatively short distances. Where possible, these stone bands have been identified from the geophysical density log and included into the dataset for later mining evaluation. Close to the LHD/L2 split line, there is a "split" stone band in the LHD seam. This split stone is consistent up to 500 m from the split line. The maximum depth of mining based on the current estimates, will be approximately 70 to 80 m.

The LHD in the Expansion Area is marginally thinner than at the existing Isaac Plains Coal Mine. No cored samples were taken in the L1 or L2 down dip of the split line and therefore no resource has been defined as part of the IIPP Feasibility Study for the LHD L1 or L2 seam splits. **Figure 3-4** presents a diagrammatic section of the typical seam stratigraphy of the area.

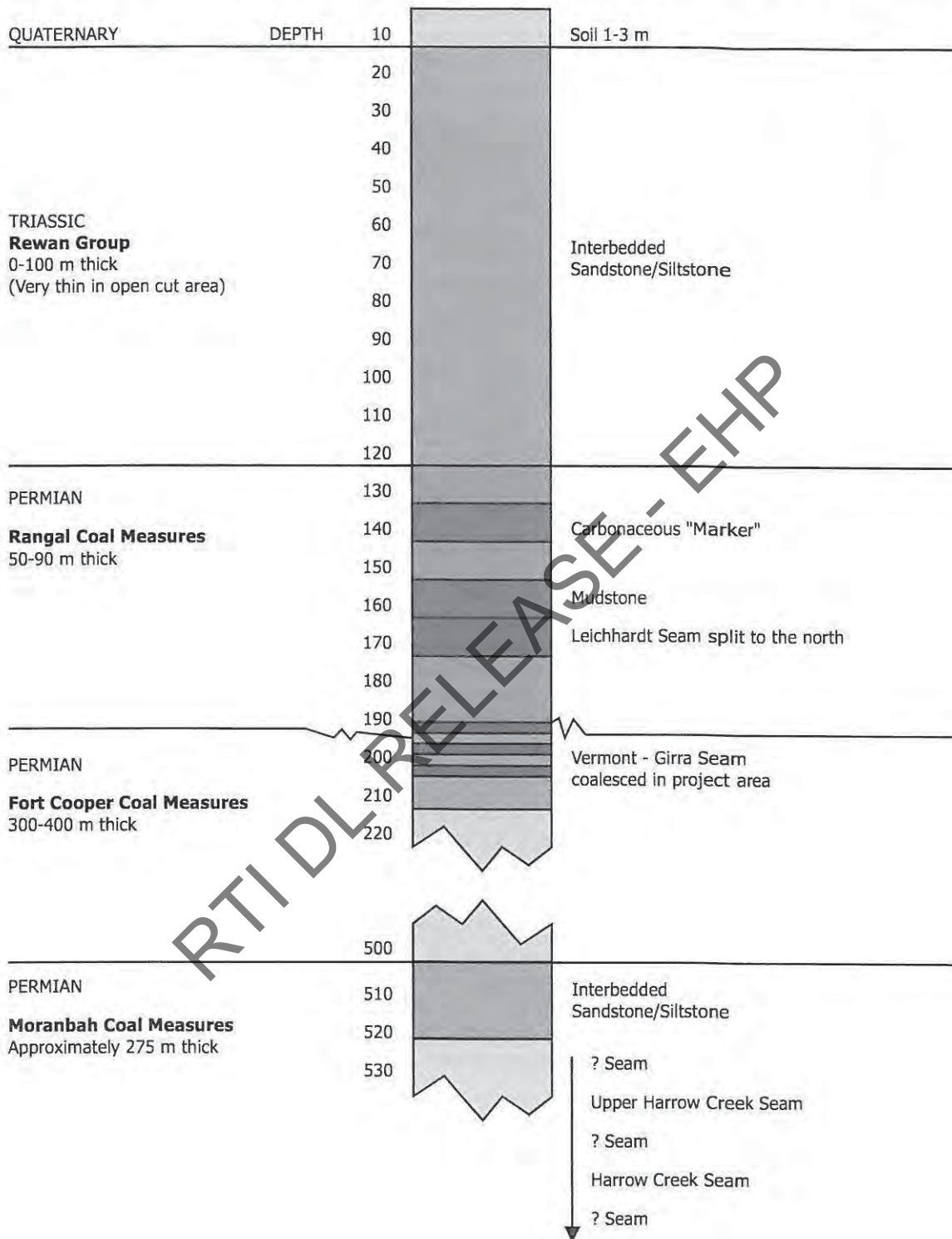
In the northern portion of the Expansion Area, immediately south of the Isaac River, the LHD and VER seam coalesce to form a thick coal sequence of 5 to 6 m. The VER also coalesces with the Girrah seam in the southern end of the Expansion Area. The boundary between the Rangal Coal Measure and the underlying Fort Cooper Coal Measures is the tuffaceous claystone band (Yarrabee Tuff – YT). The YT has been identified immediately below the V1 coal ply in most drill holes in the Expansion Area. The V2 and V3 coal plys are the uppermost seams of the Fort Cooper Coal Measures.

Within the Expansion Area, the VER generally lies approximately 25 m below the LHD seam and varies in total thickness between 5 and 9 m (V1 to V32 including parting). There are three plys identified in the VER (V1, V2 and V3, which is further split into V31 and V32 plys). V1 averages 1.8 m in thickness, V2 averages 1.4 m, V31 averages 0.4 m and V32 averages 0.4 m. The VER raw ash varies depending upon which ply is observed. The V1 ply has the better coal quality (as measured by ash content), but the other coal plys have good coking properties. V1 raw ash is typically 22.6 %, V2 is 34.5 %, V31 is 37.2 % and V32 is 35.5 %.

The Girrah seam in the south of the Expansion Area coalesces with the base of the VER seam. The Girrah seam has been identified in 49 holes and was sampled in two 100 mm cored holes. No thickness statistics have been generated on the Girrah seam as it has only a limited spatial distribution in the south of the deposit.

For the Expansion Area, the depth of weathering over the deposit ranges from 15 to 30 m averaging 22 m. In the seam sub-crop zone the depth of weathering averages 19.5 m. Deeper weathering zones are generally related to faulting. Weathering increases to 30 m in depth south of Conrock Gully.

TYPICAL STRATIGRAPHIC SECTION - ISAAC PLAINS PROJECT



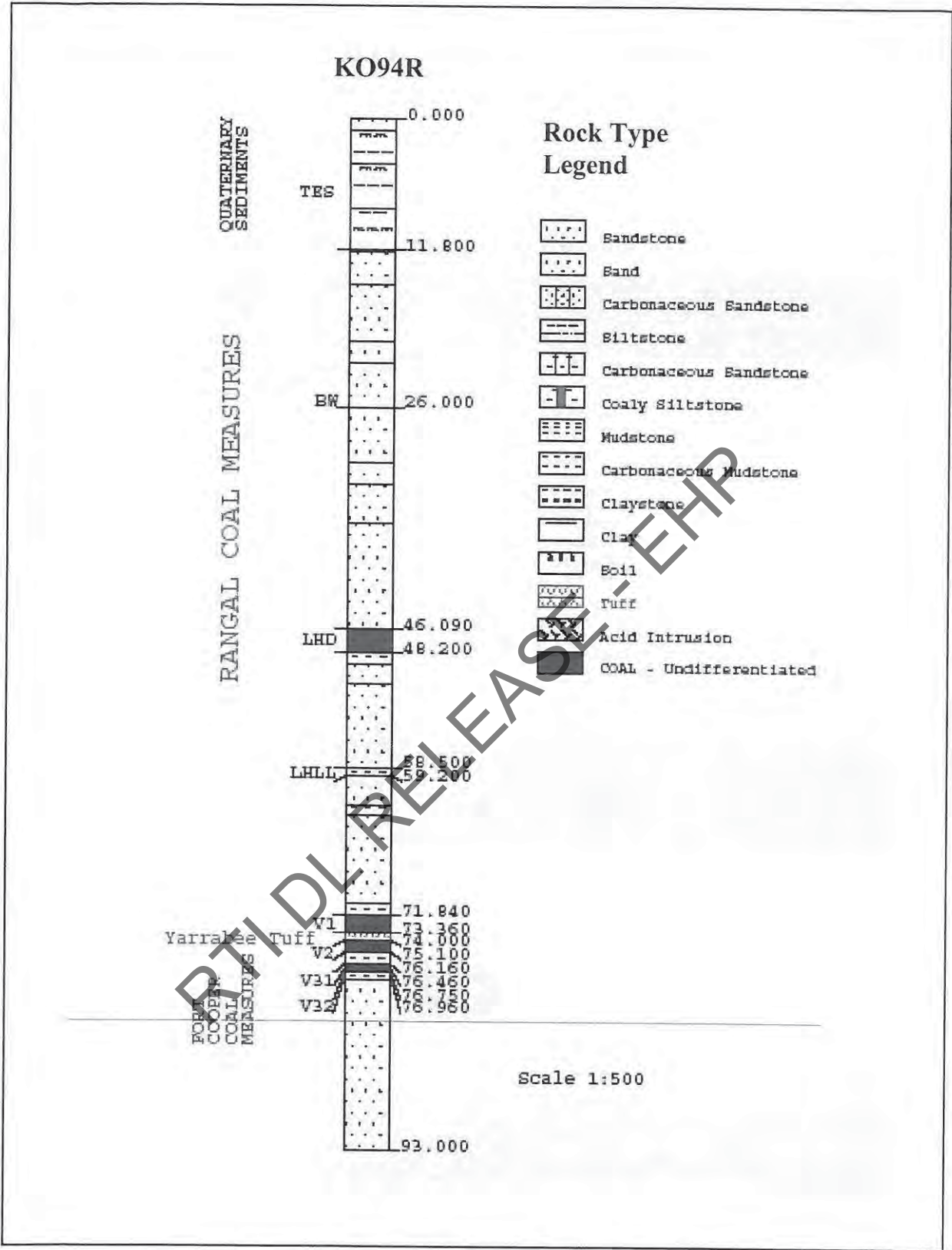
Conceptual Only - Not to Scale



Isaac Plains Coal Management Pty Ltd Integrated Isaac Plains Project

Typical Stratigraphic Section - Existing Isaac Plains Coal Mine

FIGURE 3-3



Isaac Plains Coal Management Pty Ltd
Integrated Isaac Plains Project
Typical Stratigraphic Section - Expansion Area



PRINTED: 30/10/07

Datum: WSG 84
Projection: MGA Zone 55

FIGURE 3-4

3.4.5 Resources and Reserves

Resource estimates for the existing Isaac Plains Coal Mine, as of June 2007, are presented in **Table 3-3** and include resource recovery associated with the diversion of Smoky Creek. The resources/reserves have been calculated as per the Australasian Code for Reporting on Mineral Resources and Ore Resources (JORC).

Table 3-3 Summary of Resources - Existing Isaac Plains Coal Mine

Seam	Measured* Tonnes x 10 ⁶	Indicated Tonnes x 10 ⁶	Total Measured & Indicated Tonnes x 10 ⁶	Inferred Tonnes x 10 ⁶	Total Measured Indicated & Inferred Tonnes x 10 ⁶
LHD	29.4	4.9	34.2	9.7	44.0
LHL	-	0.4	0.4	-	0.4
Sub-total	29.4	5.2	34.6	9.7	44.4
LHD	2.2	1.2	3.4	3.1	6.5
LHL	-	0.5	0.5	0.9	1.3
Sub-total	2.2	1.7	3.8	4.0	7.8
TOTAL	31.6	6.9	38.4	13.7	52.2

* As per JORC 2004 definitions – based on a level of confidence.

Since August 2005, further exploration has been undertaken which has resulted in the development of a feasible option to extend the existing operations, i.e. the proposed Expansion Area. Resources and reserve estimates for the Expansion Area, as at June 2007, are presented in **Table 3-4**. **Table 3-5** presents a summary of the total resources and reserves of the IIPP as a whole.

Table 3-4 Summary of Resources – Expansion Area

Seam	Measured* Tonnes x 10 ⁶	Indicated Tonnes x 10 ⁶	Total Measured & Indicated Tonnes x 10 ⁶	Inferred Tonnes x 10 ⁶	Total Measured, Indicated & Inferred Tonnes x 10 ⁶
LHD	-	18.8	18.8	1.7	20.5
V1	-	18.8	18.8	9.6	28.4
V2	-	12.2	12.2	12.2	24.4
V31	-	3.5	3.5	4.0	7.5
V32	-	2.8	2.8	4.2	7.0
TOTAL	-	56.1	56.1	31.7	87.8

* As per JORC 2004 definitions – based on a level of confidence.

Table 3-5 Summary of Resources IIPP

Seam	Measured* Tonnes x 10 ⁶	Indicted Tonnes x 10 ⁶	Total Measured & Indicated Tonnes x 10 ⁶	Inferred Tonnes x 10 ⁶	Total Measured Indicated & Inferred Tonnes x 10 ⁶
LHD	31.6	24.9	56.5	14.5	71.0
LHL	-	0.9	0.9	0.9	1.8
V1	-	18.8	18.8	9.6	28.4
V2	-	12.2	12.2	12.2	24.4
V31	-	3.5	3.5	4.0	7.5
V32	-	2.8	2.8	4.2	7.0
TOTAL	31.6	63.1	94.7	45.4	140.1

* As per JORC 2004 definitions – based on a level of confidence.

3.4.6 Coal Quality

Since September 2002 Aquila, and more recently BCCM, has conducted exploration over EPC755. This included rotary chip drilling, 62 mm core, 100 mm core and small diameter reverse circulation Lox-line drilling. The program initially utilised chip samples, drilled at approximately 500 m spacing, to determine the extent of the deposit. This was then closed to 250 m spacing with additional drilling. More recently, large diameter (200 mm) drilling has been conducted to collect bulk samples for washability and coke oven tests.

Chip samples, at 0.5 m increments, were taken from Lox-line drilling holes and tested for ash %, volatile matter %, moisture, and Crucible Swell Number (CSN). Lox-line drilling was conducted on lines to 60 m spacing to determine the extent of the coal seam up dip, to the point where the coal loses all saleable properties. This line determines the location of shallowest part of the open cut pit.

Coal quality analyses were conducted on the 100 mm and 200 mm cores. Cores were pre-treated to simulate the process of mining and crushing for washing. Analysis was then undertaken to determine the washability of the different types of coal, and determination of the most effective washing method. Pys were washed using a haematite float sink method at various densities from F1.3 to F2.2 on various size fractions. Some of the washed and raw coal properties analysed include:

- proximate analysis (ash, volatiles, carbon, moisture);
- phosphorous;
- ash chemistry;
- specific energy;
- Hardgraves Grindability Index;
- sulphur content;
- coking properties, including CSN, CSR, CRI; and
- simulated CHPP Yield.

In-pit drilling is conducted on a regular basis as part of the ongoing need to control coal quality for customers. In-pit drilling provides more detailed information of the immediate coal available for blending. Some of the coal parameters are sensitive to pit location, including amount of oxidation, washed phosphorous and coal washability. This analysis also allows for the defining of the resource on an ongoing basis.

Reverse circulation, or production chip, samples are taken from the pit and tested under similar conditions to the exploration parameters, but with a more refined focus on the immediate customers' needs. All but full washabilities and sizing information can be tested, albeit with a degree of inaccuracy, due to in-pit sampling techniques.

3.5 EXISTING INFRASTRUCTURE (EXISTING ISAAC PLAINS COAL MINE)

3.5.1 Existing Mine Infrastructure Area

The major infrastructure at the existing Isaac Plains Coal Mine is listed below and illustrated on **Figure 3-5**. This includes:

- a fully electrified rail spur just under 5 km long that connects directly to the main trunkline known as the Goonyella Main line (refer to **Figure 1-2**). The rail spur was designed in close consultation with the Queensland Rail engineering group (refer to **Plate 3-1**). Just west of the Isaac Plains turnout, the Goonyella main line splits into two lines servicing mines in the Moranbah and Clermont districts. As of December 2006, the rail loop was fully functional and has been receiving trains. Automatic signalling systems are installed on the rail loop;
- demountable buildings, consisting of office blocks, one large lunch room, a first aid room and ablutions facilities. Buildings are connected by decking and roofing;
- a workshop consisting of a 9 m x 6 m shed with cement pad and oil/water separator;

Description of the Project

- chemical storage within the workshop and bunded in accordance with AS1940 - The Storage and Handling of Flammable and Combustible Liquids (AS1940);
- portable self bunded lubrication system;
- freight containers for miscellaneous storage;
- two waste oil tanks, bunded in accordance with AS1940;
- fuel storage consisting of 2 x 58,000 L diesel fuel tanks self-bunded, in accordance with AS1940;
- fuelling station consisting of a cement pad complete with bunding, sump and oil water separator. (Truck refuelling is via service trucks at various locations around the site – spill kits are located on refuelling vehicles);
- light and heavy vehicle wash-down pad which includes sediment control, oil/water separator and adequate bunding;
- combined hardstand and laydown areas covering an area of 3.7 ha;
- a septic system at the main administration offices with capacity for 40 equivalent persons (EP). The facility has a transpiration trench which is used for the release of treated sewage (no treated sewage is transported off-site);
- a septic system, with a transpiration trench, at the train load-out with capacity for 5 EP;
- an explosives magazine designed in accordance with AS2187.2-2006 - Explosives Storage and Use (AS2187.2 2006) to store 120 tonnes of explosives. There is also a designated 1 km exclusion safety zone around the magazine. The explosives magazine will remain on the existing Isaac Plains Coal Mine with explosives being transported to the Expansion Area on an as needs basis (refer to **Figure 1-2**);
- automatic weather station situated at 614172.63 (eastings), 7570868.20 (northings) (AGD 84);
- two 10,000 L potable water tanks adjacent to the CHPP offices and train load-out facility. Potable water is trucked to the site on an as-needed basis;
- raw water being pumped from a raw water dam to distribution points for use throughout the site. Raw water is sourced from the Eastern Spur pipeline, which is supplied from Eungella and Burdekin Dams. Water supply is discussed further in **Section 3.5.6**;
- a mine water management system that includes stormwater control infrastructure, i.e. sediment and release dams (refer to **Figure 3-6** for a schematic);
- the Isaac Plains substation that provides power to the mine infrastructure, CHPP, train load-out and raw water dam (refer to **Plate 3-2**). The earth wire of the aerial power line network contains an optical fibre which will be used to reticulate communications (data and voice) around the site;
- electricity for the proposed dragline that will be supplied by Ergon; and
- a Telstra microwave tower (refer to **Section 3.6.5**).

3.5.2 Coal Handling and Preparation Plant

The existing CHPP (refer to **Plate 3-3**) has a design throughput of 500 tonne ROM coal per hour and contains three circuits-dense medium cyclones, teeter-bed separator and a Jameson cell floatation.

Through the use of belt filter presses, the fine rejects are dewatered to around 70 % solids (30 % moisture), recovering water at the CHPP and negating the need for a tailings dam. As there is no requirement to use water to dispose of rejects, water consumption is also minimised. Under this system, fine coal rejects recovered from the process will then be added to the coarse reject stream and disposed of in-pit. However, through early operations, IPCM have identified the need to develop an alternative system to manage the fine rejects as a contingency to failure of the belt filter presses, and to also improve the water recovery from the rejects circuit. This system entails a fine coal management system.

An application to amend EA MIN100329505 was lodged in August 2007 and an amended EA was received on 25 October 2007 for a fine coal management system (effective 30 October 2007) via an amendment to the EA⁵. The intention of the system is to capture and process fine coal rejects only, separate from the management of coarse rejects. If the filter presses are not operating, the fine rejects will be pumped via a pipeline from the CHPP to the cells described below. Once dry, fine rejects will be hauled by trucks and dumped in the in-pit spoil. The moisture content will be approximately 20 %.

The main benefits to the system are as follows:

- to have an alternative fine coal rejects management system in the event of belt filter press failure;
- to recycle water back to the CHPP for re-use; and
- to reclaim good quality fine coal to be incorporated into the coal product stream.

The fine coal management system consists of engineer designed cells to allow for separation of the fines and the supernatant, with the supernatant reused in the CHPP.

The fine coal management system cells are managed such that a freeboard is maintained which has the capacity to hold a 1 in 20 year ARI three month wet season rainfall. Should rainfall exceed the capacity of these structures, excess rainfall overflow is captured by an offline wet season storage, preventing release from site. The offline wet season storage has capacity to contain a volume equal to the 1 in 20 year ARI three month wet season rainfall multiplied by the total area of the cells, spillway drain and the storage itself. Although very unlikely, potential overflows would be highly diluted from direct rainfall into the cells, minimising any water quality impacts on the surrounding environment.

The CHPP and associated infrastructure located at the existing Isaac Plains Coal Mine will remain in place for the life of the IIPP, as coal mined within the Expansion Area will be transported to the existing CHPP for processing.

A list of infrastructure at the existing CHPP is provided below. This infrastructure is additional to that identified in **Section 3.6**. It includes:

- a ROM Coal Stockpile area, approximately 200 m by 200 m;
- an administration building (1 x demountable building) including first aid, ablution and toilet facilities;
- hardstand and laydown area with an area of approximately 0.7 ha;
- a septic system with transpiration trench in the mine infrastructure area with capacity for 20 EP;
- a workshop with oil/water separator (18 m x 12 m);
- a process diesel fuel tank (capacity 26,000 L);
- two diesel fuel tanks (capacity 32,000 L);

⁵ The EA was reissued on 21 December 2007 following an administrative amendment made by the EPA.

Description of the Project

- fuelling station, cement pad complete with bunding, sump and oil water separator. (truck refuelling is via service trucks at various locations around the site);
- MIBC (Methylisobutylcarbinol) tank (capacity 26,000 L);
- a flocculent storage silo, positioned next to the MIBC tanks and process diesel tanks (flocculent is stored in accordance with relevant standards);
- freight containers for miscellaneous storage;
- portable lubrication and chemical bulk bins;
- power and lighting supplied via mains from the Isaac Plains (Ergon) substation;
- raw water pumped from raw water dam to distribution points; and
- 2 x 10,000 L potable water tanks next to CHPP offices and train load out.

3.5.3 Coal Load-out Facilities

The coal load-out facility comprises a 4,000 tonne per hour coal reclaim system and a 250 tonne surge bin. The train load-out system was commissioned in October 2006 shortly before loading the first train on 27 October 2006.

Plate 3-4 illustrates the load-out facility in operation on 27 October 2006, when the first train was loaded with coal from the existing Isaac Plains Coal Mine.

The number of coal trains will increase from three trains per week to an average of six trains per week with full production from the IIPP.

3.5.4 Existing Roads

An 8 km access road runs from the Peak Downs Highway, across private property (under agreement with the landowner) and along the western boundary of ML70342 to the mine infrastructure area and the CHPP at the existing Isaac Plains Coal Mine.

There are a number of haul roads within the site from the mine pit areas to the CHPP area.

3.5.5 Existing Mine Lighting

Mine lighting includes fixed lighting around the mine infrastructure area, lighting of active work areas using mobile lighting plants, as well as lights on mobile equipment working at night.

Lighting on site is minimised to reduce the impact on adjacent landholders, while maintaining adequate illumination levels to meet operational and safety requirements.

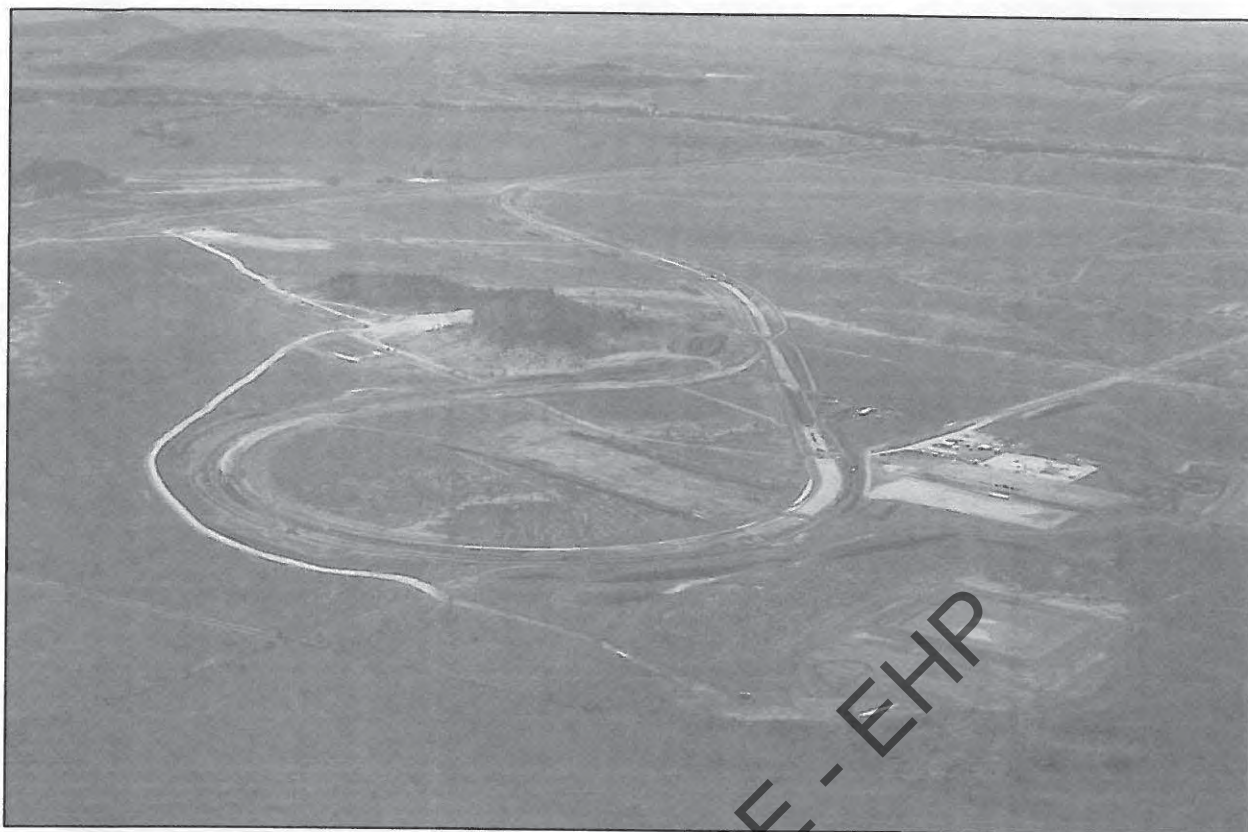


Plate 3-1 Existing Rail Spur

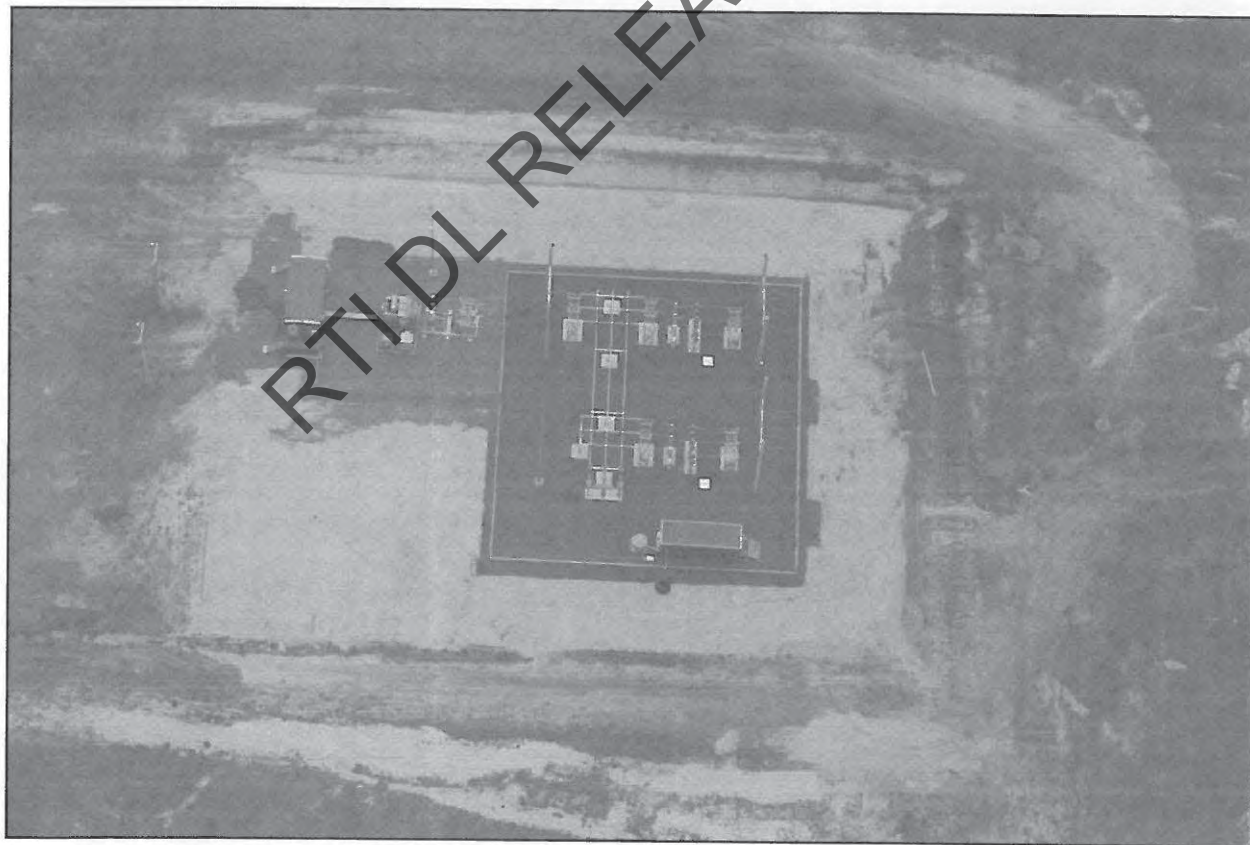


Plate 3-2 Isaac Plains Sub-Station

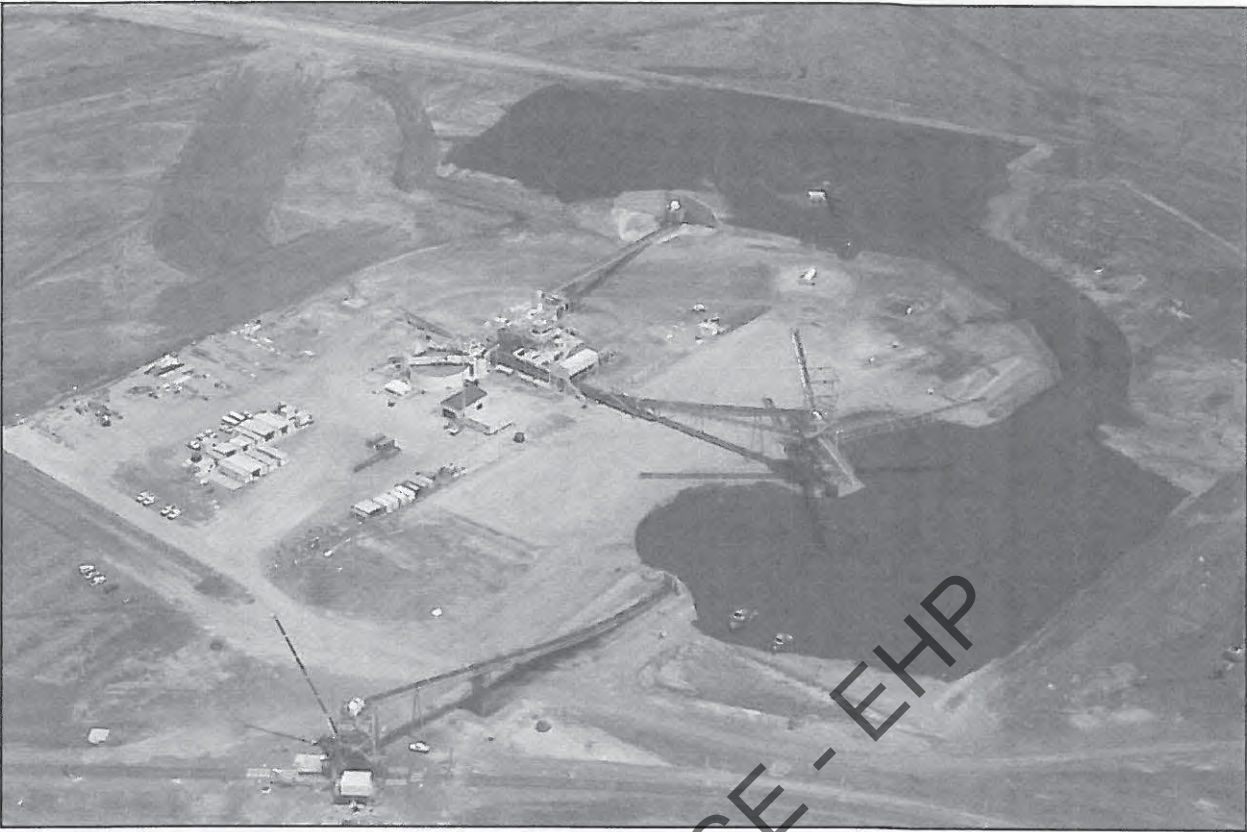


Plate 3-3 Existing CHPP

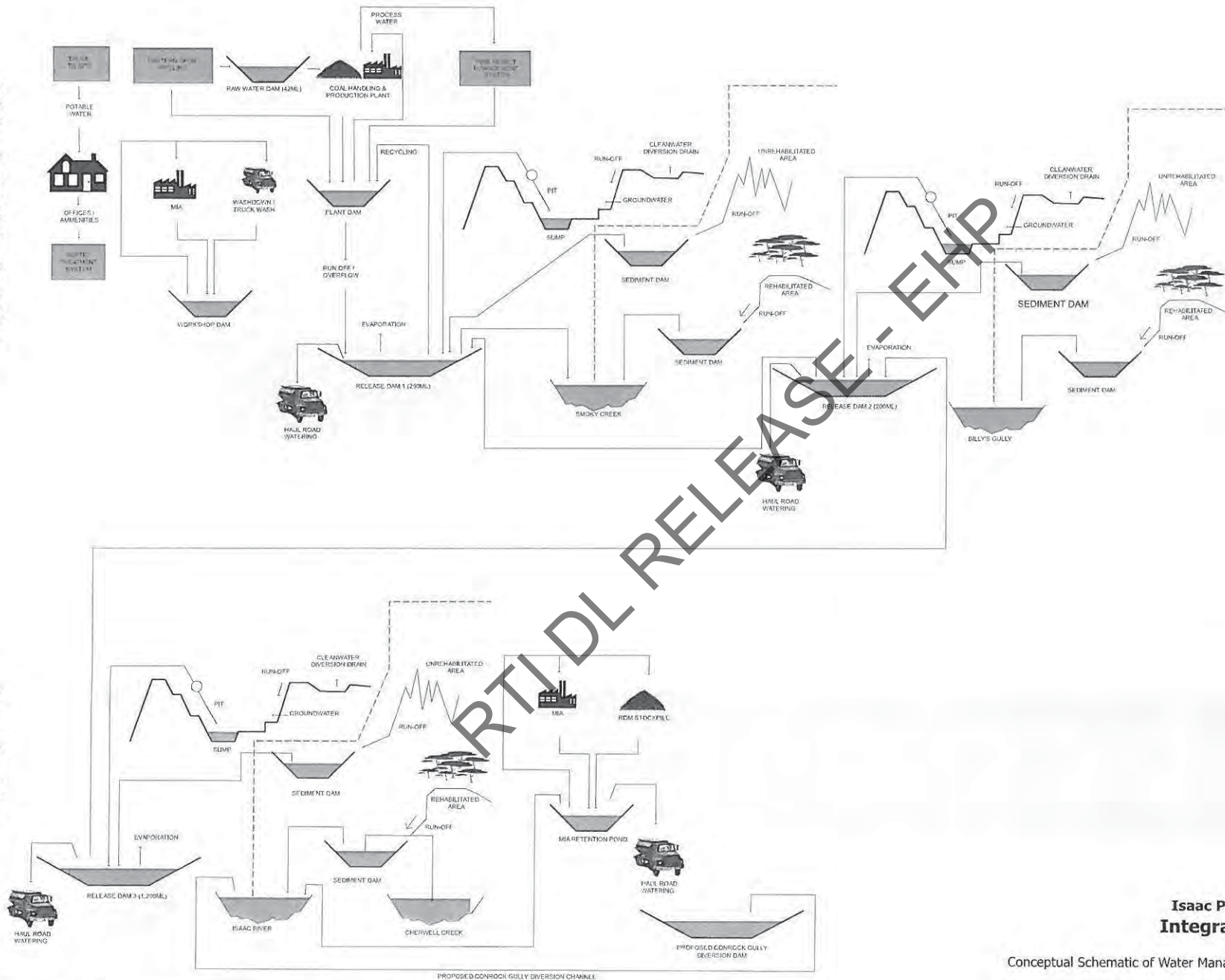


Plate 3-4 Existing Isaac Plains Coal Mine Load-out Facility and Rail Spur



Existing Isaac Plains Coal Mine

Expansion Area



Isaac Plains Coal Management Pty Ltd
Integrated Isaac Plains Project

Conceptual Schematic of Water Management System for IIPP - FIGURE 3-6

3.5.6 Water Supply

Throughout the construction of the existing Isaac Plains Coal Mine, water was received from the adjacent Broadlea borefield via a pipeline network which extended to the site via the raw water dam adjacent to the Carborough Downs Mine CHPP.

Since May 2006, water has been received from Eungella Dam via the Sunwater Eastern Spur pipeline located adjacent to the existing Isaac Plains Coal Mine. Water was initially received by gravity feed from the Eastern Spur Pipeline whilst pumping stations and the remainder of the pipeline were being installed.

IPCM has a water allocation from the Eungella Dam and is a foundation participant in the Burdekin Pipeline Agreement, guaranteeing water supply for the IIPP from two sources. **Table 3-6** lists IPCM water supply agreements and **Section 6.8.3.2** provides detail on the water demands for the IIPP.

Table 3-6 Water Supply Agreements

Water Agreement	Term	Quantity Per Annum	Special Conditions
Eungella Water Pipeline	01 November 2005 to 31 December 2020 i.e. 15 yrs subject to extension provisions.	540 ML-1 st allocation to 01 July 2008. 380 ML additional taking total to 920 ML	Agreement is between Vale and Eungella Water Pipeline Company but assignment to IPCM is committed. However, assignment deed is pending. IPCM has been receiving water since May 2006.
Burdekin River Delivery and Pipeline Transportation	15 December 2005 for a period of 20 yrs (i.e. to 2025).	920 ML (2008) 540 ML (2007)	IPCM may request extension to term of at least 10 yrs, no earlier than 3 yrs and no later than 1 year prior to the expiry date.
Eastern Spur Pipeline	For a period of 20 yrs after operations date occurs (7 days after Eungella advises stage 1 is complete, commissioned and operational).	938 ML	Commencement date occurs 7 days after Eungella advises Stage 2 is complete and operational. IPCM may request an extension for a term of at least 10 yrs, no earlier than 3 yrs and no later than 18 months prior to the expiry date.

NB: The Eastern Spur Pipeline (ESP) delivers both the Burdekin and Eungella water to the project site from Moranbah. As the ESP is limited to 920 ML/pa, the project supply is limited to this despite the collective allocation being 1840 ML/pa.

The water received from the pipeline enters the raw water dam located south-west of the CHPP (refer to **Figure 3-5**). The water from the dam was analysed on 2 August 2007 for a range of analytes, results of which are presented in **Table 3-7**.

Table 3-7 Water Quality – Raw Water Dam

Analyte	Unit	Results
pH	pH Unit	7.73
Conductivity	µS/cm	177
Total Dissolved Solids	mg/L	140
Suspended Solids	mg/L	4
Dissolved Mercury	mg/L	<0.0001
Fluoride	mg/L	<0.1
Nitrite as N	mg/L	<0.010
Nitrate as N	mg/L	<0.010
Nitrite plus Nitrate as N (NOx)	mg/L	<0.010
Total Kjeldahl Nitrogen (TKN)	mg/L	0.2
Total Nitrogen as N (TKN + NOx)	mg/L	0.2
Total Phosphorous as P	mg/L	0.23
Alkalinity		
Hydroxide Alkalinity as CaCO ₃	mg/L	<1
Carbonate Alkalinity as CaCO ₃	mg/L	<1
Bicarbonate Alkalinity as CaCO ₃	mg/L	53
Total Alkalinity as CaCO ₃	mg/L	53
Dissolved Major Ions		
Sulphate as SO ₄ ²⁻	mg/L	5
Chloride	mg/L	26
Dissolved Major Cations		
Calcium	mg/L	14
Magnesium	mg/L	4
Sodium	mg/L	16
Potassium	mg/L	3
Dissolved Metals		
Iron	mg/L	<0.05
Aluminium	mg/L	0.02
Antimony	mg/L	<0.001
Arsenic	mg/L	<0.001
Cadmium	mg/L	<0.0001
Chromium	mg/L	<0.001
Cobalt	mg/L	<0.001
Copper	mg/L	0.001
Manganese	mg/L	<0.001
Molybdenum	mg/L	<0.001
Nickel	mg/L	<0.001
Selenium	mg/L	<0.010
Zinc	mg/L	<0.005
Ionic Balance		
Total Anions	meq/L	1.91
Total Cations	meq/L	1.80
Ionic Balance	%	Not available

< - at or below the detection limit

3.6 IIPP INFRASTRUCTURE AND INFRASTRUCTURE INTEGRATION

Mine infrastructure associated with the IIPP and integration with the existing Isaac Plains Coal Mine is discussed below and illustrated in **Figure 3-5** and **Figure 3-7**.

3.6.1 Mine Infrastructure Area

Construction activities in the Expansion Area will initially involve earthworks and drainage installation using earthmoving equipment such as scrapers and dozers. The mine administration buildings will be transportable units, while the workshop will be a steel-frame prefabricated structure installed on a concrete slab.

Buildings and equipment will be sourced predominantly from Queensland, with the exception of the dragline.

Section 3.16 details the number of staff required for the construction phase of the IIPP.

3.6.2 Water

Water infrastructure required as part of the IIPP is as follows:

- potable water storage on site in 2 x 10,000 L tanks adjacent to the site office. Potable water will be trucked to site on an as needs basis;
- raw water pumped from the IPCM raw water dam to distribution points for use throughout the site. Raw water will be sourced from both the Eungella and Burdekin Dams and distributed via an off-take from the Eastern Spur Pipeline. The Southern Spur Pipeline is proposed to be utilised as a potential raw water supply in the Expansion Area;
- diversion of Conrock Gully to the north to the Isaac River. To minimise the extent of excavations required for the diversion and to limit the opportunity for flood water to flow back along the diversion, a dam will be constructed to raise the head level during the operations phase of the mine. Post-mining the Conrock Gully inundation area will be filled in and a channel constructed to the diversion so that the area is free draining at the end of mine life; and
- levees to provide flood immunity for the 1–0.2 % Average Exceedence Possibility Probability (AEP).

In addition, IPCM have identified feasible reserves of coal beneath Smoky Creek within the existing Isaac Plains Coal Mine, and propose to divert this waterway to give access to these reserves.

A schematic of the conceptual mine water management system for the IIPP is provided in **Figure 3-6** and further information regarding water infrastructure is provided in **Section 6**.

3.6.3 ROM Coal Stockpile Pad

A ROM coal stockpile pad with a capacity of 200,000 t coal will be built on the northern boundary of the proposed Expansion Area ML. The ROM coal pad will be used to stockpile and blend coal mined from the Expansion Area, before it is hauled to the CHPP at the existing Isaac Plains Coal Mine.

The ROM coal stockpile pad will also be used for stockpiling of coal in the event that flooding of the Isaac River prevents coal haulage activities to the CHPP. Light vehicle access to the Expansion Area at times of flooding will be via Winchester Road.

In addition, the ROM coal stockpile at the existing Isaac Plains Coal Mine will also have a contingency storage to cater for flooding, i.e. will have sufficient stockpile capacity to ensure that the CHPP can continue to operate.

3.6.4 Power

A power line will be installed to the Expansion Area. This will essentially be an extension of the existing Isaac Plains Coal Mine electricity network supplied by Ergon Energy. Electricity for the proposed dragline will be supplied by mains power (Ergon).

3.6.5 Communications

As per an existing arrangement, land line communications (telephone and internet) at the site are provided by Telstra via a microwave link. Mine radio communications are run through a site UHF system. Mobile telephone communications (3G) are organised through Telstra.

The earth wire of the aerial power line network can contain an optical fibre which may be used to reticulate communications (data and voice) around the Expansion Area site. Alternative options under consideration are the use of microwave or two-way radio in conjunction with mobile phones.

3.6.6 Mine Lighting

As is the case with the existing Isaac Plains Coal Mine, site lighting will include fixed lighting around the mine infrastructure area and the lighting of active work areas, using mobile lighting plants as well as lights from mobile equipment working at night. Fixed lighting will be powered by mains supply.

Lighting on site is minimised to reduce the impact on adjacent landholders, while maintaining adequate illumination levels to meet operational and safety requirements.

Potential lighting impacts and mitigation measures for the Expansion Area are further discussed in **Section 12**.

3.6.7 Proposed Mine Infrastructure Area

Infrastructure required for the development of the Expansion Area within the mine infrastructure area are listed below and illustrated in **Figure 3-7**:

- demountable buildings – 1 x office, ablutions block and first aid room, lunch or crib room;
- a 9 m x 6 m workshop with concrete pad and oil/water separator;
- chemical storage within the workshop bunded in accordance with AS1940;
- freight containers for miscellaneous storage;
- a portable self bunded lubrication system;
- 2 x 58,000 L diesel storage tanks self-bunded in accordance with AS1940;
- fuelling station, cement pad complete with bunding, sump and oil water separator. (truck refuelling will be via service trucks at various locations around the site);
- light and heavy vehicle wash-down pad which will include sediment control, oil water separator and adequate bunding;
- hardstand and laydown areas (80 m x 80 m);
- a septic system at the main office/mine infrastructure area with capacity for 60 EP. As with the system at the existing Isaac Plains Coal Mine, this system will be installed in lieu of a package sewage treatment plant. The treated sewage is pumped to a transpiration trench on site; and
- raw water will be transported from the Burdekin pipeline corridor into the Expansion Area via the Southern Spur Pipeline.

3.6.8 Proposed Heavy Equipment Construction Pad

It is proposed to build a heavy equipment construction pad in the existing Isaac Plains Coal Mine (refer to **Figure 3-5**). The pad which is approximately 4 ha will be used initially to assemble a dragline and then periodically over the life of the mine for refurbishment work that needs to take place on larger items of mining equipment. It is proposed that the dragline will commence operating in the existing Isaac Plains Coal Mine and on completion of mining in this area, will be walked to the Expansion Area, from the existing Isaac Plains Coal Mine, in approximately 2016.

Description of the Project

The pad is to be approximately 250 m x 150 m and contain the following facilities:

- demountable buildings – 1 x office, ablutions block and first aid room, lunch or crib room;
- workshop, a 30 m x 15 m workshop shed;
- chemical storage within the workshop bunded in accordance with AS1940;
- freight containers for miscellaneous storage;
- hardstand and laydown areas; and
- a blast and paint yard.

3.7 OTHER PROPOSED INFRASTRUCTURE

3.7.1 Access/Haul Road and Peak Downs Highway Underpass

An access/haul road will be required between the Expansion Area and the existing Isaac Plains Coal Mine. The access/haul road will include an underpass beneath the Peak Downs Highway.

This road will be similar in form to the recently-constructed haul road at Carborough Downs Mine, i.e. width and standard for 'big foot' sized road trains, however, the envelope will be increased to accommodate the relocation of mobile earthmoving plant from the existing Isaac Plains Coal Mine to the Expansion Area on a regular basis. **Plate 3-5** below illustrates the Carborough Downs Mine haul road at the Peak Downs Highway underpass. Public access will not be permitted on the access/haul road to the Expansion Area.

The construction of the underpass is of a significant nature and is expected to take in the order of nine months to construct. From an operational and safety perspective, i.e. both workers and passing traffic, it would be impracticable to accommodate traffic along the existing Peak Downs Highway during the construction of the underpass.

Therefore, it is proposed to provide a side-track to deviate highway traffic past the underpass construction zone. This side-track will be provided to cater for two-way traffic movements and applied in accordance with the requirements of DMR's *Manual of Uniform Traffic Control Devices* (DMR, 2003). A similar arrangement was recently used for the construction of the nearby Carborough Downs Coal Mine underpass.

The alignment for the access/haul road has been negotiated through consultation with the two affected landholders, and the holder of EPC602 (i.e. Anglo Coal and Exxaro). The alignment runs north-west from the northern boundary of the Expansion Area to the Isaac River, along the Belyando/Nebo Shire Boundary (in a north north-east direction), to the project area boundary, then heads north-west to meet the existing access road to the Isaac Plains Coal Mine (refer to **Figure 1-2** and **Figure 1-3**).

3.7.2 Low Level Crossing

The crossing of the Isaac River is proposed to be an over topping low level crossing accommodating low flow events of less than a 1 in 2 year occurrence interval. As coal hauling to the approved CHPP will be conducted on a campaign basis, the access/haul road is not required to be accessible under all weather conditions. Access to the Expansion Area will be via the main access/haul road, however, an alternative route to access the site will be negotiated with the landholder of the protection of an individual's right to privacy the west when the low level crossing is subject to flooding.

The crossing will be designed to accommodate the haulage of coal from the Expansion Area to the existing Isaac Plains Coal Mine primarily in haul trucks. The crossing will also allow for the dragline to be 'walked' across the Isaac River to the Expansion Area upon completion of mining on the existing Isaac Plains Coal Mine. This will require the Isaac River crossing to be widened by adding bed sand or gabions to increase the width. The additional material will be removed once the dragline has crossed. These provisions will be confirmed with the EPA and DNRW prior to moving the dragline.



Description of the Project

The imposition of speed limits across the crossing will minimise the risk of coal spillages. Notwithstanding this, the causeway will be regularly inspected for spillages of coal and any spillages will be collected.

The low level crossing of the Isaac River will be constructed so fish and other aquatic fauna have unrestricted flow over the crossing during both low and high flow events.

The minimisation of disturbance to the riparian corridor has been considered in the Isaac River low level crossing location selection process and this will be further refined at the detailed design stage.

Provisions are to be made for the safe movement of fauna in the vicinity of the low level crossing of the Isaac River. This includes the provision of 'dry culverts' or pipe/box culvert structures, and/or the erection of fencing along the margin of the riparian corridor in the vicinity of the crossing to direct fauna into the safe passage area and prevent fauna crossing the road. As part of the detailed design of the low level crossing, flood studies will be assessed to ensure that appropriate fauna passageways are provided.

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3.8 MINE EQUIPMENT

The majority of the equipment installed and operating for the existing Isaac Plains Coal Mine was originally manufactured overseas. It is likely that additional equipment such as excavators, trucks, dozers and graders required for the Expansion Area will either be imported as new or as used machines, or sourced locally and transported to site on low loaders with appropriate safety escorts.

The dragline, purchased in New Mexico, USA, for initial use at the existing Isaac Plains Coal Mine and in turn for the Expansion Area, was dismantled into smaller components prior to being transported from the port of Galveston in the USA by ship, to the Port of Mackay, arriving in March 2008. Dragline parts will be transported to the existing Isaac Plains Coal Mine site in the same manner as other large equipment required for the day to day operation. The total weight of the dragline will be 2,581 tonnes and a maximum of approximately 70 tradesmen and assemblers will be employed during the reassembly.

The dragline will commence operating in the existing Isaac Plains Coal Mine and on completion of mining in this area will be walked to the Expansion Area from the existing Isaac Plains Coal Mine in approximately 2016.

Table 3-8 summarises the equipment fleet currently being used at the existing Isaac Plains Coal Mine and other equipment required for the Expansion Area.

Table 3-8 Equipment for the IIPP

Item	Existing Isaac Plains Coal Mine	Expansion Area
Electric Walking Dragline	Bucyrus Eyrie 1370 - capacity 63 yd ³	The dragline will be walked to the Expansion Area when the northern coal reserves are exhausted.
Hydraulic Excavators	1. Hitachi 3600, 350t, 17m ³ bucket 2. Cat 5230, 350t, 17m ³ bucket 3. Hitachi EX1100, 110t, 6m ³ bucket	Same as existing.
Coal & Waste Haulage Trucks	1. 8 X Cat 789 or equivalent, 135t 2. 2 X Cat 777D or equivalent, 70t	Same as existing, plus 5 new Cat 785A trucks.
Tracked Dozer – Production	1 x D10 Cat dozer	Same as existing.
Tracked Dozers – Dragline, Clean Up & Waste Dumps	2	Vehicles used in association with the dragline will move to the Expansion Area with the dragline. Dragline will work in the north (existing mine) until reserves are exhausted.
Tracked Dozer – Dragline	1 x D11 Cat dozer	As above.
Front-End Loader – Utility, ROM Rehandle & Stockpile Management	1 x D9 + 1 x D11 Cat dozers (ROM)	1 x 992 Loader/994 Loader.
Graders – Road Maintenance	Cat 16G Grader	One additional grader of same type.
Water Truck – Road Maintenance	Cat 777, 50,000 L Tank	Two additional trucks of the same type.



Plate 3-5 Carborough Downs Coal Haul Road and Underpass beneath The Peak Downs Highway

3.9 MINING SCHEDULE

The mining schedule developed for the IIPP aims to maximise the economic recovery of coal by using both truck and shovel and dragline operations at the existing Isaac Plains Coal Mine, whilst simultaneously mining in the Expansion Area using truck and shovel operations. On completion of mining at the existing Isaac Plains Coal Mine, the dragline will be walked to the Expansion Area where mining will then occur by truck and shovel and dragline operations.

In addition, it is proposed as part of the IIPP, to divert two waterways, Smoky Creek in the existing Isaac Plains Coal Mine site and Conrock Gully in the Expansion Area, in order to recover the underlying coal resources.

The Expansion Area mine plan has been developed with the objective of maximising the recovery of the coal resource and balancing economic return with the protection of the environment. Mining will predominantly move in an easterly direction, where the depth of the coal increases to between 70 and 100 m. Mining will commence in the northern end of the site, below the Isaac River with the final pit extent located to the south above Cherwell Creek. The proposed mine sequencing of the Expansion Area from the first year of mining to the completion of mining is illustrated in **Figure 3-8** to **Figure 3-12** (which illustrates the conceptual post-mining landform). Figures also illustrate the infrastructure to be established throughout the life of the mine.

The mine schedule could be altered if the market demands different coal production rates, or the demands for particular types of coal increase or decrease.

The IIPP mine equipment fleet and schedule has the flexibility to meet changes in market demands by:

- varying coal volumes mined (either less or more);
- changing mining methods; and/or
- changing the length of the mine life.

The current conceptual mining schedule is summarised below in **Table 3-9**. The mine will increase from the currently approved mining rate of 1.9 Mtpa up to 4 Mtpa ROM following attainment of the necessary approvals for the IIPP and the construction of the necessary infrastructure (nominally by year 2009).

Table 3-9 Proposed Mining Schedule

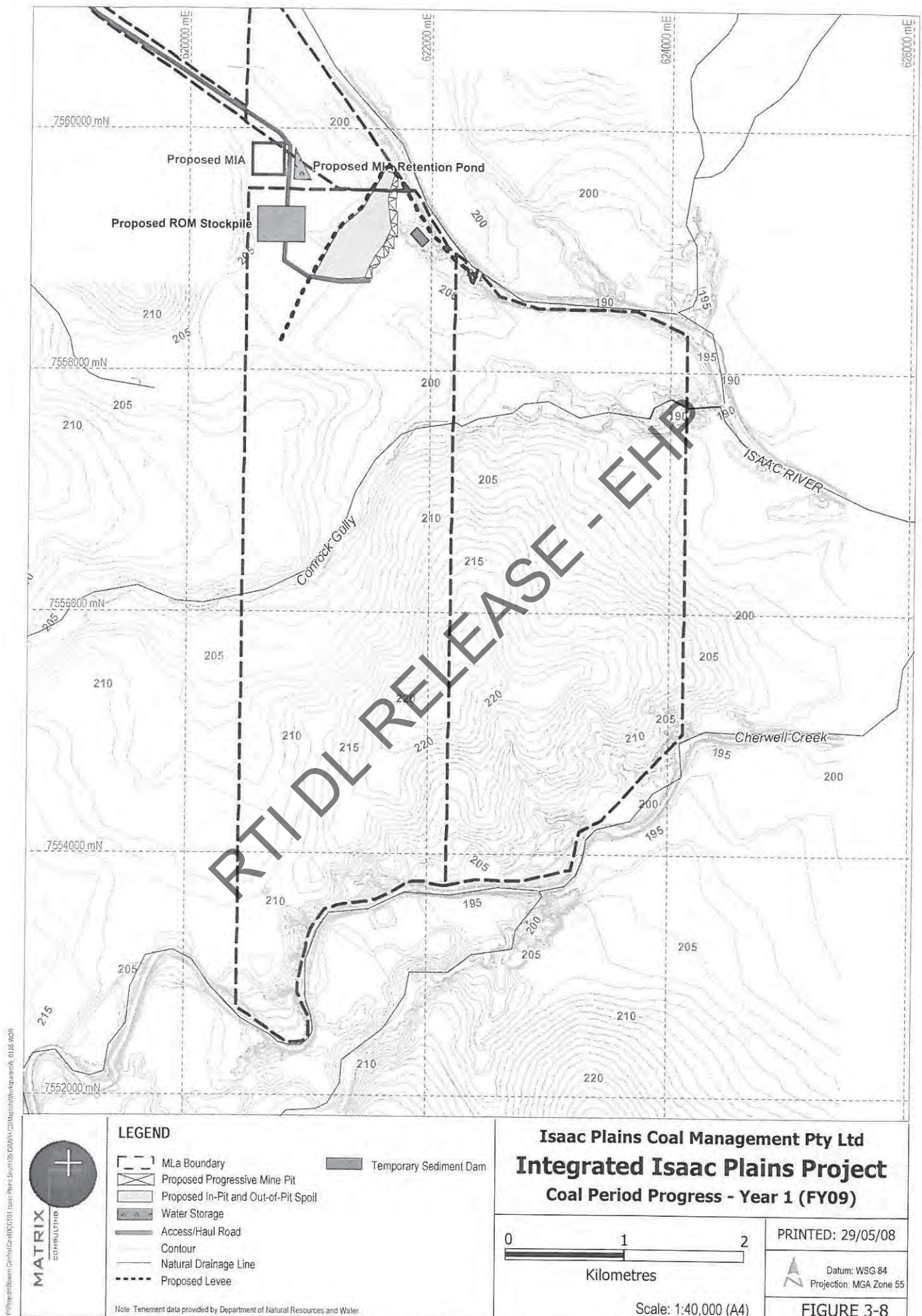
Fiscal Year	ROM Coal Production (Mtpa)
2007 (Existing Mine)	0.65
2008 (Existing Mine)	1.9
2009-2014 (Existing Mine and Expansion Area)	4
2015-2023 (Expansion Area)	4

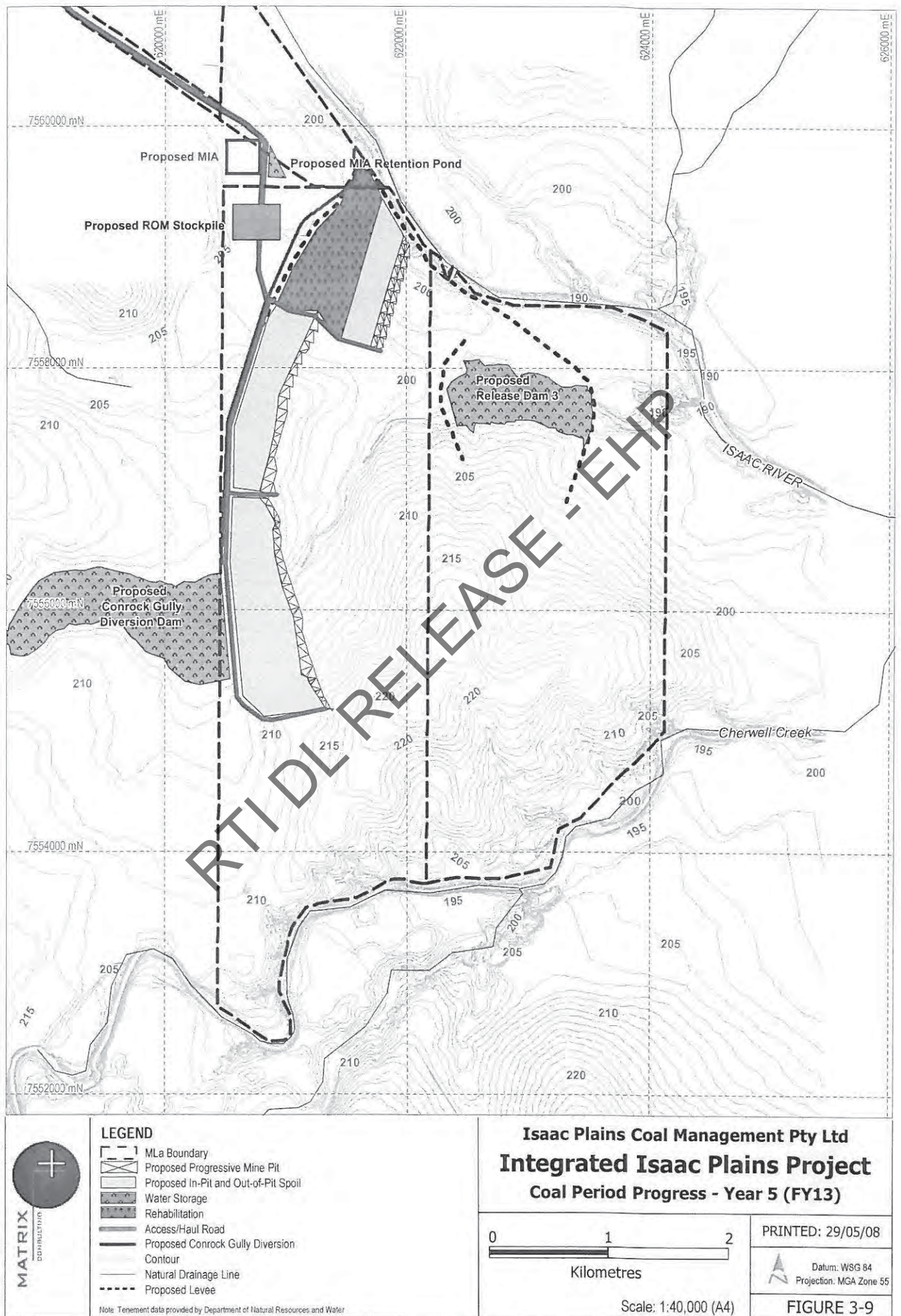
3.10 MINING OPERATIONS

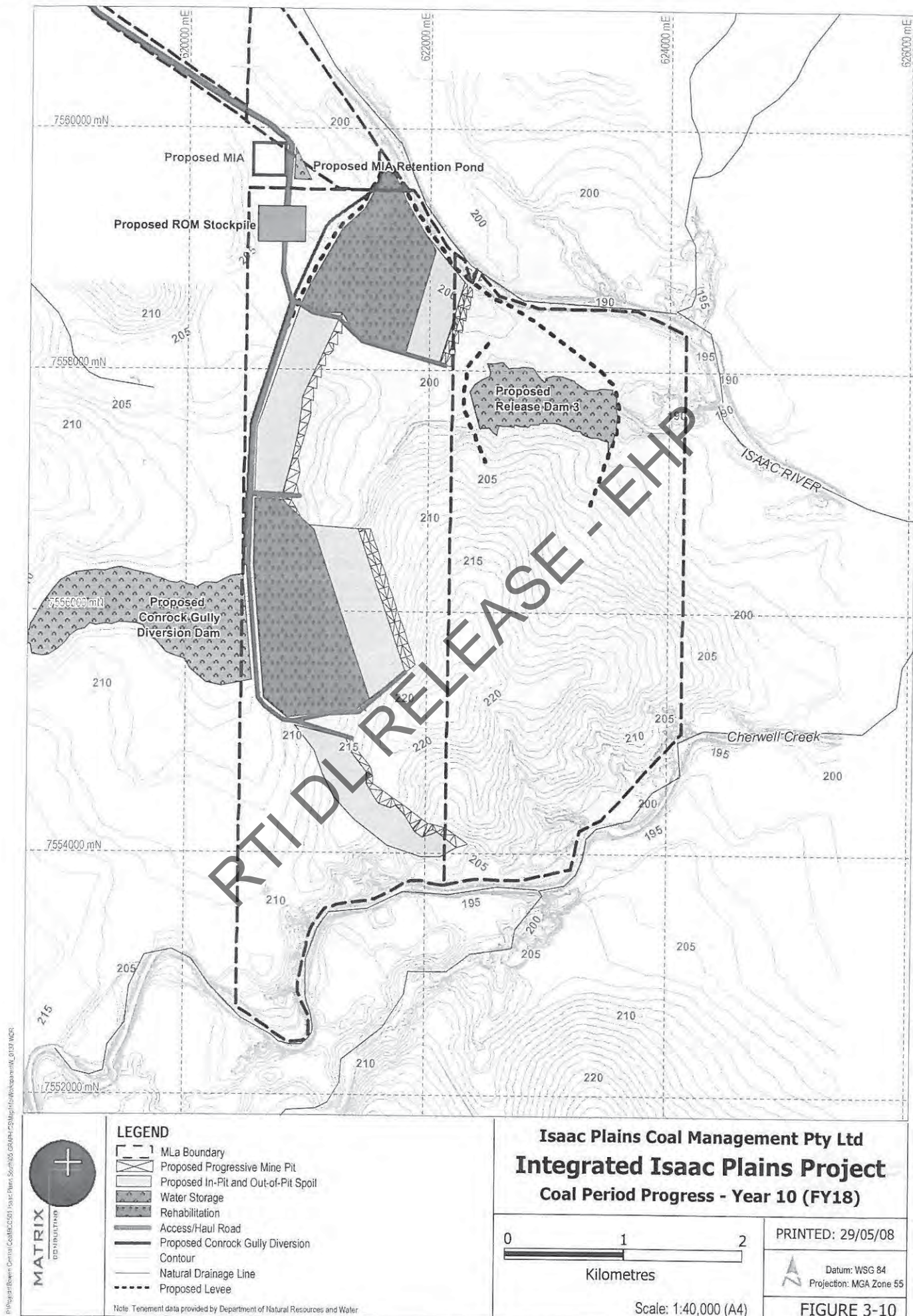
The existing Isaac Plains Coal Mine commenced mining operations in the third quarter of 2006 with the first coal railed on 27 October 2006.

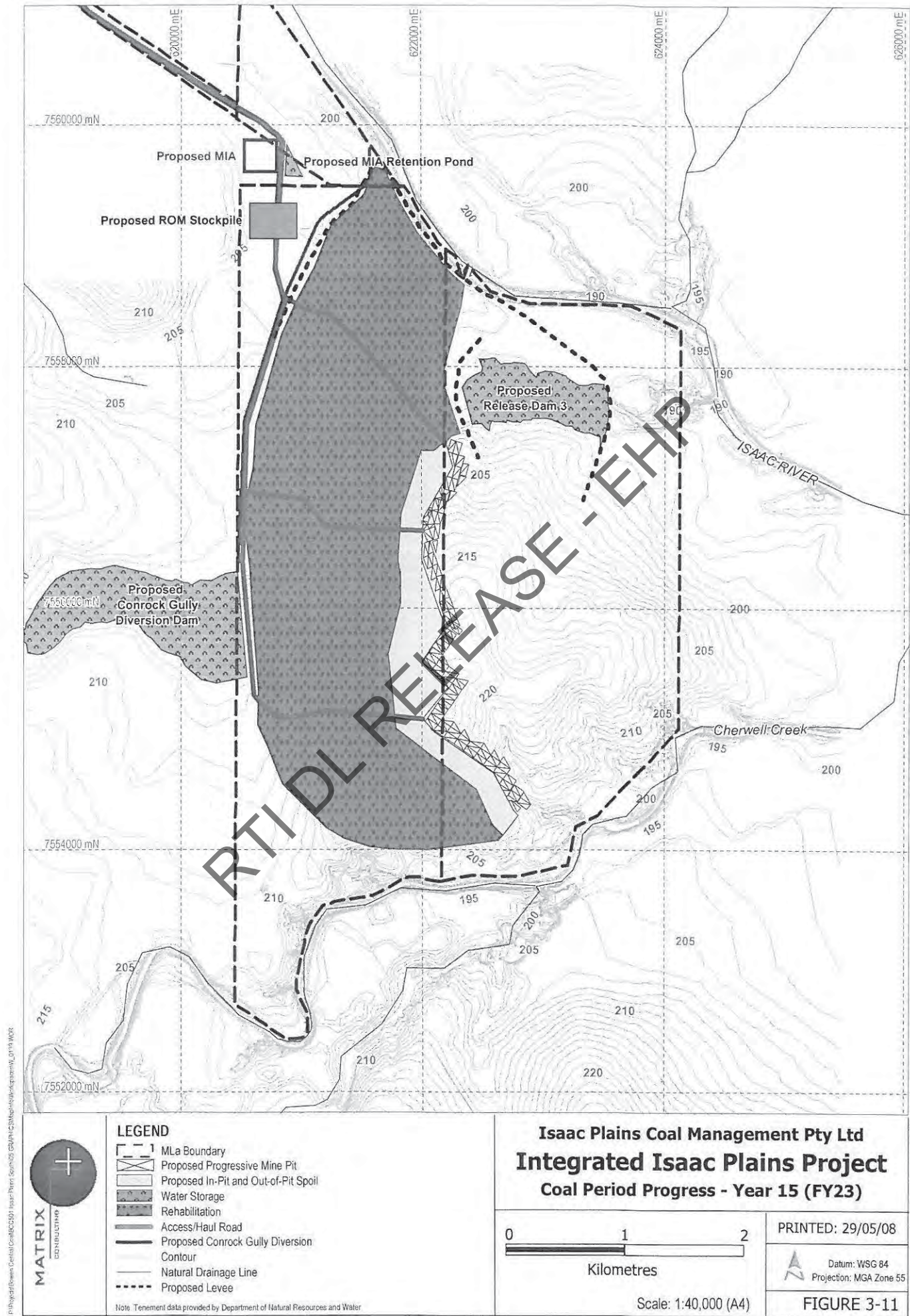
The IIPP will mine at the expanded rate of up to approximately 4 Mtpa ROM coal. The entire IIPP operation will be an open cut mine primarily employing the use of truck and shovel and introducing the dragline, once it arrives in Australia and is assembled, to more efficiently remove the overburden at the existing Isaac Plains Coal Mine in 2009. The IIPP will produce export and domestic thermal, coking and PCI coal. The coal production is made up of nominally 25 % coking coal, 50 % PCI coal (both used in the steel industry) and 25 % thermal (for electricity generation) coal.

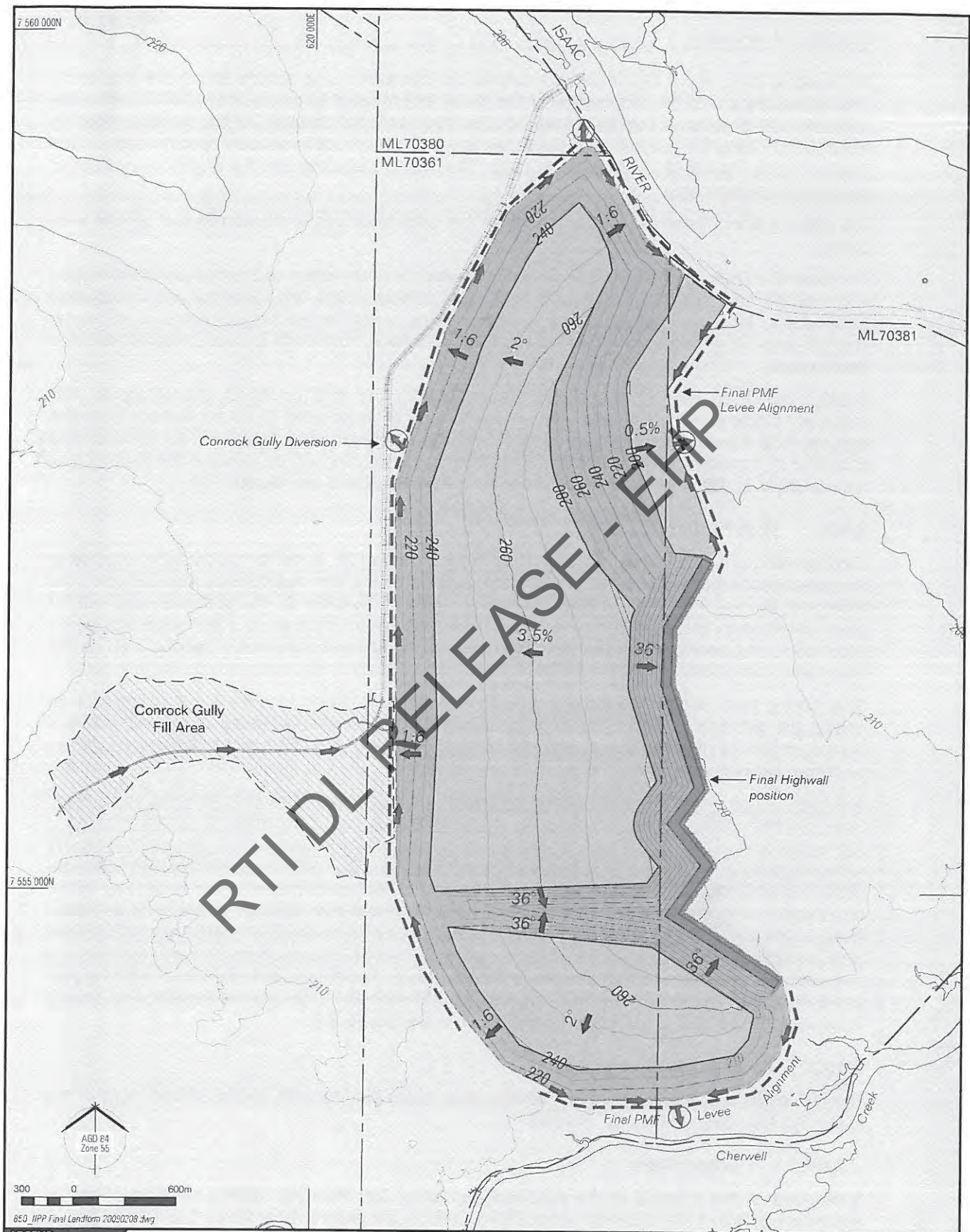
The mine resource in the existing Isaac Plains Coal Mine area consists of dipping coal seams from a depth of 10 to 15 m in the west to 50 to 70 m in the east. The shallow depth of the deposit makes it suitable for truck and shovel operations. Separate pre-strip operations are currently undertaken at the existing Isaac Plains Coal Mine and this process will continue for the entire IIPP.











LEGEND

ML Boundaries	PMF Final Levee Alignment
Surface Contours (5m interval)	Proposed Final Void
Spoil Toe Drain	Rehabilitated Spoil
Culverts / Flood Gates	Conrock Gully Fill Area

ISAAC PLAINS COAL

INTEGRATED ISAAC PLAINS PROJECT

Isaac Plains

Conceptual Final Landform and Drainage Plan

FIGURE 3-12

Description of the Project

The existing Isaac Plains Coal Mine has commenced operation using a truck and shovel operation. This will continue until the introduction of the dragline (estimated to commence in 2009), when the operation will become a combined method operation with the dragline as the primary stripping mechanism. Mining will commence in the Expansion Area using truck and shovel operations until such time as mining operations at the existing Isaac Plains Coal Mine cease and the dragline is moved for use in the Expansion Area.

The existing Isaac Plains Coal Mine consists of five contiguous pits to be worked over a nine year period.

The Expansion Area operations are proposed to commence upon receipt of approval and confirmation of the mining lease application, estimated to be late 2007/early 2008. The Expansion Area is expected to be worked for approximately 11 years. Detailed mine design for the Expansion Area is still to be finalised, but it is expected to consist of one long pit striking from north to south, worked from the west to east.

Initially, vegetation will be stripped and removed from the area of impact and stockpiled and selectively placed on the final land form. Where it can not be so used, it will be burned under the regional rural fire service's 'Permit to Light Fire' system. Following this topsoil will be removed and stockpiled and overburden will be drilled and blasted. Overburden will be removed followed by coal removal. Spoil and topsoil will be managed as outlined in **Section 5** and **Section 19**.

3.10.1 Post Mining

The overriding principle for the rehabilitation program for the IIPP is that the land will be returned to an agreed post-mine land use that will be stable, self-sustaining and maintenance free. Based on the findings of the soil and land suitability assessment (refer to **Section 5**), the post-mine land use for areas disturbed by mining activities as part of the IIPP will be returned to a self-sustaining native vegetation using appropriate native tree, shrub and grass species based on site specific trials during progressive rehabilitation. **Section 19**, Rehabilitation and Decommissioning, provides further detail.

Final mining voids will form a significant feature of the post-mining land form. On completion of mining, the last strip that is mined in an open-cut mining operation is left as a final void. This is because there will be no further overburden removal to fill the void and it is not typically feasible to push spoil back into the void.

The open cut pit within the limits of the predicted inundation area of the Probable Maximum Flood (PMF) will be backfilled at mine closure. In areas of the open cut pit above the predicted level of the PMF a final void will remain. The final void will be located on the eastern side of the mining area and will extend over a length of approximately 2.8 km (Figure 3-12). With the exception of the northern end of the Expansion Area pit and a 1.2 km section of the final void adjacent to the Isaac River within the floodplain, final voids will not be backfilled. The final void that runs perpendicular to the Isaac River, at the easternmost side of the Expansion Area pit, will remain as an open void until closure (refer to Figure 3-12). It will be backfilled up to the 202 m AHD contour during the decommissioning and closure phase (refer to Section 19 for further detail). Backfilling up to the 202 m AHD contour has been chosen to provide flood immunity for the 1 % AEP plus 1 m, which is estimated to provide immunity for the 0.5 % to 0.1 % AEP, as discussed in Section 6.7.6.

3.10.2 Creek/Gully Diversions

The flow paths of Smoky Creek in the existing Isaac Plains Coal Mine ML and of Conrock Gully in the Expansion Area each overlie coal reserves.

3.10.2.1 Smoky Creek

Subsequent to the approval of the existing Isaac Plains Coal Mine (ML 70342), IPCM identified an economic quantity of coal reserves under Smoky Creek in the existing Isaac Plains Coal Mine. To mine the coal seam under Smoky Creek, the creek will be diverted to a new alignment to the south for a length of about 1.2 km (refer to **Section 6**). The diversion does not change the catchment area contributing to the creek or any other waterway and accordingly flood flows will remain unaltered. Further details of the diversion are available in **Section 6**.

3.10.2.2 Conrock Gully

To enable efficient mining of the economic Expansion Area coal resources, it is proposed to divert Conrock Gully from its current course. The diversion will direct flows from Conrock Gully, north to the Isaac River about 4.2 km upstream of the existing confluence of Conrock Gully with the Isaac River. A number of options were assessed for the diversion, which examined diverting the gully to the north or to the south. Diverting the gully north was the only viable option based on the earthworks requirements. The haul road across Conrock Gully will act as a dam to raise the water levels within Conrock Gully so that water can discharge into the diversion channel during the operations phase of the mine. Conrock Gully reservoir area will be backfilled so that the area is free draining at the end of mine life. Refer to **Section 6** for further details.

3.11 COAL HANDLING

3.11.1 Existing Isaac Plains Coal Mine

Coal at the existing Isaac Plains Coal Mine is currently removed from the pit(s) by truck and shovel and is transferred to the ROM coal stockpile for processing into batches. The ROM pad is designed to allow for short-term stockpiling of pre-crushed coal. This is currently separated into two zones to enable the stockpiling of the:

- LHD top seam; and
- LHD bottom seam and LHL.

The stockpiles collectively have the capacity to contain approximately 150,000 tonnes or 15 days of feed coal as intermediate storage and allow for the best possible blending of ROM feed. Coal from LHD top and LHD bottom seams are processed separately on a batch washing basis. Processing batch lengths have been developed in order to optimise the process yields and minimise the rate of use of consumables.

3.11.2 Expansion Area

The introduction of the Expansion Area will require a change to the management of the pre-crusher coal. Mining in the Expansion Area will require the following seams to be individually stockpiled:

- LHD;
- V1;
- V2;
- V31; and
- V32.

ROM coal from the Expansion Area will be hauled from the mine pits and separately stockpiled at the ROM coal stockpile located at the northern end of the Expansion Area. Blending will be carried out at the Expansion Area ROM stockpile area to produce a single ROM feed for the CHPP. The Expansion Area coal will be trucked along the access/haul road to the existing ROM stockpile area. If necessary, an extension to the pad within existing cleared areas will be made to accommodate this coal.

3.11.3 Product Stockpiles

Stockpile management will be carried out by the CHPP contractor, Ascentis, to cater for the current production plans for the existing Isaac Plains Coal Mine. Stockpile operating practices need to recognise not only the mine based production requirements but also short and medium term shipping schedules for the IIPP.

Stockpiling of product coal at the existing CHPP will continue to use three discrete product stockpiles. These are typically as described in **Table 3-10**.

Table 3-10 Product Stockpile Capacity

Description	Live (kt)*	Dead (kt)**	TOTAL (kt)
Semi-Soft Coking Coal (SSCC)/PCI	30	40	70
Coking Coal (Semi-Hard Coking Coal (SHCC))	30	40	70
Thermal	60	80	140
TOTAL	120	160	280

* Live assumed as the immediate stockpile beneath the stacker.

** Dead capacity requires dozing out to the pad perimeter.

3.12 COAL PROCESSING

The CHPP to be used for the IIPP has already been constructed under approvals for the existing Isaac Plains Coal Mine. Details regarding the CHPP are provided in **Section 3.5.2**.

No additional infrastructure will be required to increase production of the CHPP from 1.9 Mtpa ROM up to approximately 4 Mtpa ROM. To achieve the increased throughput, the CHPP run time will increase from the current two shift per week day to 24 hrs per day, 7 days per week. The CHPP was approved based on conservative modelling for 24 hr, 7 days per week operation.

3.13 COAL EXPORT

Coal from the existing Isaac Plains Coal Mine is exported from Dalrymple Bay Coal Terminal (DBCT). The terminal currently has an annual loading capacity of 68 Mtpa. Already one of the largest coal terminals in the world, DBCT's capacity is being expanded to 85 Mtpa (from approximately 68 Mtpa) to meet ongoing customer demand.

Environmental control structures at the coal terminal continue to be upgraded to meet regulatory requirements as part of DBCT statutory requirements. Port capacity has been allocated to IPCM to meet the plan for the IIPP, i.e. 3.3 Mtpa at maximum capacity.

3.14 NOTIFIABLE ACTIVITIES

Notifiable activities are listed in Schedule 2 of the EP Act. Under the EP Act, landowners and local government must inform the EPA that land has been or is being used for a notifiable activity. Land that has been or is being used for a notifiable activity is recorded on the Environmental Management Register, which is maintained by the EPA. Notifiable activities that are currently carried out at the existing Isaac Plains Coal Mine and are proposed for the Expansion Area are listed below.

- **1 Abrasive blasting** - carrying out abrasive blast cleaning (other than cleaning carried out in fully enclosed booths) or disposing of abrasive blasting material.
- **7 Chemical storage** (other than petroleum products or oil under item 29) - storing more than 10 t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code.
- **14 Engine reconditioning works** - carrying out engine reconditioning work at a place where more than 500L of the following are stored -
 - (a) halogenated and non-halogenated hydrocarbon solvents;
 - (b) dangerous goods in class 6.1 under the dangerous goods code;
 - (c) industrial degreasing solutions.
- **23 Metal treatment or coating** - treating or coating metal including, for example, anodising, galvanising, pickling, electroplating, heat treatment using cyanide compounds and spray painting using more than 5 L of paint per week (other than spray painting within a fully enclosed booth).

Description of the Project

- **24 Mine wastes –**
 - storing hazardous mine or exploration wastes, including, for example, tailings dams, overburden or waste rock dumps containing hazardous contaminants; or
 - exploring for, or mining or processing, minerals in a way that exposes faces, or releases groundwater, containing hazardous contaminants.
- **29 Petroleum product or oil storage - storing petroleum products or oil**
 - in underground tanks with more than 200 L capacity; or
 - in above ground tanks with -
 - (i) for petroleum products or oil in class 3 in packaging groups 1 and 2 of the dangerous goods code—more than 2,500L capacity; or
 - (ii) for petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code—more than 5,000L capacity; or
 - (iii) for petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS 1940, *The storage and handling of flammable and combustible liquids* published by Standards Australia - more than 25,000L capacity.

3.15 ENVIRONMENTALLY RELEVANT ACTIVITIES

Environmentally Relevant Activities (ERAs) are defined in Schedule 1 of the *Environmental Protection Regulation 1998*. ERAs are usually industrial activities with the potential to release contaminants to the environment, for example chemical processing, waste treatment, spray painting etc. Mining and petroleum activities are also ERAs. ERAs are used to define the annual licence fees for the site. The ERAs that are currently carried out at the existing Isaac Plains Coal Mine and are proposed for the Expansion Area are listed below.

- **7(b) Chemical storage** - storing chemicals (other than crude oil, natural gas and petroleum products), including ozone depleting substances, gases or dangerous goods under the dangerous goods code in containers having a design storage volume of 1,000 m³ or more.
- **11(b) Crude oil or petroleum product storing** - storing crude oil or a petroleum product in tanks or containers having a combined total storage capacity of 50,000L or more.
- **15(a) Sewage treatment** - a standard sewage treatment works having a peak design capacity to treat sewage of 21 or more equivalent persons but less than 100 EP.
- **23(a) Abrasive blasting** - commercially cleaning equipment or structures using a stream of abrasives if the activity is carried out at a permanent location.
- **24 Boiler making or engineering** - commercial boiler making, electrical machine manufacturing or building or assembly of agricultural equipment, motor vehicles, trains, trams or heavy machinery.
- **25(b) Metal surface coating** - commercial spray painting (other than spray painting motor vehicles), powder coating, enamelling, electroplating, anodising or galvanising in works having an annual throughput of metal products of 2,000 t or more but less than 10,000 t.
- **28 Motor vehicle workshop** - operating a workshop or mobile workshop in the course of which motor vehicle mechanical or panel repairs are carried out in the course of a commercial or municipal enterprise (other than on a farm or under a mining tenement) or on a commercial basis.

Description of the Project

- **42 Mineral processing** - commercially processing, classification, mixing or concentration of mineral ores to produce mineral concentrates in works having a design production capacity of more than 100,000 t/yr.
- **62 Concrete batching** - producing concrete or a concrete product by mixing cement, sand, rock, aggregate or other similar materials in works (including mobile works) having a design production capacity of more than 100 t/yr.

Extraction of rock or other material and screening for the purpose of infrastructure construction in the Expansion Area (e.g. roads, dams etc.) will be undertaken within the proposed MLs wherever possible. If required, additional material will be imported from an external source that is appropriately licensed under the EP Act. Extraction of rock or other material and screening under a mining tenement or an authority, lease or licence does not constitute an ERA, providing it is not exported from the site for sale.

The majority of material required for construction of infrastructure within the Expansion Area will be sourced on-site through a balanced cut and fill.

3.16 WORKFORCE AND HOURS OF OPERATION

The IIPP workforce will vary through the construction and operation phases and therefore will create varying accommodation requirements and traffic within the area. Refer to **Section 3.16.3** for details of accommodation.

An operational workforce of 70 persons is employed at the existing Isaac Plains Coal Mine, (i.e. 1.9 Mtpa ROM coal operation), with a two shift roster, up to seven days per week.

With the introduction of mining in the Expansion Area, the increase in production from 1.9 Mtpa up to 4 Mtpa ROM coal, and increased hours of CHPP operations, the workforce will increase by 40 persons to a total of 110 persons. Mining and associated activities will be undertaken 24 hrs per day consisting of two 12 hr shifts, seven days per week. Administration staff working hours are 7 am to 5 pm Monday to Friday.

In addition to staff required for mining operations, approximately 20 persons (potentially peaking at 40 persons for approximately three to six months) will be required to construct the access/haul roads within the Expansion Area and between the Expansion Area and the existing Isaac Plains Coal Mine (including construction of the underpass beneath the Peak Downs Highway). Construction activities will be completed in a period of approximately nine months. Construction workers will work during daylight hours only.

Assembly of the dragline will also require a peak workforce of up to 70 persons during the construction phase.

Refer to **Section 15** for further details on the IIPP workforce.

3.16.1 IPCM Team

IPCM have developed the existing Isaac Plains Coal Mine using a small team of staff specifically assembled for the project. This team will primarily focus on the management of the IIPP operation in terms of health, safety and environment, production management, contract supervisions and coal quality and logistics. The team is split between two offices, the corporate office and the site office located at the existing Isaac Plains Coal Mine. Team members fill the following roles:

- General Manager;
- Compliance Superintendent (Health, Safety, Environment and Community);
- CHPP Superintendent (contractor);
- Technical Services Superintendent;
- Mine Superintendent;
- Senior Management Accountant;
- Accountants;

Description of the Project

- Commercial Manager;
- Administration Personnel; and
- Consulting Engineer.

Larpro have been appointed by IPCM as the Project Managers for the development of the IIPP.

Consultants have been and will continue to be used periodically for support in detailed design and other areas of expertise.

3.16.2 Operational Mining Contractors

All operational functions at the existing Isaac Plains Coal Mine are undertaken by contractors. The Expansion Area of the IIPP will also be operated by contractors. Contractors and IPCM staff operate under site management structures and guidelines. All contractor responsibilities rest with the contractor's senior manager on site.

The mine operational team consists of the mining contractor, Cook Construction Pty Ltd (Cook), and Ascentis, manager and operator of the CHPP. The contractors employ the following personnel:

Cook's Construction - Mining Contractor

- Project Manager/Site Senior Executive
- Superintendent Level: maintenance, mining, safety
- Professional staff: mining, maintenance
- Operators
- Tradespersons

Ascentis - CHPP Contractor

- CHPP Manager/SSE
- Maintenance co-ordinator
- Professional staff-administration and safety
- Electrical maintenance/operators and mechanical maintenance/operators

Weekly site meetings are held between members of the IPCM team and the site contractors to discuss site operational issues. The meetings are run by the IPCM team who then report to the IPCM project joint venture participants.

3.16.3 Workforce Accommodation

Accommodation for the majority of operational and construction personnel will be provided at the MAC Coppabella camp on the Peak Downs Highway, approximately 26 km east of the IIPP and 35 km east of the township of Moranbah. IPCM has a contract with the MAC Coppabella camp for 120 rooms in Coppabella. With the increase in construction and operational personnel at the IIPP, the number of rooms will increase to a maximum of 228 rooms. An agreement has been reached with MAC Coppabella camp to allow for fluctuation in demand. This increase will accommodate the dragline construction staff. Some of the workforce, estimated to be approximately 5 %, may choose to live locally in Moranbah.

3.16.4 Workforce Transport

Mine shift workers will be transported to the IIPP site by bus from their camp accommodation as will the majority of contractors during the construction phase. The use of the bus to transport shift workers is intended to reduce the risk of fatigued drivers on the road.

An estimated 200 light vehicles (composed of staff and visitor trips) will enter and exit (i.e. sum of in: out trips) the site on a daily basis during construction. In terms of heavy/other vehicles, an estimated 60 service/deliveries vehicles and minibuses will enter and exit the site daily.

Description of the Project

The anticipated trip distribution for traffic accessing the site is as follows:

- 95 % of traffic will be travelling to and from the east (e.g. Coppabella and Mackay); and
- the remainder of 5 % will be travelling to and from the west (e.g. Moranbah).

It is anticipated that the traffic distribution percentages will be the same during construction and full operation.

In addition, assembly of the dragline at the existing Isaac Plains Coal Mine will require a peak workforce of 70 persons over approximately 12 months. It is estimated that 40 % of this workforce will travel to the site by buses from the Copabella camp, supplied by IPCM with the remainder travelling in private light vehicles. An allowance for an additional 12 trade visitors per day has also been made.

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4

CLIMATE &
NATURAL DISASTERS

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

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4 CLIMATE AND NATURAL DISASTERS

4.1 CLIMATE

The Bureau of Meteorology (BoM) has a weather station at the Moranbah Water Treatment Plant, (Station 034038) which collected climatic records from 1972 to 2004. This is the closest long-term weather station to the IIPP. A summary of the average climate recorded at Station 034038 is presented in **Table 4.1**. According to the BoM, the Moranbah region is classified as 'Subtropical' based on the Koppen¹ classification system.

Moranbah has a warm climate with mean maximum temperatures ranging from 34.2°C in January to 23.6°C in July. Mean minimum temperatures range from 22°C in January to 9.7°C in July. The wind is predominantly from the north-east to the south-east. Further information on wind direction and speed, predominantly in reference to air quality is provided in **Section 8**.

The average annual rainfall at Moranbah Water Treatment Plant is 589.5 mm, of which the majority falls in the warmer months of the year (November to February). Historically, the highest monthly rainfalls occur in December.

The evaporation rate is highest in the summer months, with a mean daily rate of 8.5 mm in January, and lowest in the cooler months, with a mean daily rate of 3.6 mm in June. The mean monthly rate of evaporation is 77.8 mm. The annual average rate of evaporation is 2,372.5 mm, which greatly exceeds the annual rainfall, a characteristic of semi-arid environments.

Table 4-1 Climate Averages – Moranbah Water Treatment Plant

Month	Temperature		Relative Humidity (%)		Wind Speed (km/h)		Rainfall (mm)		
	Mean min	Mean max	9am	3pm	9am	3pm	Mean Monthly	Highest Daily	Highest Monthly
Jan	22	34.2	69	41	7.2	8.5	94.8	120.4	315.0
Feb	21.8	33.2	73	46	7.5	9.6	90.5	150.8	316.2
Mar	20.1	32.3	70	41	8.2	9.5	52.7	164.8	268.0
Apr	17.6	29.5	73	44	7.7	8.8	36.7	143.8	271.0
May	14.4	26.4	73	45	6.2	6.8	39.4	58.0	196.6
Jun	11.0	23.7	72	43	5.3	6.3	18.8	38.8	55.3
Jul	9.7	23.6	68	39	5.1	6.8	17.1	60.0	103.6
Aug	11.1	25.2	66	36	6.6	7.7	24.9	150.8	247.3
Sep	13.9	29.4	57	28	8.2	9.0	8.0	20.4	39.4
Oct	17.6	32.2	59	31	8.6	8.6	37.5	73.8	146.6
Nov	19.5	33.0	61	35	8.4	8.8	69.6	85.6	220.3
Dec	21.1	33.8	65	40	8.3	8.5	99.6	116	318.2
Annual Average	16.7	29.7	67	39	7.3	8.2	49.1	-	-

Source: http://www.bom.gov.au/climate/averages/tables/cw_034038.shtml

¹ The Koppen classification is based on the concept that native vegetation is the best expression of climate, thus climate zone boundaries have been selected with vegetation distribution in mind. It combines average annual and monthly temperatures and precipitation, and the seasonality of precipitation.

4.2 NATURAL DISASTERS

4.2.1 Cyclones/Flooding

A summary of the BoM Queensland Flood Summaries over the past 120 yrs indicates that there have been relatively few cyclones in the past 120 yrs in the Bowen Basin area. The most intense cyclone, a Category 2 event, occurred in January 1918 in Mackay and caused severe flooding. High floods were also experienced in all tributaries of the Fitzroy and Burdekin Rivers, especially the Dawson, Mackenzie, Comet and Nogoa Rivers.

Some Category 1 cyclones have been reported in Mackay region over the last 120 yrs. However, these cyclones tend to be quite weak in intensity and the associated rain depression would have little effect on the IIPP area.

As previously discussed, meteorological monitoring commenced at the Moranbah Water Treatment Plant in 1972. Since 1972, the highest daily rainfall recorded at the Moranbah BoM station was 164.8 mm. Potential impacts from flooding and heavy rainfall events have been assessed for the IIPP in **Section 6**. There is a risk of flooding and impact from cyclonic winds on the IIPP with the potential to release contaminants and sediments from site. This may occasionally, but infrequently, necessitate halting of mining activities.

IPCM will manage the impacts of flooding in accordance with SPP: 1/03 *Mitigating the adverse impacts of Flood, Bushfire and Landslide*. Flood levees will be constructed progressively throughout the IIPP site in an attempt to prevent flooding from impacting mining activities.

4.2.2 Bushfires

Bushfire risk mapping as modelled by the Rural Fire Service and Queensland Fire and Rescue Service, has been reviewed for both Belyando and Nebo Shire LGAs². The area surrounding Moranbah is primarily classified as having a medium to low bushfire risk, although there are a number of locations within Nebo Shire which have been classified as having a high bushfire risk. The high bushfire risk locations closest to the IIPP are an area adjacent to the northern side of the Peak Downs Highway approximately 15 km to the east, and two areas approximately 17 to 18 km to the north-east of the existing Isaac Plains Coal Mine.

As a bushfire mitigation measure, the area around the existing mine infrastructure has been cleared. A dedicated buffer has been left around the CHPP and mine infrastructure areas of approximately 100 m, which meets the requirements of SPP: 1/03 *Mitigating the adverse impacts of Flood, Bushfire and Landslide*. A 100 m buffer will also be constructed around the infrastructure located in the Expansion Area. There is ongoing liaison with the adjacent landowners regarding fire breaks and ongoing maintenance programs to minimise the risk of bush fire.

IPCM follows the Queensland Mines Rescue Service regulations and procedures and has a dedicated, fully trained, Mines Rescue Team. Those employees/contractors who form the team have full senior and occupational first aid qualifications.

4.2.3 Landslides

Landslides can be caused by earthquakes, volcanoes, soil saturation from rainfall or seepage or by human activity (e.g. vegetation removal, construction on steep terrain).

Landslides usually involve the movement of large amounts of earth, rock, sand or mud or any combination of these. The rate of movement of a landslide can vary from exceptionally slow to a sudden and total collapse.

The distance travelled by landslide debris can also vary greatly, from a few centimetres in 'ground slumps', to many kilometres when large mud flows follow river valleys.

² On advice from Queensland Fire and Rescue Service mapping has been used as a guide only.

Based on the topography of the IIPP site it is unlikely that there would be any landslides resulting from natural causes. Disturbance to waterways has the potential to create land slippages and mining activities also have the potential to create localised slippages within the mine pits. Despite this low risk, should a land slide/slippage occur, IPCM will manage the impacts in accordance with SPP: 1/03 *Mitigating the adverse impacts of Flood, Bushfire and Landslide*, in consultation with the Queensland Government State Disaster Management Group.

4.2.4 Earthquakes

The majority of the world's earthquakes generally occur at plate boundaries, i.e. interplate seismicity. Although Australia is located within a tectonic plate, it exhibits intraplate seismicity but with a comparatively low level of activity. Earthquakes have been assessed as a low hazard for the IIPP based on the Mackay region earthquake map (Geoscience Australia, 2007). Earthquake activity occurs in a general zone along the coast from the border of NSW to north of Cairns and extends off the coast and further inland from the IIPP.

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5

LAND

Land

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5 LAND

5.1 ENVIRONMENTAL VALUES

In the absence of criteria for specifying environmental values for land in the EP Act, EP Regulations and Policies, the environmental value for the land is regarded as the existing land suitability classification, i.e. suitability for grazing. The major potential impacts on land suitability will be the construction of surface infrastructure and mining.

In the case of the former, most of the surface infrastructure has been constructed under the approval for the existing Isaac Plains Coal Mine and therefore does not require consideration in this EIS. Additional surface infrastructure related to the Expansion Area is outlined in **Section 3.6.7**, **Section 3.7.1** and **Section 3.7.2**.

Section 19 presents information regarding changes to topsoil parameters as a result of proposed changes to the existing Isaac Plains Coal Mine, i.e. change in pit layout and the proposal to divert Smoky Creek. In terms of soil conservation and agricultural land suitability, potential impacts from mining activities are considered manageable and the proposed post-mining land use is considered readily achievable. In addition, although there is some change to the agricultural land available, the IIPP will provide a greater community benefit as mining is a high value land use and contributes to employment and expenditure for the state.

5.2 TOPOGRAPHY

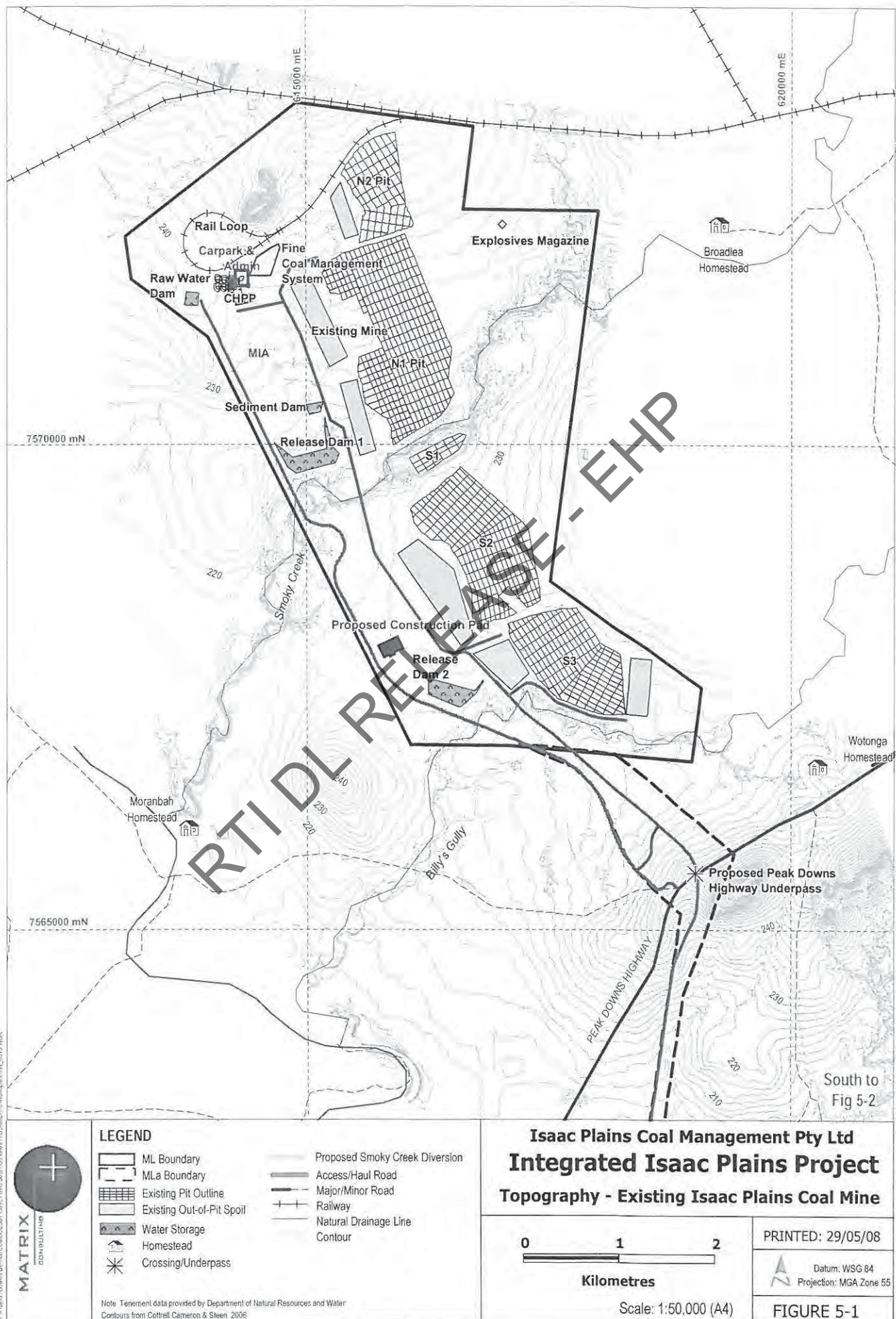
The topography in the area of the existing Isaac Plains Coal Mine area is detailed in the Harrybrandt 1:100,000 scale Topographic Map (DME, 1973). Elevation at the site ranges between 200 m AHD and 300 m AHD, and the drainage lines from the north-east to south-west towards the Isaac River. Smoky Creek flows through the centre of the ML while the waterway, known locally as Conrock Gully, traverses the ML adjacent to its southern boundary. **Figure 5-1** illustrates the topography of the existing Isaac Plains Coal Mine.

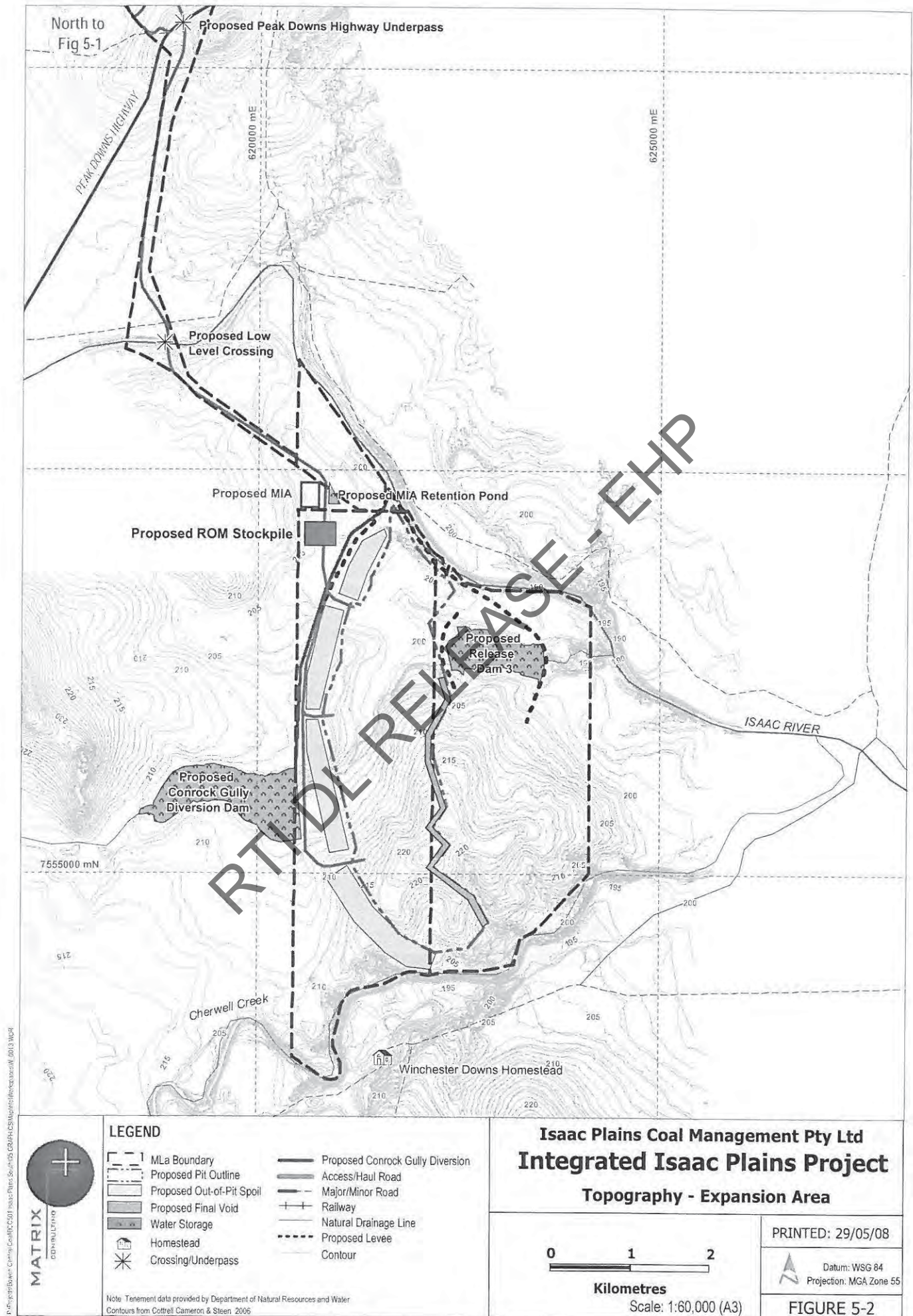
The general slope of land beneath the footprint of the mining pit area averages between 2 % and 3 % and can be described as gently undulating. Steeper slopes occur within the waterways and in the undisturbed hills to the east and west of the mine pit area. The rail loop traverses an area to the south of a small mesa of about 280 m AHD in height.

The existing Isaac Plains Coal Mine site is bisected by Smoky Creek, which is an ephemeral stream that runs in a north-east to south-west direction to Isaac River. It is proposed to divert Smoky Creek to the south of its existing course in order to access the portion of the deposit directly beneath it. This is detailed in **Section 6**. Billy's Gully is located to the south of the southernmost pit, also flowing in the north-east to south-west direction to the Isaac River.

The topography of the Expansion Area is presented on the Grosvenor Downs 1:100,000 topographic map (Sheet 8553). Within the Expansion Area, the local topography generally grades from the west to the east towards the Isaac River, with the topography characterised by a small ridge/plateau in the centre, running almost north-south. The ridge rises from 200-206 m on the western boundary to 224 m, dropping down to 200-210 m on the eastern boundary and the highest elevation within the proposed pit is at 7,555,500 mN, 622,100 mE, 222 m AHD (refer to **Figure 5-2**). Topography in the Expansion Area can also be described primarily as gently undulating.

The Expansion Area is south of the Isaac River and is currently accessed via Winchester Road. The southern boundary of the Expansion Area is bordered by Cherwell Creek, a tributary of the Isaac River. Neither Cherwell Creek nor the Isaac River will require diversion. Conrock Gully (local name), also a tributary of the Isaac River, passes through the middle of the Expansion Area in a general west-east direction and will be diverted. This is also discussed in **Section 6**.





5.3 SOILS

5.3.1 Soil Survey and Land Suitability Assessment Methodology

A soil survey and land suitability assessment was undertaken for the Expansion Area of the IIPP by GTES Pty Ltd in August 2006 (refer to **Appendix F**). An assessment was previously completed for the existing Isaac Plains Coal Mine (and is available upon request). Relevant components of the study are reproduced in this section of the EIS. Both assessments were based on the Queensland Department of Minerals and Energy (1995) Technical Guidelines for the Environmental Management of Exploration and Mining and the Environmental Policy for Mining in Queensland (Policy)¹. The Policy states that post-mining landforms should aim to return lands of similar suitability and range of land use options which existed prior to mining, or, to an agreed alternative use(s). To achieve this, an understanding of pre-mining land resources and suitability is essential.

The soil survey and land suitability assessment involved the following steps:

1. a review of the existing data for the study area, both published and unpublished, and an assessment of how adequately the data addresses the environmental approval requirements for soil surveys over the area to be mined within the Expansion Area. An assessment methodology was developed in accordance with the findings;
2. approximate mapping units were initially defined using an interpretation of topographic and vegetative patterns from aerial photographs. A preliminary soil legend indicating soil types was developed and refined as detailed field surveys progressed;
3. a detailed soil survey was undertaken (1:40,000) of the proposed disturbance area in accordance with the methodology which met the requirements described by Gunn *et al.* (1988). Detailed and non-detailed site descriptions are nominated. Detailed sites describe the soil profile, major vegetation and landforms including major profile and topographic attributes such that soils may be classified and major observable limiting factors documented. Non-detailed descriptions confirm map unit type and boundaries; and
4. laboratory analyses of soil chemical properties were performed by a NATA approved facility on key profile soil horizons deemed representative of major soil mapping units. The analysis included:
 - electrical conductivity, pH and chloride (all samples);
 - exchangeable cations, particle size, Nitrogen (N), Phosphorus (P), Potassium (K) (surface horizons only);
 - micronutrients, Aluminium (Al), Iron (Fe), Avail. N, Org. Carbon (C), Rep. K (surface only); and
 - heavy metals (where toxicity was suspected).

5.3.2 Soil Mapping Units and Descriptions

Soil mapping units within the Expansion Area have been developed on the basis of similarity in morphology, laboratory data, original vegetation, soil origin and topographic position. The survey area lies predominantly between Cherwell Creek and the Isaac River. An area north of the Isaac River extending north to the Peak Downs Highway was also included in the survey as the mine plan was not available at the time, i.e. a broader area was surveyed. Soil types identified in the Expansion Area are similar to those identified in the surveys conducted for the existing Isaac Plains Coal Mine (GTES, 2005) (refer to **Figure 5-3**).

¹ Guidelines are essentially based on Gunn *et al.* (1988) and the Land Resources Branch. These guidelines are regarded as the established standard for soil surveys in Queensland and form the basis of Local Government shire planning and agricultural assessments for a variety of purposes.

Land

The principal soil types over the Expansion Area are: non-cracking sandy clay, Brigalow gently undulating plains (B2) together with sandy duplex Poplar Box woodlands (E1). Deep sandy and duplex alluvia, with mixed Poplar Box woodland (A1) occur in association with major alluvial lines in the area.

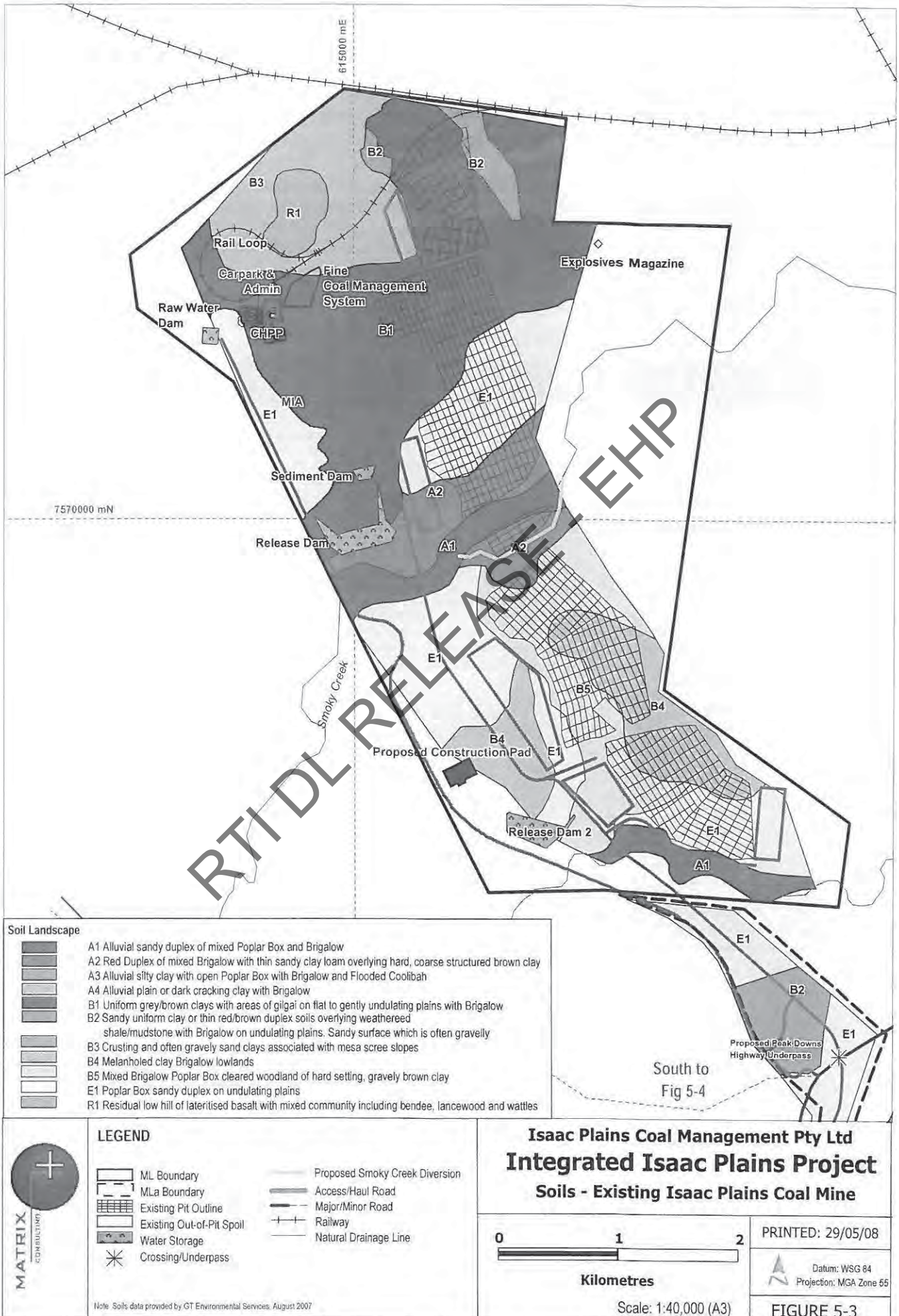
The soils and land suitability assessment identified a total of six major soil types, including one variant. A soil variant may possess attributes which are somewhat different from the mainstream soil attributes but either cannot be mapped out at the relevant scale, i.e. 1:40,000, or does not constitute any significant deviation from the agricultural suitability or basic soil morphology. The variant in this survey consists of the shallower upper slopes of Ironbark occurring within the Poplar Box woodlands (E1) (refer to **Table 5-1**). **Table 5-1** also provides general details of sites described and sites sampled for analysis. **Figure 5-4** illustrates the location of each soil type identified by the soil survey within the Expansion Area.

Table 5-1 Soil Mapping Units and Area

Soil	Description	General Comments	Area (ha)
A1	Alluvial sandy duplex of mixed Poplar Box and Brigalow.	Associated with alluvia of Cherwell Creek and the Isaac River. Mostly uncleared frontage country.	193.9
A3	Alluvial silty clay with open Poplar Box with Brigalow and flooded Coolibah.	Possible opportunistic forage crop use but limited to relatively small area on the Isaac River. Quite thick Parthenium weed was apparent.	162.0
A4	Alluvial plain of dark cracking clay with Brigalow.	Deep well structured clay with possible cropping use although area is not extensive.	258.3
E1	Poplar box sandy duplex on undulating plains	Extensive throughout the area. Excellent pasture at time of survey with good utilisation of short-term rainfall in the deep sandy upper soil layer.	930.6
E1 variant	Relic ridgelines above E1 with shallower duplex with Silver Leaf and Narrow leaf Ironbark with Poplar Box.	Very minor areas in upper positions of the E1 landscape.	Included in E1
B1	Uniform grey/brown clays with areas of gilgai on flat to gently undulating plains with Brigalow.	Occurs on lower lying areas above the alluvial plains in association with B2.	135.2
B2	Sandy uniform clay on thin red/brown duplex soils overlying weathered shale/mudstone with Brigalow on undulating plains. Sandy surface which is often gravelly.	Extensive throughout the area. Buffel pastures were quite dense following earlier rain. Very productive broad scale grazing land which is in good condition. Quite thick Parthenium was apparent in some areas.	593.4

The assessment of soil units, potentially impacted by activities within the Expansion Area, was completed before the finalisation of the alignment of the access/haul road linking the Expansion Area to the existing Isaac Plains Coal Mine. Based on this work, it is anticipated that soils in the area of the final alignment would be similar to those within the northern component of the study area. Soils in this area will be further assessed at the commencement of construction and will be managed accordingly.

Table 5-2 describes the Australian Soil Type (Isbell, 1998) for each soil unit and comparable soils described in the district by Gunn *et al* (1967) and Bourne and Tuck (1996).



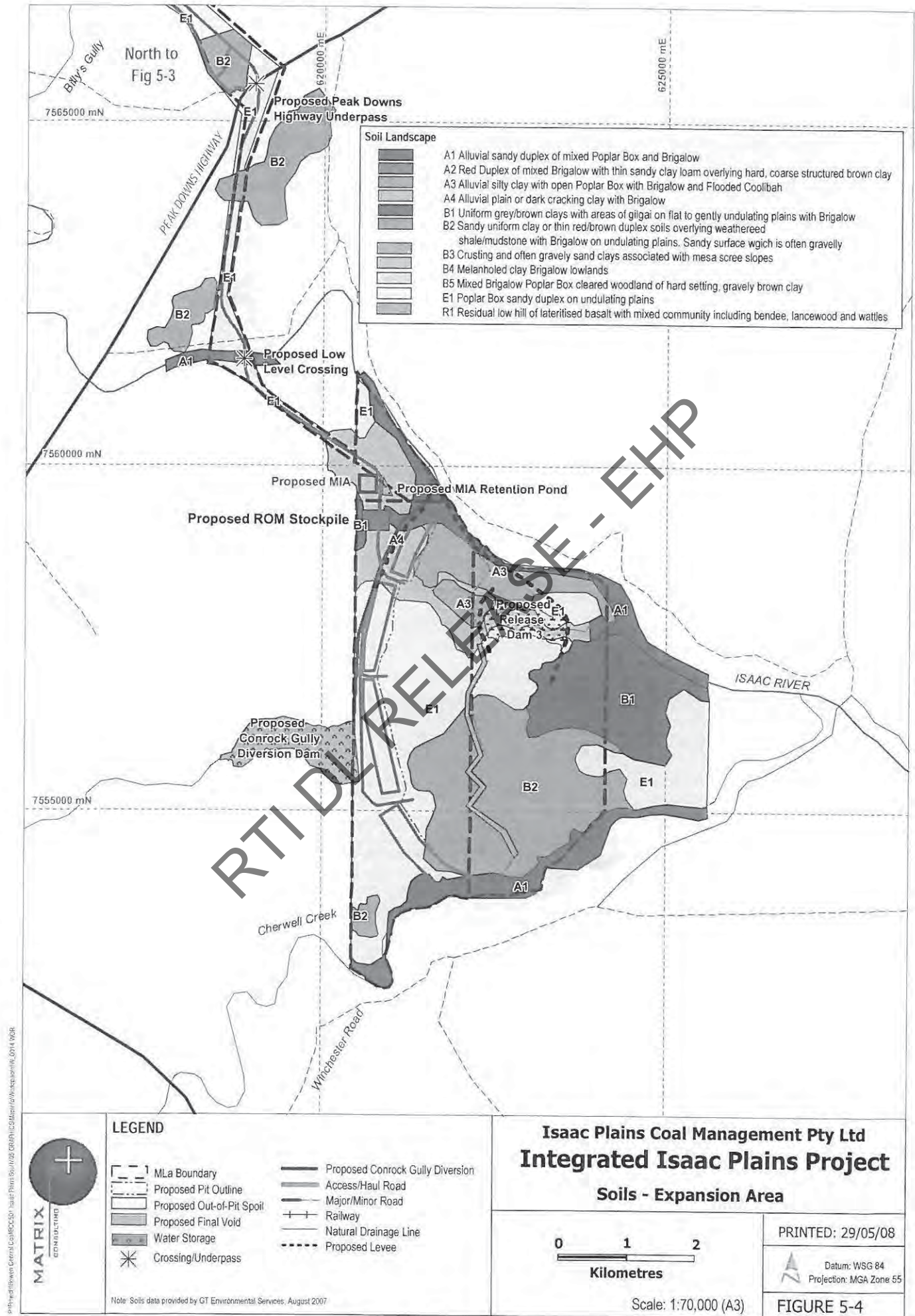


Table 5-2 Relationship Between Study Area Soils and Other Surveys

Soil Type	Description	Australian Soil Type (Isbell, 1998)	AMU (Bourne & Tuck, 1993)	CSIRO (Gunn <i>et al</i> , 1967) land system/soil type
A1	Alluvial sandy duplex of mixed Poplar Box and Brigalow.	Brown Sodosol	Isaac	Connors/Luxor
A3	Alluvial silty clay with open Poplar Box with Brigalow and Flooded Coolibah.	Brown Sodosol	Moramana	Connors/Springwood
A4	Alluvial plain of dark cracking clay with Brigalow.	Black Vertisol	Moramana	-
E1	Poplar box sandy duplex on undulating plains.	Brown Sodosol	Lascelles	Monteagle/Luxor
E1 variant	Relic ridgelines above E1 with shallower duplex with silver leaf and Narrow leaf Ironbark with Poplar Box.	Brown Sodosol	Lascelles	Monteagle/Luxor
B1	Uniform grey/brown clays with areas of gilgai on flat to gently undulating plains with Brigalow.	Vertisol	Springton	Daunia/Teviot
B2	Sandy uniform clay or thin red/brown duplex soils overlying weathered shale/mudstone with Brigalow on undulating plains. Sandy surface which is often gravelly.	Red Chromosol	Glen Idol	Daunia/Taurus

5.3.3 Soil Types and Topsoil Characteristics

Table 5-3 below presents the topsoil characteristics of each soil mapping unit presented in **Table 5-1** as well as a description of accepted management strategies for each.

Table 5-3 Soil Types and Topsoil Characteristics

Soil Type	Topsoil Characteristics
A1 – Active Alluvial Plain of Deeper Sandy Duplex Soil	<p>General - Soils are mostly sandy duplex with mixed vegetation dominated by Poplar Box, but also includes the deep alluvial loams and riverine vegetation associated with the active creek/river channels.</p> <p>Nutrient Level - Nutrient levels are variable and the area supports strong Buffel pasture, particularly during good seasons when moisture is not the significant limiting factor. This soil type is suitable for grazing.</p> <p>Management - Clearing of slopes into the creek channels should be avoided where practicable. The deep surface soil is sandy, well drained and not reactive. It should not be used for water holding structures due to very high permeability characteristics. This soil will respond well to nitrogen application for pasture establishment. The top sandy layer may extend to 100 cm depth and can be stripped when either wet or dry. The deep clay material should be avoided completely due to saline and sodic conditions. The surface soil is better suited to less erosive situations in rehabilitation such as low gradient dumps. Trafficability should be restricted due to excessive moisture as a result of poor infiltration characteristics of the clay B horizon.</p> <p>Distinguishing Features - This soil type occupies alluvia associated with Cherwell Creek and the Isaac River. It occurs on flat plains and is susceptible to occasional flooding. The surface structure is that of a fine sandy loam with the low clay content associated with fairly rapid drainage making it susceptible to drought, although the substantial rooting depth available negates this to some extent.</p>
A3 – Alluvial Silty Clay of open Poplar Box with Brigalow and Flooded Coolibah	<p>General - Soils are uniform silty clays and mostly cleared of vegetation which was previously dominated by Poplar Box in association with Flooded Coolibah, Brigalow, Casuarina and Blackbutt.</p> <p>Nutrient Level - Nutrient levels are strong within the surface 30-40 cm layer. However, levels decrease below this depth. The area supports strong Buffel pasture and is very suitable for grazing; however no cropping potential is indicated.</p> <p>Management - The surface structure is that of fine sandy clay over a silty clay profile with substantial rooting depth. The soil is not reactive; however the stratified alluvial nature of the medium is such that it should not be used for water holding structures. This soil will respond well to nitrogen application for pasture establishment and is best stripped dry. The top 30 cm may be stripped for use as topsoil with potential to take more subject to pH and Electrical Conductivity (EC) levels. The soil will be useful for rehabilitation of level surfaces such as spoil dump tops.</p> <p>Distinguishing Features - This soil type occupies older alluvial plains associated with the Isaac River. It occurs on flat plains and is susceptible to occasional flooding.</p>

Soil Type	Topsoil Characteristics
A4 – Alluvial Plain of Dark Cracking Clay with Brigalow	<p>General - This soil type occurs in association with soil type A3 along older alluvial plains associated with the Isaac River. As with soil type A3, it occurs on flat plains and is susceptible to occasional flooding. The soils are uniform dark cracking clays which were originally thick Brigalow, which differ from the silty non-cracking clays with Poplar Box of the A3. A4 soils have been completely cleared of vegetation, although, Brigalow regrowth is quite evident. These soils offer some potential for opportunistic cropping. However, the extent of A4 is not large and is currently being used for high value grazing.</p> <p>Nutrient Level - Nutrient levels are reasonable and the area supports strong Buffel pasture once initial establishment has been satisfactorily achieved. At the time of the survey, Parthenium weed was quite dense in the area.</p> <p>Management - The surface structure is that of a granular cracking vertisol with medium clay over well structured medium heavy clay which extends to depths exceeding 100 cm. The soil is not reactive, but the shrink/swell nature of the clay medium is such that it should not be used for water holding structures. This soil will respond well to nitrogen application for pasture establishment. The soil is best stripped dry. The top 30 cm may be stripped for topsoil with potential to take soils from deeper than 30 cm subject to pH and EC levels. The soil will be useful on rehabilitation of level surfaces such as dump tops. However, problems with the initial establishment of fine seeded pasture species can be expected.</p>
E1 & E1 Variant – Poplar Box Woodlands on Sandy Duplex Soils	<p>General - These two soil types occupy a major portion of the survey area, i.e. It is a significant component. It is generally quite uniform in characteristics with open Poplar Box on a 50 cm thick (average) surface layer of loamy sand over mottled yellow clay. It occurs on undulating 0-2 % slopes, is susceptible to erosion, and supports Buffel pasture which was quite abundant at the time of the survey. The soil unit has been subject to extensive thinning and clearing.</p> <p>A localised soil variant which occurs on upper ridge areas exhibits a thinner sandy surface horizon with both narrow and Silver leaf Ironbark.</p> <p>Nutrient Level - Nutrient levels are low, the area supports reasonable Buffel pasture. Plants may better utilise soil moisture from sandy soils following short rainfall events than is possible from clays which tend to tie up such moisture in the dry clay matrix. This soil type is suitable for grazing at fairly broad scale stocking rates.</p> <p>Distinguishing Features - The surface structure is that of a sandy loam to loamy sand overlying very hard, mottled clay subsoils. Restricted drainage is indicated by the presence of bleached A2 horizons at some sites.</p>
B1 – Brown and Grey Uniform Non-cracking Clays	<p>General - Productive grazing soils with desirable all round qualities on very low slopes with reduced degradation potential from erosion following dry times. The soils are brown to grey, moderately well structured, generally non-cracking clays which support abundant Buffel pasture.</p> <p>Nutrient Level - Nutrient levels are quite good on the surface layers. However, saline and sodic conditions prevail immediately below 20 cm depth. It is recommended that prior to stripping of topsoil layers on this soil type, more EC tests should be undertaken to more fully evaluate the potentially high salinity concentrations.</p> <p>Management - A high cation exchange capacity will facilitate favourable responses to fertiliser application for pasture improvement. Preferably, the soil should be stripped when dry to minimise compaction and structural decline. The top 20 cm may be stripped for topsoil with little potential to go deeper. The soil will be useful on rehabilitation in a variety of situations.</p> <p>Distinguishing Features - Some of the area may include shallow (up to 15 cm deep) gilgai of brown sandy clay interspersed with grey clay depressions. The surface structure is sandy and firm with areas of ironstone gravel. In most instances drainage is not impeded to 40 cm.</p>
B2 – Reddish Brown Sandy Clay	<p>General - This soil occupies mid to upper slope positions within the undulating Brigalow lands. The surface structure is firm and sandy with ironstone gravel common. A significant and productive grazing soil but lighter texture and reduced soil depth would reduce moisture storage and increase drying rates with the onset of dry times. These soils have fairly hard structured light clay subsoils over weathered material but appear to be well drained to at least 40 cm in most instances. The soil has a sandy surface and supports strong Buffel pasture.</p> <p>Nutrient Level - General fertility is not high although reasonable for grazing lands. There are problems apparent from subsoil sodicity and salinity below 30 cm depth which is not assisted by its coarse structure.</p> <p>Management - The soil is well suited to grazing and pasture improvement with favourable responses to fertiliser addition expected. The soil should preferably be stripped when dry to minimise compaction and structural decline. The top 20 cm may be stripped for topsoil only. The soil will be useful on rehabilitation in a variety of situations.</p>

5.4 LAND USE

Other than works associated with the existing Isaac Plains Coal Mine, the current land use in the IIPP site is grazing. There is no indication that grain crops have been cultivated anywhere across the entire area of the proposed IIPP. The IIPP area was originally vegetated with mixed Brigalow and Poplar Box communities and associated grasslands. The area has almost been completely cleared to increase grazing capacity and for farm infrastructure including fences, dams and water troughs. The existing Isaac Plains Coal Mine land use is open cut mining and associated mining activities and cattle adjustment. This is also the proposed land use for the Expansion Area.

On completion of mining, the areas will be rehabilitated to a suitable post-mining land use. Factors that affect the post-mining land suitability include changes in soil physical, chemical and biological properties, slope angle and length and soil depth. The over-riding principles for the rehabilitation of the areas disturbed by the IIPP are that the land should be returned to a stable, self-sustaining and maintenance-free state. The existing Isaac Plains Coal Mine rehabilitation objectives are approved and include pit areas of the mine, including internal and external spoil dumps, ramps and final voids. These will be rehabilitated to a self-sustaining native vegetation cover. This will be also the objective for those areas impacted by mining and associated activities in the Expansion Area. The adopted final land rehabilitation suitability and associated rehabilitation activities/methods are further discussed in **Section 19**.

The soil characteristics identified in the field survey in the Expansion Area have been used to identify the land capability according to the Queensland Department of Primary Industries (DPI) land classification system. This information will form the basis for establishing the final land uses which will be incorporated into the overall IIPP rehabilitation program.

5.5 AGRICULTURAL LAND SUITABILITY

The relative suitability for beef cattle grazing as well as dryland cropping was investigated as part of the soils and land suitability assessment. Grazing of native and improved pastures by beef cattle has been the dominant land use since agricultural development of the district. Cropping has not been practised due to generally significant moisture, workability and fertility limitations.

The land suitability classification identifies the types and severity of limiting factors for each land use on the different soil types present. Basically, suitability class is determined by the most severe limitation, or a combination of varying limitations. Details of limiting factors and their assessment are provided below.

5.5.1 Limiting Factors

The following limitations are considered relevant to the suitability for rainfed (or dryland) cropping and grazing in the IIPP area. These are using the DPI nomenclature in brackets:

- plant available water capacity (m);
- nutrient deficiency (n);
- soil physical factors (p);
- soil workability (k);
- salinity (s);
- rockiness (r);
- microrelief (g-gilgai);
- wetness (w);
- water erosion (e);
- flooding (f); and
- topography (t).

Land

Land suitability class is determined by the highest ranking limiting factor or a combination of a number of factors. Normally, only the most severe two or three limiting factors would determine suitability and the remainder become irrelevant. For this reason, only the major limiting factors determining suitability are presented. In this survey, the main limiting factors determining cropping and grazing suitability class are: plant available moisture (m); nutrient deficiency (n); soil physical factors (p); erosion (e); workability (k); and susceptibility to flooding (f).

Land suitability classification is based on specific land uses assessed using the classes provided in **Table 5-4**.

Table 5-4 Land Suitability Classification

Class	Description
Class 1	Suitable land with negligible limitations and is highly productive requiring only simple management practices.
Class 2	Suitable land with minor limitations which either reduce production or require more than simple management practices to sustain the use.
Class 3	Suitable land with moderate limitations – land which is moderately suited to a proposed use but which requires significant inputs to ensure sustainable use.
Class 4	Marginal cropping land with severe limitations which make it doubtful whether the inputs required to achieve and maintain production outweigh the benefits in the long-term.
Class 5	Unsuitable land with extreme limitations that precludes its use.

Source: Shields and Williams, 1991 and DME, 1995.

5.5.2 Pre-mining Land Suitability

Existing land use within the IIPP site was described in **Section 5.4**. Across the IIPP site, soils have been used for beef cattle grazing for many years. Only the better, fine textured Brigalow scrub soils (*Picardy* Agricultural Management Unit (AMU)), (Bourne and Tuck, 1996) are known to have cropping potential in the district. None of the *Picardy* type soils were identified in the IIPP site.

5.5.2.1 Rainfed Cropping Suitability

This classification evaluates the broadacre potential for growing non-irrigated cash crops such as sorghum and wheat. Soils identified in the Expansion Area survey area range in suitability from Brigalow clays of B1 (grazing limitation level m2²) to sandy duplex (E1, A1) and hard uniform clay (B5).

Plant Available Water Capacity (m)

Plant available water capacity (PAWC) is a significant soil property in the study area as cropping is based on fallow storage of moisture in the soil profile. PAWC is the moisture stored in the soil profile that is available to the plant and is classically defined as the moisture present between field capacity and permanent wilting point by 15 bar measurement technique (Baker, D.E. and Eldershaw, V.J. 1993). **Table 5-5** shows the criteria which Shields and Williams (1991) proposed for assessment of the moisture availability limitation for crops in the study area.

² Refers to the moisture class of the soil.

Table 5-5 PAWC Criteria for Assessing Cropping Limitations

Limitation Level (m)	PAWC (Mm)	Depth of Black Cracking Clay (Effective Rooting Depth)	Predicted Cropping Success
2	>130	900 mm	70-75 %
3	100-130	600 mm	40-70 %
4	75-100	400 mm	<40 %
5	<75	<400 mm	<<40 %

Source: Shields & Williams (1991).

In this survey, the PAWC of the soil groups was assessed from site specific chemistry, and effective rooting depth estimations developed in accordance with the Bourne and Tuck (1996) guidelines and DME (1995). Effective rooting depth and PAWC estimations were further refined from observed field morphology which facilitated the alignment and comparison of PAWC profiles determined in Shaw and Yule (1978) and Shields and Williams (1991). Field morphology observations and chemical data used included: soil texture; barriers to root growth such as high sodium; gravel; poor soil structure; high electrical conductivity; and chloride.

The findings of the assessment are presented in **Table 5-6** and indicate that the Brigalow clays of B1 hold the most water and therefore would appear to be most effective for pastures. At the other end of the scale are the sandy duplex (E1) soils which typically have less than 80 mm PAWC, and have a lower potential suitability for pasture usage.

Shields and Williams considered that crops on land whose only major limitation was moisture (m4) would only succeed in four out of every 10 yrs in this district.

Table 5-6 Estimated PAWC and Limitation Levels

Soil Type	Effective Rooting Depth (cm)	PAWC (mm)	Available Plant Moisture Limitation (m) refer to Table 5-5	
			Dryland cropping	Beef cattle grazing
A1	40-100	70 - 100	5	3
A3 and A4	40-50	70 - 80	5	2
E1	50-60	60 - 80	5	3
B1	30 -80	80 - 120	5	2
B2	30 - 50	80 - 100	5	2

On a field morphology basis, the only potential for dryland cropping is on the alluvial A4 cracking clay scrub soils which have been assessed as moisture limitation m4 which Shields considers would only succeed in less than 40 % of years. Saline subsoils were found in the analysis of all Brigalow soils (A3, A4, B1, B2) suggesting variable salinity profiles in Brigalow clay soils including the A4 soil type. In addition, the field assessment found that the spatial extent of the soil is not large and is isolated from any other areas of soils with cropping potential which would render the area unsuitable for crops due to management restrictions (access by machinery). It is likely that the inputs required to achieve and maintain a reasonable level of production would outweigh the benefits. Given these factors, the A4 soil type is not considered suitable cropping land.

Other Limiting Factors

Table 5-7 presents the limiting factors to rainfed cropping suitability for each of the soil types within the study area.

Table 5-7 Limiting Factors to Rainfed Cropping Suitability

Limiting Factor	Soil Type/Description of Limiting Factors
Susceptibility to Water Erosion (e)	The risk of soil loss from water erosion is exacerbated by increased water velocity when land is devoid of vegetation for cropping. In the undulating Brigalow soil unit of B2 this risk has been assessed as low to moderate with limitation levels of 2 - 3 applied. During this survey, some evidence of erosion was observed under a grazing use, but it was not considered severe. Erosive effects would increase under cropping.
Nutrient Deficiency (n)	Shields states that soil nutrient deficiency has not been recognised as a major problem for crop production on traditionally cultivated soils in the Central Highlands. Although most soils described in this survey are not the 'traditional cultivated soil' to which Shields refers (G. Tuck pers. comm.), the levels of nutrient deficiency found (refer to Table 5-3) are not severe. The major soil types have levels of limitation between 2 and 3.
Salinity (s)	This refers to the reduction in dry matter yield as a result of soluble salts in the soil profile. It also contributes to reduced water availability limitation. Increasing salinity in the soil profile (below 40 cm) was identified across all Brigalow soil types A3, A4, B1 and B2. In this survey, no specific limitation level has been assigned with the effect of salinity incorporated into moisture availability estimations which directly affect PAWC and hence suitability.
Soil Physical Factors (p)	This limitation deals with conditions which determine sufficient seed contact with moist soil to prevent desiccation prior to germination and establishment. One such condition applies to clay soils which have a narrow moisture content suitable for cultivation as they are susceptible to compaction and smearing when wetter than the plastic limit. Trafficability is also limited by high clay content and moisture retention on the clay soils. The brown clay soils in the Expansion Area have potential to compact with resulting structure decline. The lowest limitation assigned for soil physical factors was a p2 limitation for the A4 soils while the maximum limitation was p3 for the sandy duplex E1.
Rockiness (r)	Rockiness refers to the amount of rock outcrop and coarse fragments greater than 6 cm in diameter. Plough zones of 30 cm depth with 10 % or less rock was considered to be r1, r2 was 10-20 %, r3 was 20-30 %, r4 30-40 % and r5 50 % or greater.
Flooding (f)	Flooding may limit cropping opportunities due to the high risk of erosion of cultivated soil as well as loss of access in critical times. The highest erosion risk occurs in summer with the majority of rainfall coming in intense storms. Flooding risk also increases the risk of crop and pasture improvement failure due to waterlogging, particularly during establishment. Flooding limitation is a real issue for A3 and A4 but generally considered minor in comparison to limitations discussed above.
Topography (t)	Topography is assessed in terms of slope and micro-relief. Slope may limit the effective and safe use of machinery and contribute to erosion hazard. While (t) is a factor in this survey, it is not a major determining factor.

5.5.2.2 Suitability for Beef Cattle Grazing

The assessment process adopted in the assessment conducted followed that used by Shields and Williams (1991). Apart from the addition of vegetation regrowth (v) as a limiting factor, the same limitations assessed for cropping were also used for suitability for grazing of improved Buffel grass pastures.

Class 1 to 3 lands are considered suitable for significant pasture improvement. Class 4 offers marginal potential for pasture improvement, and Class 5 is not suitable for improvement and restricted to grazing of native pastures with low productivity. Major limiting factors are assigned a severity rating (1-5) with the most severe being the overall suitability class for that soil type.

All identified soil units are suited to beef cattle grazing with potential for improved Buffel pastures (Class 1 to 3). Basically, most of the relevant soils do not have significant limitations to a grazing use with the incorporation of sound management practices and have potential for pasture improvement. For these reasons, most of the survey area has long since been cleared.

Plant Available Water Capacity (m)

Pasture production occurs in a shallower root zone than cropping systems and 60 cm of rooting depth in clay soils is considered to be adequate for pastures to achieve maximum production (Shields and Williams, 1991). Limitation levels for grazing are shown in **Table 5-8**.

Table 5-8 Land Suitability for Cattle Grazing – PAWC

Land Suitability Class					
	1	2	3	4	5
Moisture (M)	PAWC >125 mm	PAWC 100-125 mm	PAWC 75-100 mm	PAWC 50-75 mm	PAWC <50 mm

Source: Shields and Williams, 1991.

Other Limiting Factors

Other limiting factors to beef cattle grazing are presented below in **Table 5-9** while the effects of slope on cattle grazing are presented in **Table 5-10**.

Table 5-9 Limiting Factors to Beef Cattle Grazing

Limiting Factor	Soil Type/Description of Limiting Factors
Nutrient Deficiency (n)	These were rated using DME guidelines (1995) from soil analysis data of surface horizons. Shields and Williams (1991) state that a major limiting factor to pasture production in northern Australia is reduced pasture quality as a result of deficiencies in nitrogen and phosphorus. Other elements which also play key roles are potassium and calcium. The clay Brigalow soils (A3, A4, B1, and B2) were generally adequate however the sandy duplex Poplar Box dominated soils (E1) had low fertility.
Salinity (s)	This refers to the reduction in dry matter yield as a result of soluble salts in the soil profile. It also contributes to reduced water availability limitation. Increasing salinity in the soil profile (below 40 cm) was evidenced across all Brigalow soil types B1, B2, A3 and A4. In the assessment conducted, no specific limitation level was assigned with the effect of salinity incorporated into effective rooting depth estimations which directly affects PAWC and hence suitability.
Soil Physical Factors (p)	Physical factors refer to restrictions in the establishment and vigour of pastures as a result of soil surface condition and are typically related to size of surface aggregates which in turn affect the tendency for the surface to seal and hardset. Shields (1991) considers that the establishment and spread of most pasture species is restricted on hard setting surface soils with a sandy loam to clay loam texture which are extensive in this survey area. In cracking clays such as the A4 alluvia, variable levels of moisture alter the soil to seed relationships for small seeded species such as Buffel and Rhodes grass which increases establishment problems. When such soils are dry, seeds may be lost down large cracks, desiccate in airspaces or rapidly dry out after germination in the porous soil.
Susceptibility to Water Erosion (e)	Some evidence of water erosion was noticed in the survey area with the major areas of concern confined to B2 soils. Most parts of the survey area have slopes <1 % which constitutes minor limitations. Table 5-10 shows slope limits for erosion limitation of DME Guidelines (1995).
Rockiness (r) Microrelief (g) Wetness (w) Flooding (f) Vegetation Regrowth (v)	These limitations in the grazing context were considered minor and would not contribute any significant weighting in the classification of grazing land suitability in the survey area. Other limiting factors, as discussed above, were all more significant than those factors listed here. Only a limited number of improved pasture species persist in areas which are subject to frequent or extended inundation. This was also considered to be a low level limitation in some stream channel areas. No regrowth limitations were assigned for any of the soil types with A4 exhibiting the most prominent Brigalow regrowth.

Table 5-10 Land Suitability for Cattle Grazing Land - Effects of Slopes

Limitation Rating					
	1	2	3	4	5
Cracking clays	<3 % slope	Slopes 3-6 %	Slopes 6-9 %	Slopes 9-15 %	>15 %
Sodic rigid soils	<1 % slope	Slopes 1-3 %	Slopes 3-6 %	Slopes 6-12 %	>12 %

Source: *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland* (DME, 1995).

The land suitability of the Expansion Area is summarised in **Table 5-11** below.

Table 5-11 Land Suitability Classes – Pre-Mining

Soil Unit	Description	Cropping		Grazing		Preferred Use
		Major Limitations and Severity	Class	Major Limitations and Severity	Class	
A1	Alluvial sandy duplex of mixed Poplar Box and Brigalow.	moisture – m5 workability – k3 soil physical factors – p2 nutrients – n2 flooding – f2	5	moisture – m3 nutrients – n3 soil physical factors – p2	3	Grazing native pastures. Deep sandy A horizon improves short-term water availability (e.g. storm rain is immediately available) but limits long-term storage.
A3	Alluvial silty clay with open Poplar Box with Brigalow and Flooded Coolibah.	moisture – m5 workability – k4 soil physical factors – p3 nutrients – n2	5	moisture – m2 nutrients – n1 soil physical factors – p2	2	Grazing native pastures. Deep silty clay assists moisture availability and root exploitation.
A4	Alluvial plain of dark cracking clay with Brigalow.	moisture – m4 workability – k3 soil physical factors – p3 salinity – s3	4	erosion susceptibility – e2 moisture – m2 nutrients – n2	2	Grazing of improved pastures. Productive grazing lands with possibility of opportunist forage in good years.
E1	Poplar box sandy duplex on undulating plains.	moisture – m5 erosion susceptibility e4 workability – k4 soil physical factors – p4 nutrients – n3	5	erosion susceptibility – e2 moisture – m3 nutrients – n2 soil physical factors – p2	3	Grazing of improved pastures. Deep sandy A horizon improves water retention and use of small rainfall events e.g. thunderstorms for pastures.
B1	Uniform grey/brown clays with areas of gilgai on flat to gently undulating plains with Brigalow.	moisture – m5 workability – k4 soil physical factors – p3 nutrients – n3 salinity- s3	5	moisture – m2 nutrients – n2 wetness – w3 physical factors – p3	2	Salinity observed below 20 cm in representative site. Brigalow regrowth a problem.
B2	Sandy uniform clay or thin red/brown duplex soils overlying weathered shale/mudstone with Brigalow on undulating plains. Sandy surface which is often gravelly.	moisture – m5 nutrients – n2 soil physical factors – p4 salinity – s3	5	moisture – m2 nutrients – n2	2	Hard subsoil structure and sealing sandy surface restricts moisture. Also, saline subsoils.

5.6 EXISTING LAND CONDITION – EXPANSION AREA

Observations were made at each sampling site of estimated pasture cover percentage and the general state of the land in terms of erosion, vegetation condition and general degradation. At the time of the survey the area had endured extended periods of extremely dry weather with all soil profiles completely dry to the depth of sampling. These conditions provided the optimal time for viewing evidence of land degradation from past grazing practices.

Overall, the Expansion Area is in quite good condition and appears to have been used in accordance with its land suitability. Specific observations with respect to erosion, structural decline, stocking rates, vegetation vigour, fertility and property management, are detailed below.

5.6.1 Erosion

The original soils in unit B2 would probably have been a texture contrast soil with a thin sandy surface layer over the clay B horizon. In most cases, the thin surface had been either wholly or partially removed by sheet wash erosion. This is a common occurrence for such soils and has not significantly impacted its agricultural suitability.

Some soils have dispersive subsoils and apart from localised areas of A1, most subsoils have not been exposed. As a whole, the land in the survey area was not severely depleted from erosion.

5.6.2 Structural Decline

No evidence of compaction as a result of overgrazing was evident, apart from localised areas such as stock watering points and holding yards. No cultivation has been conducted within the area.

5.6.3 Stocking Rates

No specific data was obtained of historical stocking rates however the condition of pastures did not indicate overgrazing was occurring.

5.6.4 Vegetation Vigour

Pasture cover varied from 40-70 % with most sites in the 60 % area which is quite a high percentage in view of seasonal conditions. Most of the original vegetation has been removed, and regrowth in most areas is moderate. The most remnant vegetation remaining was located along Cherwell Creek, Conrock Gully and the Isaac River. Canopy dieback is widespread throughout the Expansion Area and is especially prolific within the woodland in the southern part of the Expansion Area, i.e. along Conrock Gully (refer to **Section 10**).

There was a significant cover of parthenium in the A4, B2 and B1 soil types following rains. No significant occurrences of other noxious species were observed.

5.6.5 Fertility

Overall recorded fertility levels were quite good with some results indicating quite high levels of surface fertility. There is no evidence to suggest that fertility has been degraded as a result of grazing.

5.6.6 Property Management

Farm infrastructure was well maintained and overall the properties appear to be very well managed.

5.7 GOOD QUALITY AGRICULTURAL LAND

The Planning Guideline, "The Identification of Good Quality Agricultural Land" (GQAL) (DLGP and DPI, 1993) establishes four classes of agricultural land for Queensland. Class A Land in all areas is considered to be GQAL. In some areas, Class B land (where agricultural land is scarce) and better quality Class C land (where pastoral industries predominate) may also be considered to be GQAL. The description of the classes is as follows.

- **Class A Crop Land** is suitable for current and potential crops with limitations to production ranging from none to moderate levels.
- **Class B Limited Crop Land** is marginal for current and potential crops due to severe limitations; and suitable for pastures. Engineering and/or agronomic improvements may be required before the land is considered suitable for cropping.
- **Class C Pasture Land** is suitable only for improved or native pastures due to limitations, which preclude continuous cultivation for crop production; but some areas may tolerate a short period of ground disturbance for pasture establishment. C1 designates suitability for improved pastures. C2 is designated land suitable for native pasture.
- **Class D Non-agricultural Land** is not suitable for agricultural uses due to extreme limitations. This may be undisturbed land with significant habitat, conservation and/or catchment values or land that may be unsuitable because of very steep slopes, shallow soils, rock outcrop or poor drainage.

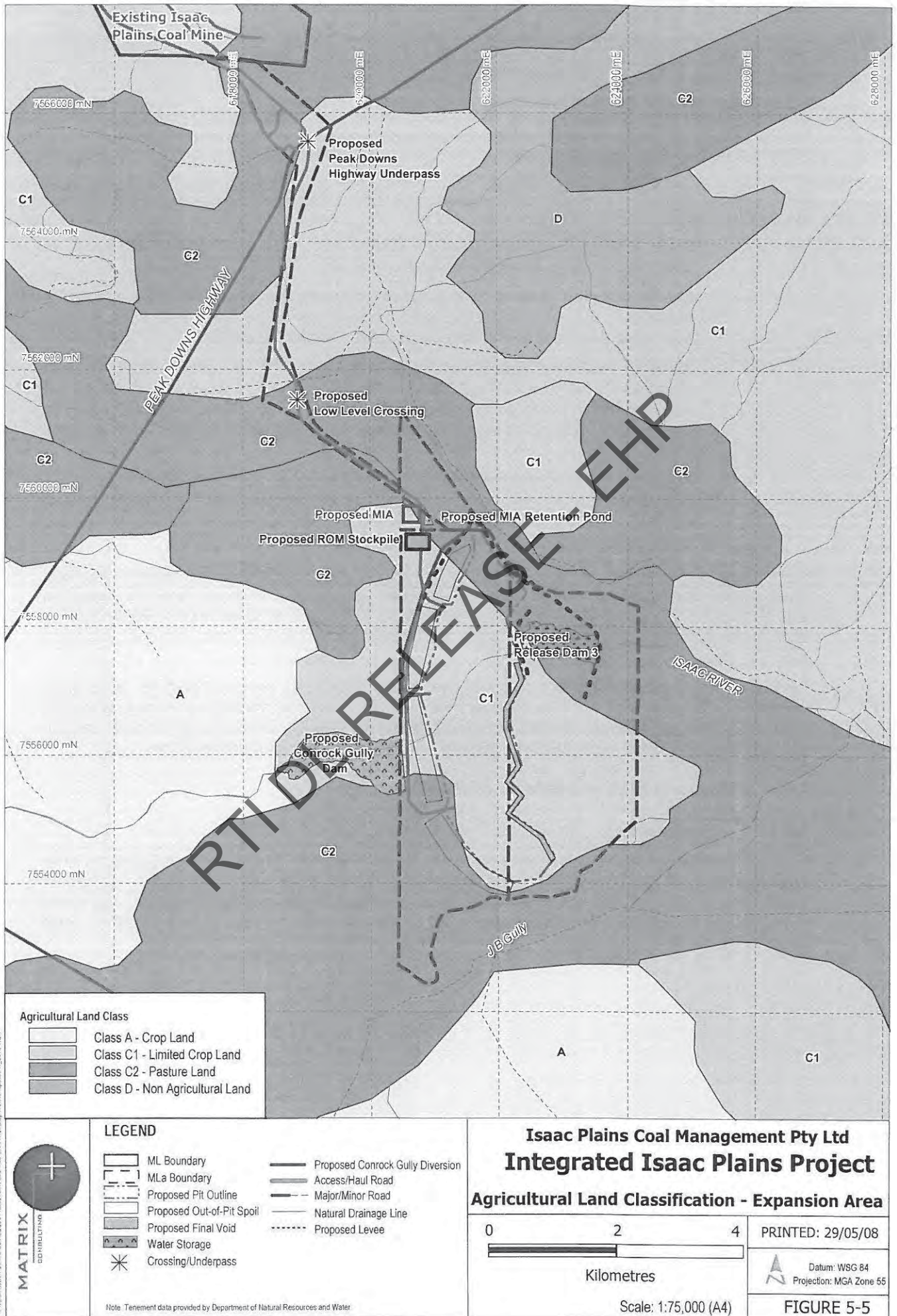
In the Belyando Shire, DPI have identified the presence of crop land (Class A), marginal crop land (Class B) and land suitable for improved pastures (Class C1). Approximately 75 % of the Expansion Area has been categorised as C1 (refer to **Figure 5-5**). There are no Class A or B GQAL cropping lands in the area. The C1 land, which makes up most of the Expansion Area, is considered to be suited for grazing under improved pastures.

This soil survey indicates that much of the C2 land is also suitable for improved pasture. Buffel grass has either been sown into or pioneered much of the study area and grass cover is generally quite good, except for minor areas of relict mesa/ridge and dark vertisols (Alluvial plain of dark cracking clay with Brigalow) which occur in lower lying areas, close to, or on, major drainage lines.

5.8 POTENTIAL IMPACTS AND MITIGATION MEASURES

5.8.1 Topography

Open cut mining voids and overburden spoil dumps have a significant impact on the topography. After controlled placement by truck, the spoil dumps will appear as a gently undulating plateau of unconsolidated soil and rock, on what was previously predominantly undulating lowland plains and gently sloping crestal areas. Dragline spoil will require reworking to achieve this landform. Spoil dumps are to be 30-40 m (maximum) above natural ground level.



5.8.2 Spoil

Physical disruption of the materials during the mining process changes the nature of the spoil materials and their interaction with the surrounding environment in a number of ways. These include:

- exposure of unweathered material to oxidation processes near the post-mining landform surface. This can result in the release of oxidation products (e.g. salts and potentially acid) which are prone to transport by surface runoff or infiltration;
- materials expanding by approximately 30 % when mined (i.e. spoil in a dump has a volume approximately 1.3 times that of its in situ or unmined volume). As a result, spoil cannot be contained within the mined excavation leading inevitably to landforms different to those originally present. The post-mining material will also have a higher initial porosity than the original in-situ spoil. Some residual settlement is expected with time, but this will have little effect on the final landform. Historical evidence from open cut coal mines in the Bowen Basin indicates that instability does not largely exist on spoil dumps; however, some residual settlement may occur over time;
- return of a vegetation growth media to the surface of a landform that is different to that which was present near the surface prior to mining can alter the capability of original vegetation communities to re-establish; and
- spoil returned to the surface having a poorer nutrient status, lower organic matter content and poorer structure compared to the soil hosting original vegetation communities. Poorly structured and potentially dispersible materials may be prone to erosion, particularly on slopes.

The Isaac Plains spoil does not present an ARD or salinity risk, however, **Section 13** provides further detail on the management of overburden and **Section 19** provides detail on the rehabilitation of spoil. Fine coal rejects are considered potentially acid forming (PAF). Coal rejects will require alkali blending (or co-disposal) where they remain an ARD risk following treatment; they should be encapsulated/covered at depth within spoil dumps to reduce the risk of ARD.

Spoil material is moderately sodic and slightly dispersive. Further investigation of the sodic properties of spoil material should be investigated through the PoO.

5.8.3 Soils

5.8.3.1 Topsoil Stripping

Approximately 820 ha of the Expansion Area is planned to be disturbed as a result of open-cut mining and will require stripping of topsoil for reuse in rehabilitation programs.

The basic principle in determining useable depths of topsoil for rehabilitation is its quality in comparison to the spoil requiring rehabilitation. As a rule of thumb, the quality of the topsoil must exceed that of the spoil. In addition, spoil can be expected to improve with years of exposure, leaching and plant colonisation and in some cases, may result in better coverage than topsoil after an appropriate time-span.

Often, Brigalow soils associated with Tertiary sediments in Central Queensland (Bourne and Tuck 1996) are sodic and saline at depth. The depth to the salt accumulation layer (or salt bulge) may be quite variable but is greater than 40 cm in most cases. Most Brigalow subsoil, which has accumulations of salt, is not recommended for reuse in rehabilitation, not only because of salt, but also the associated sodic conditions predisposing coarse hardsetting behaviour.

The areas subject to land disturbance as a result of open cut mining are mostly contained within the E1, B1, B2, A3 and A4 soils. Where such disturbance occurs, stripping of topsoil for reuse in rehabilitation programs will be required.

This survey specifically evaluated subsoil conditions in this regard and found evidence of inhibitive salinity in certain soil types. **Table 5-12** below presents the pH and EC profile in 10 cm depth increments for each soil type. Basically the pH and EC profiles indicate that potential saline and sodic conditions may occur in Brigalow clay soils in particular A3, A4, B1 and B2.

Table 5-12 EC & pH Profiles for Major Soil Types

Depth (cm)	A1 (site 4)		A3 (site 42)		A4 (site 57)		B1 (site 59)		B2 (site 64)		E1 (site 24)	
	pH	EC (μ S/ cm)	pH	EC (μ S/ cm)	pH	EC (μ S/ cm)	pH	EC (μ S/ cm)	pH	EC (μ S/ cm)	pH	EC (μ S/ cm)
10	6.1	0.01	5.5	0.09	8.5	0.05	6.8	0.10	6.2	0.01	6.1	0.01
20	6.3 (6.5)	0.02 (0.05)	5.5 (5.7)	0.25 (0.26)	8.5 (8.5)	0.07 (0.14)	7.5 (7.7)	0.43 (0.56)	6.5 (6.6)	0.03 (0.06)	6.1 (6.2)	0.03 (0.02)
30	6.4	0.04	5.6	0.22	8.5	0.26	7.9	0.54	6.2	0.03	6.0	
40	6.5	0.01	6.8	0.43	8.6 (8.4)	0.44 (0.50)	8.0 (8.1)	0.49 (0.48)	7.7	0.29	6.5	0.01
50	7.1	0.04	7.0 (7.1)	0.58 (0.50)	8.5	0.62	8.0	0.51	8.0 (8.3)	0.38 (0.42)	6.5	0.05
60	7.5 (7.7)	0.02 (0.03)	7.4	0.65	8.4	0.78	8.1	0.66	8.1	0.58	6.8	0.01
70	7.5	0.04	7.9	0.77	8.4	0.87	8.0	0.78	8.2	0.79	6.7	0.04
80	7.5	0.04	8.0	0.68	8.4 (8.3)	0.98 (1.21)	8.0 (7.7)	0.86 (0.91)	8.5 (8.4)	1.22 (1.54)	6.9 (7.4)	0.05 (0.08)
90	7.5 (7.6)	0.05 (0.08)	8.0 (8.2)	0.74 (0.71)	8.5	1.05	8.1	0.88	8.3	1.19	7.1	0.04

pH and EC values determined using a hand held Hanna instrument.

Values in *(italics)* are those from NATA laboratory.

Bold highlight indicates salinity above levels which may affect pasture species.

Overall, the IIPP area includes considerable reserves of topsoil which will be available for use in mine rehabilitation programs. As a guide, all topsoils should be stored in stockpiles no greater than 3 m high and all topsoils used in rehabilitation will be applied at no more than 250 mm. This provides sufficient depth for re-ripping, should follow-up maintenance work be required. Soils placed to 150 mm or less can be significantly contaminated by spoil when a single pass of deep ripping occurs.

The following sub-sections identify the suitability and limitations of the various soil types and horizons for use in rehabilitation activities together with recommended stripping depths.

5.8.3.2 Alluvial Soils A1, A3 and A4

The alluvial nature contributes to these soils being generally of higher fertility than other soils that occur in the Expansion Area (Bourne and Tuck, 1996). Alluvial soils included in this survey vary from deep well structured cracking clay (A4), deep light silty clay (A3) and deep uniform sandy or sandy duplex (A1). In addition, they may further vary within each group.

All soils are well suited to rehabilitation and the recommended strip depth will vary accordingly. In summary, the average recommended strip depth nominated (for planning purposes, setting of works contracts etc) for each soil type is:

- A1-50 cm or within 10 cm of subsoil clay layer;
- A3-30 cm; and
- A4-30 cm.

It is important to avoid inclusion of the harder, denser structured subsoils, and soils which have saline/sodic characteristics. Laboratory data (refer to **Table 5-12**) indicates that salinity below about 30 cm depth is an area of possible concern for soils types A3 and A4. General fertility is acceptable in all soils. The sandy type soils of A1 will more readily germinate and support both grasses and native trees.



Land

5.8.3.3 *Brigalow B1 and B2 Soils*

These soils are an excellent quality topsoil due to their well-balanced fertility, lighter, sandy clay texture and other attributes which will assist rapid establishment of small pasture or tree seed, assuming the saline/sodic subsoils at depth are avoided. The overall recommended stripping depth is 20 cm (up to a maximum of 30 cm) as the soil below this depth is quite hard and coarse structured with an increasing probability of salinity. The soils are suitable for application in all areas of rehabilitation, however should be preferentially used on sloping sites due to their higher erosion resistance compared to the sandy alluvial soils.

5.8.3.4 *Poplar Box E1 Soils*

Most of the undulating sandy Poplar Box country has at least 50 cm of sandy loam overlying the yellow/brown clay. As a general rule, all of the sandy material may be retrieved for reuse on rehabilitation. It is important to ensure that no subsoil clay material is included, as its presence will significantly decrease the value of the topsoil for rehabilitation by promoting conditions of surface sealing and erosion. A 50 cm stripping depth is nominated.

On the upper ironbark ridge country, the depth of the sandy upper horizon is generally less than 40 cm.

A summary of the average topsoil stripping depths for the IIPP and their variation is presented below in **Table 5-13**.

Table 5-13 Average Topsoil Strip Depth and Variation

Soil Unit	Average Strip Depth (cm)
A1	50 (or within 10 of subsoil clay layer)
A3	30
A4	30
B1	20 (max 30)
B2	20 (max 30)
E1	50
E1 variant	30

5.8.4 Land Use

5.8.4.1 *Good Quality Agricultural Land*

Much of the proposed mining area forms part of GQAL (as would much of central Queensland, as the region is well suited to pasture improvement) falling within C1 land suitability classification (refer to **Figure 5-5**).

SPP 1/92 *Development and Conservation of Agricultural Land* provides a framework for considering the value of GQAL in development assessment. The policy acknowledges that there will be developments that can legitimately alienate GQAL because they represent an overriding benefit to the community.

The IIPP is considered to provide the following overriding community benefits:

- it allows the utilisation of the coal resources of the State;
- it will provide substantial employment within Belyando and Nebo Shires and elsewhere in Queensland;
- it will allow the continuation and expansion of a locally significant industry that provides substantial export income to the State;
- there is no alternative location on land of lesser agricultural quality, as the Project location is dictated by the position of the coal reserves; and
- the land is typical of medium quality grazing land in the region.

5.8.5 Post-Mine Land Use Suitability

Factors influencing changes in land suitability include changed physical, chemical and biological properties of soil, changes in slope and slope length and changes in soil depth. The suitability of the waste rock dumps for cropping and grazing is constrained by slope angle, the nature of soil cover, and altered soil moisture profile. These constraints would also increase the risk of erosion significantly if cropping or grazing were undertaken.

The plateau-like upper surface of the final waste dump landform is not considered suitable for rainfed cropping as it would require the replacement of a black cracking clay profile of approximately 900 mm depth and the installation of suitable soil conservation works which is not a practical alternative. The erosional stability of the waste dump plateau may also be compromised by grazing. It is also isolated from other pastures and suitable watering points and therefore is not considered suitable for sustained grazing.

It is anticipated that a reduction in land suitability rating will result from mining and subsequent rehabilitation. The post-mining landform objective will therefore be the establishment of a self sustaining native ecosystem.

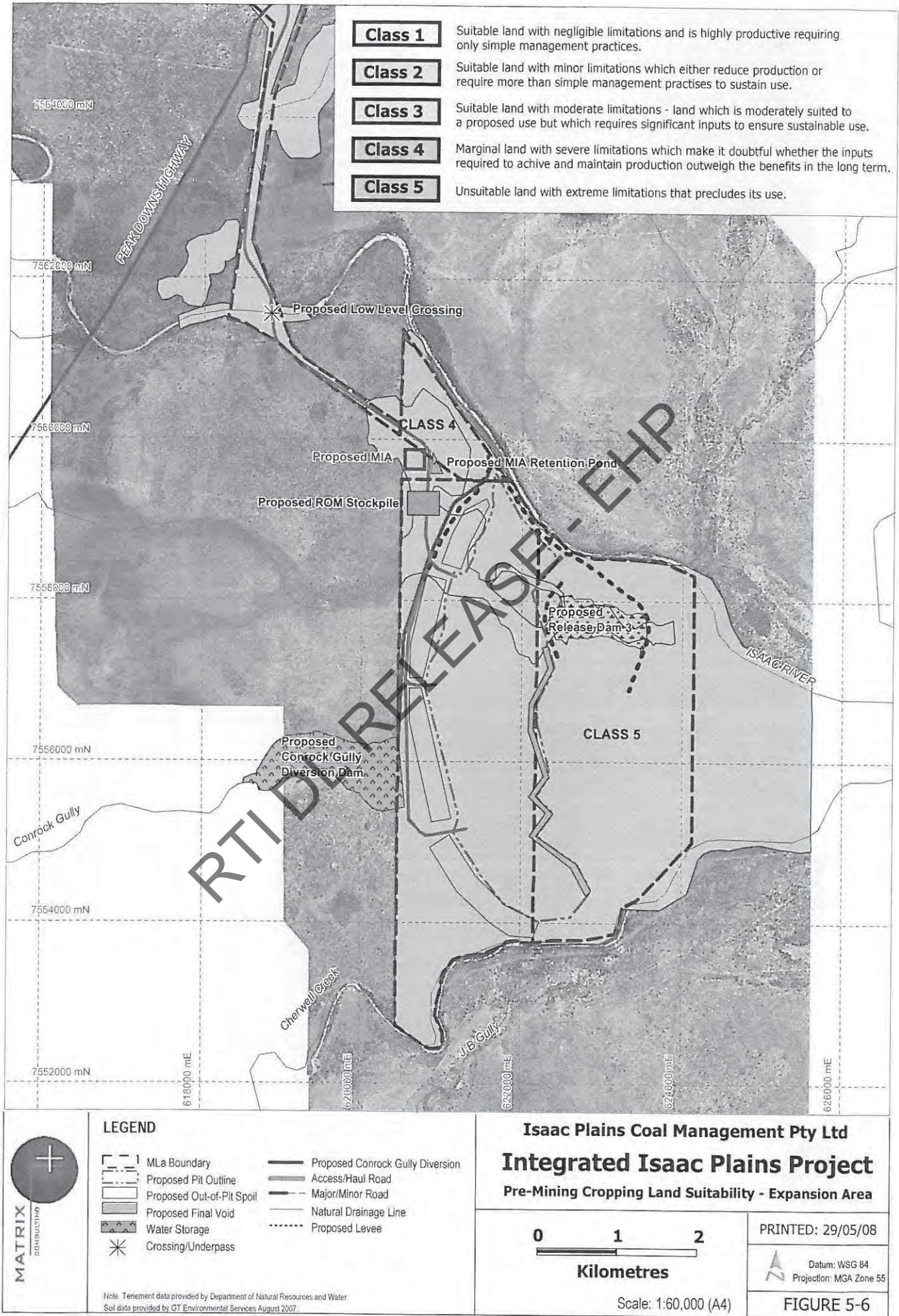
5.8.5.1 Rainfed Cropping

No areas considered suitable for rainfed cropping were identified within the survey area and/or from previous knowledge and experience within the Bowen Basin coal industry, therefore it is not envisaged that this would be an alternative post-mining land use.

Table 5-14 presents the changes in area of suitability for cropping use for land impacted by the mine pit, out-of-pit spoil, run-of-mine (ROM) and mine water dam within the Expansion Area. The access/haul road has not been included as it is anticipated that it will be returned to current land use post-mining. Pre- and post-mining cropping suitabilities are illustrated in **Figure 5-6** and **Figure 5-7**. The final void, which will cover an area of 26 ha, has been removed from the estimated post mining area.

Table 5-14 Cropping Pre- and Post-Mine Capability Change

Class	Description	Pre-Mining Area (Ha)	% Total Area	Estimated Post-Mining Area (Ha)	% Total Area
1	Suitable land with negligible limitations and is highly productive requiring only simple management practices.	0	0	0	0
2	Suitable land with minor limitations which either reduce production or require more than simple management practices to sustain the use.	0	0	0	0
3	Suitable land with moderate limitations – Land which is moderately suited to a proposed use but which requires significant inputs to ensure sustainable use.	0	0	0	0
4	Marginal cropping land with severe limitations which make it doubtful whether the inputs required to achieve and maintain production outweigh the benefits in the long-term.	258	11	180	8
5	Unsuitable cropping land with extreme limitations that precludes its use.	2,016	89	2,068	92
TOTAL		2,274	100	2,248	100





5.8.5.2 Cattle Grazing

Much remains to be demonstrated with regards to grazing as a sustainable land use on areas of mine rehabilitation and no definitive standards exist. Nevertheless, the following explores a grazing use scenario.

Limitations for beef cattle grazing are similar to those for rainfed cropping, with the addition of vegetation regrowth (v) (Shields and Williams, 1991). In grazing trials conducted at BMA Blackwater and Norwich Park Mines, results have led to proposals for limitation levels for grazing which are fundamentally based on slope (G. Tuck, P. Baker pers. experience). These levels basically define slopes <11 % as constituting Class 3/4 grazing lands with erosion susceptibility being the major limiting factor governing the class. Slopes from 11-17 % are also being trialled for grazing but are highly prone to degradation from erosion if not managed appropriately.

Consequently, only lands <11 % are considered as realistic grazing lands in this report. Mine rehabilitation areas which exceed this level include various waste rock dumps, ramps and final voids which are unlikely to sustain this use, unless considerable regrading is undertaken.

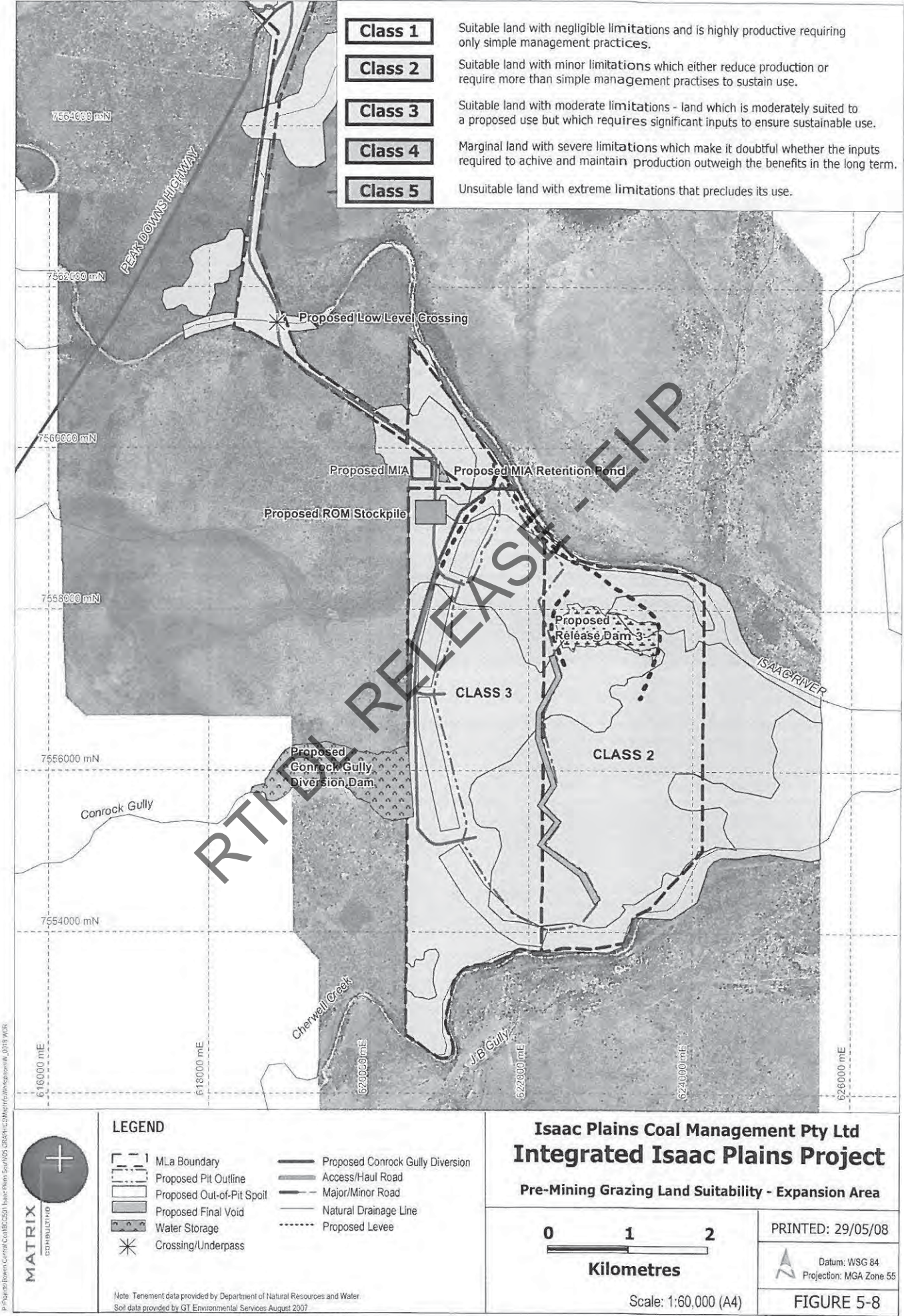
Table 5-15 presents the changes in areas of land suitable for a grazing use for land impacted by the mine pit, out-of-pit spoil, ROM and mine water dam within the Expansion Area. As with cropping potential, the access/haul road has not been included, as it is anticipated that it will be returned to current land use post-mining. Information presented illustrates that changes will result in no loss of significant grazing capacity within the affected land. The pre- and post-mining grazing suitabilities are illustrated in **Figure 5-8** and **Figure 5-9**. The final void which will cover an area of 26 ha has been removed from the estimated post mining area.

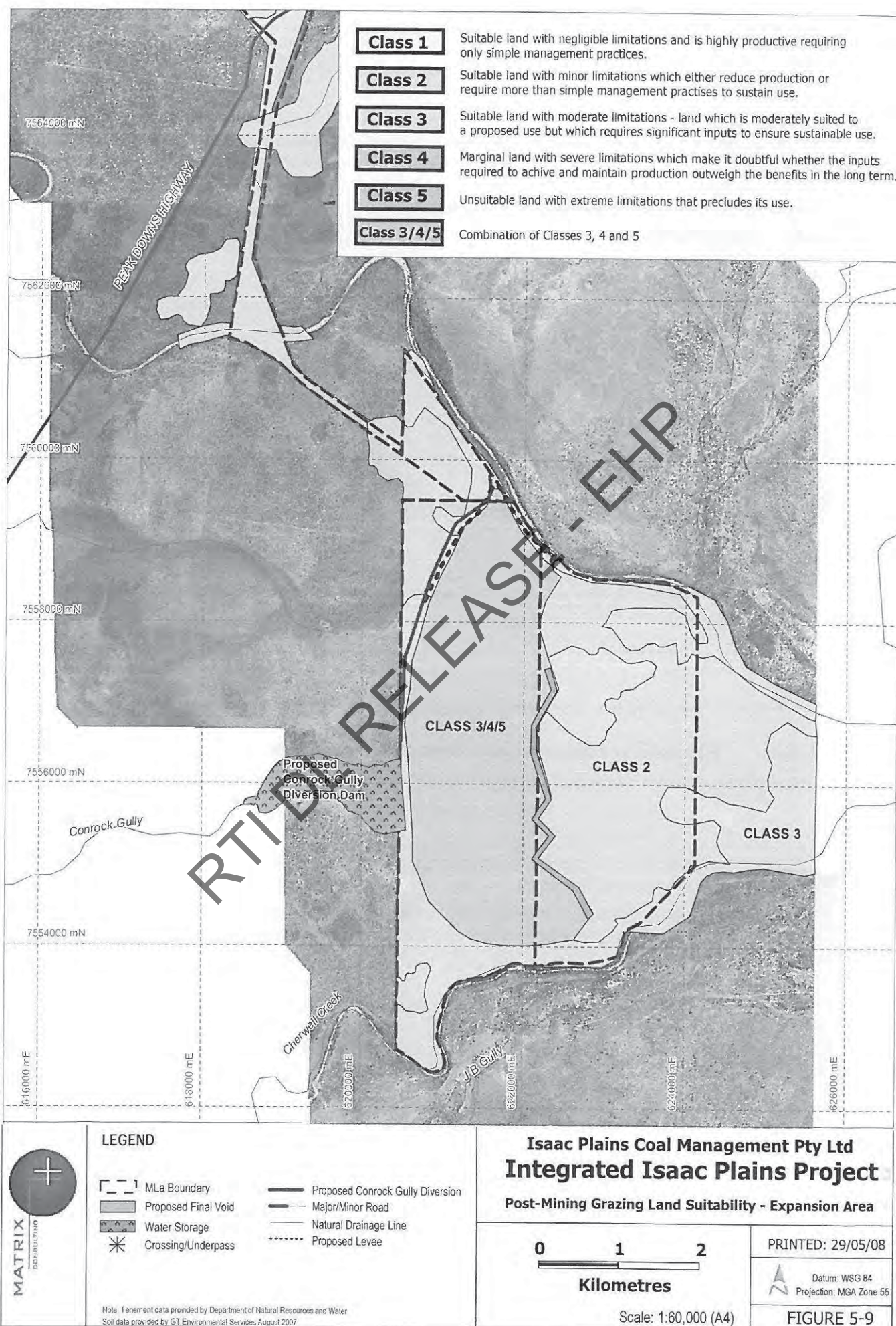
Table 5-15 Cattle Grazing Pre- and Post-Mine Land Suitability Change

Class	Description	Pre Mining Area (Ha)	% Total Area	Estimated Post-Mining Area (Ha)	% Total Area
1	Suitable land with negligible limitations and is highly productive requiring only simple management practices.	0	0	0	0
2	Suitable land with minor limitations which either reduce production or require more than simple management practices to sustain the use.	1,149	51	753	33.5
3	Suitable land with moderate limitations – land which is moderately suited to a proposed use but which requires significant inputs to ensure sustainable use.	1,125	49	746	33.2
3/4/5	Rehabilitated mine disturbance.	0	0	749	33.3
4	Marginal land with severe limitations which make it doubtful whether the inputs required to achieve and maintain production outweigh the benefits in the long-term.	0	0	0	-
5	Unsuitable land with extreme limitations that precludes its use.	0	0	0	-
TOTAL		2,274	100	2,248	100

5.8.5.3 Bushland Use

Many open cut mines within the Bowen Basin have a stated aim of native bushland use/suitability at completion of rehabilitation after mining has ceased. Fundamentally this is a conservative end use which, given the climatic limitations in the region, is the preferred use of the overall IIPP site. A higher use such as grazing is feasible, but will require the implementation of a very conservative landform design involving the formation of slopes generally less than 11 %, as discussed above, and/or rock lining of batters of pre-strip dumps as well as a probable ongoing higher maintenance costs compared to surrounding lands.





5.8.5.4 Conclusion

In conclusion, comparison of pre-mine and post-mine land capabilities indicates that the Expansion Area mine pit and out-of-pit spoil dumps will change from the current land capability of grazing to a native ecosystem capability. This is more suitable for a post-mine native bushland capability, complementary with native vegetation in the area.

5.9 CONTAMINATED LAND

5.9.1 Existing Contamination

The existing Isaac Plains Coal Mine and the proposed Expansion Area are classified as notifiable activities. Under the EP Act, IPCM has a duty to notify the EPA should potentially contaminating activities be carried out on site.

Notifiable activities are listed in Schedule 2 of the EP Act. Under the EP Act, landowners and Local Government must inform the EPA that land has been or is being used for a notifiable activity. Land that has been or is being used for notifiable activities are recorded on the Environmental Management Register, which is maintained by the EPA. Those activities, that are currently carried out at the existing Isaac Plains Coal Mine, are listed in **Section 3.14** some of these activities will also be carried out within the Expansion Area.

A search of the Environmental Management Register and Contaminated Land Register for the properties within the footprint of the IIPP was conducted. Lot 4 CP903281 owned by Queensland State Government, and leased by [redacted], is the only site to be included on the Environmental Management Register. IPCM have not, and do not currently conduct any potentially contaminating activities on this property. The property is subject to three notifiable activities which are not conducted by IPCM in this location:

- mine wastes;
- petroleum products and oils storage; and
- waste storage treatment or disposal.

5.9.2 Potential for Contamination/ Prevention and Control

The notifiable activities on the IIPP site pose a limited risk of contamination for the following reasons:

- all chemicals and fuels will be appropriately stored in accordance with the relevant Australian Standards;
- explosives are stored in accordance with the requirements of AS2187 – *Explosives Storage and Transport*;
- use of dry reject disposal to maximise the potential for water recovery as well as a fines reject management system of four individual cells all encapsulated in the site water management system will minimise the potential for groundwater and surface water contamination; and
- the existing facilities, for the prevention of land contamination and management of wastes with the potential to cause such contamination, will be extended into the Expansion Area from the existing Isaac Plains Coal Mine.

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6

HYDROLOGY

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

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6 HYDROLOGY

This section of the EIS describes the existing environment for surface water resources which may be affected by the IIPP in the context of environmental values as defined by the EP Act, EPPs, ANZECC 2000 guidelines and regulations.

Under the EPP Water, 'waters' has the meaning of bed and bank of waters and 'surface waters' means water other than groundwater. For the purpose of this EIS, surface water and groundwater are separated, with surface water meaning water above the ground surface and groundwater meaning water below the ground surface. Existing groundwater environment and potential impacts on groundwater are discussed in **Section 7**. The term 'waterway' is used generically throughout this EIS and includes 'watercourses' defined under the Water Act and 'drains' that do not meet with watercourse criteria under the Water Act.

6.1 REGIONAL AND LOCAL CATCHMENT HYDROLOGY

The IIPP is located within the Fitzroy Basin (refer to **Figure 6-1**). The IIPP is dissected by the Isaac River, a major river system of the Fitzroy Basin catchment. The existing Isaac Plains Coal Mine is located to the north of the Isaac River and the Expansion Area to the south.

The Isaac River catchment, upstream of the IIPP, comprises mainly scattered to medium dense bushland, grazing land and the township of Moranbah, located approximately 7 km south-west from the existing Isaac Plains Coal Mine. Several coal mines already exist in this catchment upstream of the site, including Moranbah North, Goonyella, Riverside, North Goonyella, Burton and Broadlea, and several downstream, including Carborough Downs, South Walker Creek, Broadmeadow, Millenium, Moorvale and Coppabella.

Smoky Creek and a drainage line known locally as Billy's Gully, traverse the existing Isaac Plains Coal Mine and are tributaries leading to the Isaac River. IPCM are proposing to divert Smoky Creek to access economic coal reserves beneath the waterway.

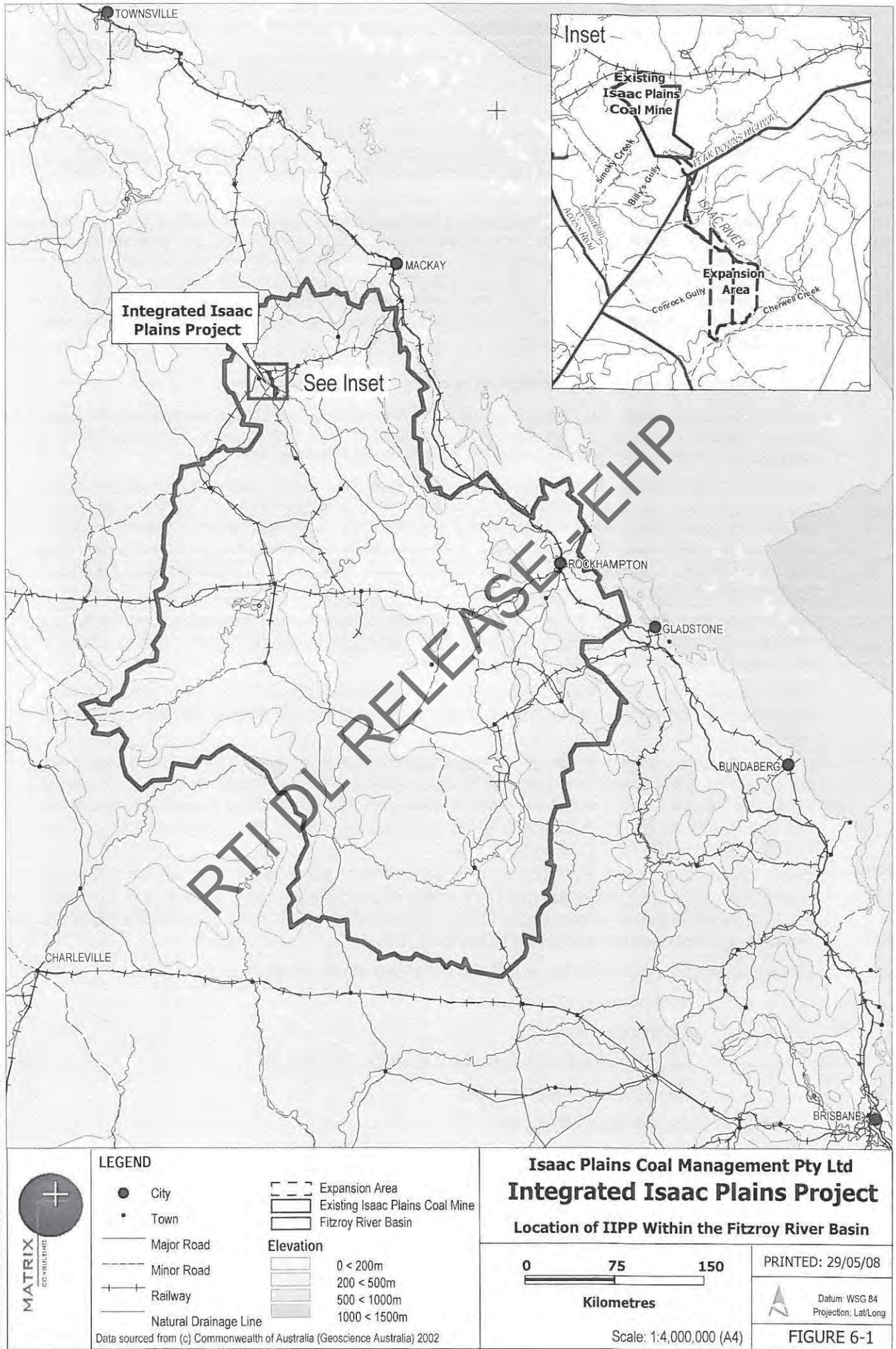
The Expansion Area is bounded to the north by the Isaac River and south by Cherwell Creek. Conrock Gully traverses through the centre of the proposed mine pit and will require diversion to facilitate mining.

Cherwell Creek is a major tributary of the Isaac River, and both the Isaac River and Cherwell Creek are subject to flooding, with the extent of flooding associated with the Isaac River posing a risk of flooding of the open cut Expansion Area coal pit. Flood levees will be required to reduce the flood risk from the Isaac River to the mine. Levees will be constructed as part of the pre-strip operation, at the commencement of mining in the Expansion Area.

Smoky Creek, Billy's Gully, the Isaac River, Cherwell Creek and Conrock Gully are all ephemeral systems with the majority of flows typically occurring intermittently following storm events in the wet season from December to March. Smoky Creek, Billy's Gully, the Isaac River and Cherwell Creek are regarded as waterways for the purposes of the Water Act.

The respective catchment areas for each of the waterways are as follows:

- Smoky Creek – 139 km²;
- Billy's Gully – 60 km²;
- Isaac River (at the Cherwell Creek junction) – 3,500 km²;
- Cherwell Creek – 720 km²; and
- Conrock Gully – 55-62 km².



6.2 ENVIRONMENTAL VALUES

Under Section 7 of the EPP Water, there are no particular environmental values attributed to the specific waterways located within the IIPP as they are not listed in Schedule 1. Section 7 (2) however, assigns the environmental values in receiving water to be protected under the category 'other waters' (e.g. in the IIPP area) as:

- ecosystem protection (Level 2 – disturbed ecosystems, Queensland Water Quality Guidelines (QWQG) 2006); and
- agricultural uses (Irrigation and Stock Watering).

Water quality guidelines are provided in *ANZECC Water Quality Guidelines 2000* (Irrigation, Stock and Ecosystem) and *Queensland Water Quality Guidelines (QWQG) 2006* (Ecosystem).

6.3 WATER QUALITY

6.3.1 Water Quality Monitoring

Water quality monitoring in the Fitzroy Basin is undertaken by the DNRW. Of relevance to this project are the monitoring stations at three sites on the Isaac River, Burton Gorge, Deverill and Goonyella. Goonyella is located approximately 30 km upstream of the site, Deverill is approximately 30 km downstream and Burton Gorge is approximately 70 km upstream. **Table 6-1** presents background water quality assessment results from these locations, which are illustrated on **Figure 6-2**.

No site-specific water quality monitoring data is available for Cherwell Creek and Conrock Gully. To establish background water quality for these waterways, the Phillips and Devlin Creek water quality monitoring sites were selected. Phillips and Devlin Creeks are located approximately 50 km and 65 km downstream of the IIPP respectively. These catchments have similar topography and land uses to Cherwell Creek and Conrock Gully and are in the general vicinity of the IIPP. Phillips Creek (344 km²) and Devlin Creek (1023 km²), join the Isaac River at approximately 85 km and 120 km respectively downstream of Moranbah. **Table 6-2** presents water quality results for these two waterways.

The water quality data from the locations described above were obtained from DNRW watershed data and are summarised in terms of median values, 80th percentile and 20th percentile values and number of samples (counts). The data has been compared with the following relevant *ANZECC Water Quality Guidelines* and QWQG 2006, for the environmental values described

- ANZECC water quality guidelines for *irrigation and general water usage*;
- ANZECC water quality guidelines for *livestock drinking water quality*; and
- QWQG for upper streams in the Central Coast Queensland region.

Even if catchments are undeveloped, the event data from ephemeral creeks can change rapidly during rainfall events. Therefore, due care should be taken when comparing event data to ecosystem protection values. The ANZECC Aquatic Ecosystem Guidelines and QWQG are shown for fresh water upland rivers.

Water quality at the existing Isaac Plains Coal Mine is monitored in Smoky Creek upstream and downstream of the existing Isaac Plains Coal Mine (W1 and W2 respectively) and Billy's Gully upstream and downstream of the existing Isaac Plains Coal Mine (W3 and W4 respectively), at locations illustrated in **Figure 6-2**. Monitoring has also been undertaken at three sediment dams (SD2, SD3 and SD4) and release dam 1 (Figure 6-2 and Table 6-3). Since monitoring has commenced at the sediment dams and release dam 1, there have has only been a limited number of one rainfall events that have has generated runoff of sufficient volumes to enable sample collection. Therefore this data should not be used to draw significant conclusions as to mine site runoff. Notwithstanding this, thee dams are located in series and therefore the results reflect the changes in water quality as it passes through the treatment train. **Table 6-3** depicts how there is a significant drop in EC, TDS and SS from SD2 to SD4 as the water passes through the various sediment dams. This suggests that the sediment dam series is working effectively. The water quality results from release dam 1 are higher because water was pumped in directly from the pit. A summary of the water quality monitoring results are provided in Table 6-3. Metadata for the eight monitoring sites on the existing Isaac Plains Coal Mine is presented in Table 6-4.



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Water quality has also been monitored by the Broadlea mine at two sites since 2004 at North Creek (CD1) and Smoky Creek (refer to **Figure 6-2**). These are the most comprehensive of local data available. A summary of the water quality results based on laboratory analyses by Australian Laboratory Services (ALS) is provided in **Table 6-45**. There is no metadata available for the Broadlea Mine monitoring sites.

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Table 6-1 Summary of Background Water Quality - Isaac River

Parameter	ANZECC Irrigation	ANZECC Stock	QWQG/ ANZECC Ecosystem	Isaac R. (Burton Gorge)			Isaac R. (Goonyella)			Isaac R. (Deverill)		
				Count	Median	Range	Count	Median	Range	Count	Median	Range
pH	6 – 9	6.5 – 8.5	6.5 – 7.5	19	7.8	1.2	30	7.7	2	44	7.6	1.9
Turbidity	-	-	25	-	-	-	29	100	3,643	14	46	5,188
Ammonia as N - soluble (mg/L)	-	-	0.01	-	-	-	2	0	0	7	0	0
Nitrate + nitrite as N - soluble (mg/L)	-	30	-	-	-	-	2	0	0	7	0	0
Nitrate (mg/L)	-	400	0.015	8	0	6.1	26	2	13.6	28	1.9	17.7
Bicarbonate as HCO ₃ (mg/L)	n/a	-	-	18	173	249	29	94	233	43	95	204.3
Hardness as CaCO ₃ (mg/L)	60	-	-	18	142	319	30	78	205	43	78	169.9
Calcium as soluble Ca (mg/L)	<60	1,000	-	18	34	84.6	29	13.1	32.6	43	17.1	24
Carbonate as CO ₃ (mg/L)	-	-	-	13	0.9	2.4	22	0.55	8.2	33	0.3	3.5
Boron (mg/L)	0.5	5	-	4	0	0	27	0.1	0.2	16	0	0
Chloride (mg/L)	175	-	0.02	18	50	153.3	29	118.6	911	43	30	291
Conductivity (µS/cm)	1,300	2,000	350	19	458	940	30	566	3,365	43	241	1,391.2
Fluoride (mg/L)	1	2	-	19	0.2	0.6	30	0.2	0.4	41	0.1	0
Iron as soluble Fe (mg/L)	0.2	n/a	-	4	0	1.4	27	0	5.4	12	0	1.7
Magnesium (mg/L)	0.2	n/a	-	18	15	27	29	9.6	36.1	43	7.7	11.1
Potassium (mg/L)	-	-	-	15	5.4	12.4	29	3.8	7.2	40	4.7	6.4
Silica as soluble SiO ₂ (mg/L)	-	-	-	18	15	23	30	10.9	44.9	41	12	12
Sodium (mg/L)	115	-	-	18	37.5	67	29	97.5	689.6	43	22	226
Sulphate (mg/L)	-	1,000	-	13	4.3	30	29	18.5	191.8	36	10	116.2
TDS (mg/L)	-	2,400	-	18	243.5	470	29	348.5	1,937.6	41	151.8	794.6
TN (mg/L)	5	-	0.25	-	-	-	3	0	0.5	-	-	-
TP (mg/L)	0.05	-	0.03	-	-	-	7	0	0	7	0.2	1.5
TSS (mg/l)	-	-	-	15	230	10275	29	170	32,995	40	127.5	2,495

Table 6-2 Summary of Background Water Quality Data in Devlin and Phillips Creeks

Parameter	ANZECC Irrigation	ANZECC Stock	QWQG / ANZECC Ecosystem	Devlin Creek at Bombandy			Phillip Creek at Tayglen		
				Count	Median	Range	Count	Median	Range
pH	6 – 9	6.5 – 8.5	6.5 – 7.5	21	7.2	2.8	26	8.1	1.5
Turbidity	-	-	25	4	0	60	3	0	221
Ammonia as N - soluble (mg/L)	-	-	0.01	-	-	-	-	-	-
Nitrate + nitrite as N - soluble (mg/L)	-	30	-	-	-	-	-	-	-
Nitrate (mg/L)	-	400	0.015	9	0	9.8	13	1.5	25.5
Bicarbonate as HCO ₃ (mg/L)	n/a	-	-	19	65	70.5	23	254	433
Hardness as CaCO ₃ (mg/L)	60	-	-	21	47	53	23	173	267
Calcium as soluble Ca (mg/L)	<60	1,000	-	19	10	15	23	25	65
Carbonate as CO ₃ (mg/L)	-	-	-	11	0.2	3.9	22	2.5	18
Boron (mg/L)	0.5	5	-	4	0	0	3	0	0
Chloride (mg/L)	175	-	0.02	19	15	35	23	42	63
Conductivity (µS/cm)	1,300	2,000	350	21	155	213	26	511.5	1,122
Fluoride (mg/L)	1	2	-	14	0.1	.02	26	0.2	0.7
Iron as soluble Fe (mg/L)	0.2	n/a	-	5	0	3.8	4	0	1.6
Magnesium (mg/L)	0.2	n/a	-	19	4.4	6	23	22	63
Potassium (mg/L)	-	-	-	13	7	3.4	20	4.3	5
Silica as soluble SiO ₂ (mg/L)	-	-	-	15	13	36	23	13	79
Sodium (mg/L)	115	-	-	19	14	19	23	43	135
Sulphate (mg/L)	-	1,000	-	8	0	7.5	17	8	26.3
TDS (mg/L)	-	2,400	-	19	97	106	22	299.5	593
TN (mg/L)	5	-	0.25	-	-	-	2	0	0
TP (mg/L)	0.05	-	0.03	-	-	-	2	0	0
TSS (mg/l)	-	-	-	14	64	681	18	46	1,125

NB: Bold indicates an exceedance of the guideline.

Table 6-3 Average Water Quality – Existing Isaac Plains Monitoring Sites

Parameter	Units	ANZECC Irrigation	ANZECC Stock	QWQG/ANZECC Ecosystem	Water Quality Monitoring Station or Stream Gauging Station							
					W1	W2	W3	W4	SD2	SD3	SD4	Release Dam
pH	pH Value	6-9	6.5-8.5	6.5-7.5	7.5	7.5	8.0	8.4	8.2	8.3	8.2	8.2
Electrical Conductivity	µS/cm	1,300	2,000	350	116.5	118.5	276	228	3,400	3,200	954	3,900
Total Dissolved Solids	mg/L		2,400		510	590	410	420	2,230	2,180	604	2,640
Suspended Solids	mg/L				2,240	1,980	3,325	5,710	30	8	16	10.5
Sulphate	mg/L		1,000		3	3	20.5	5	950	904	94	129.5
Chloride	mg/L	175	5	0.2	5.5	6	31	15	594	519	226	1,285.5
Calcium	mg/L	<60	100		6.5	5.5	7	3	83	82	23	77.5
Magnesium	mg/L	0.2			3	3	3	2	55	54	16	98
Sodium	mg/L	115			5	4	2.5	1	628	605	175	696.5
Potassium	mg/L				10.5	10.5	43	39	11	9	3	5.5
Iron	mg/L	0.2			1.02	1.19	0.49	0.66	<0.05	<0.05	<0.05	<0.50
Aluminium	mg/L				1.08	1.085	1.05	1.23	<0.01	<0.01	0.02	<0.01
Antimony	mg/L				<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001
Arsenic	mg/L				<0.001	<0.001	<0.001	<0.001	0.008	0.004	<0.001	0.001
Cadmium	mg/L				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L				0.001	0.001	0.002	<0.001	0.001	0.001	<0.001	<0.001
Cobalt	mg/L				<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.001	<0.001
Copper	mg/L				0.002	0.0025	0.002	0.002	0.003	0.002	0.002	0.002
Manganese	mg/L				0.0025	0.0035	0.003	<0.001	0.004	0.001	<0.001	0.010
Molybdenum	mg/L				<0.001	<0.001	0.004	0.002	0.051	0.044	0.01	0.023
Nickel	mg/L				0.0015	0.002	0.0025	0.002	0.004	0.004	0.001	0.001
Selenium	mg/L				<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.021
Zinc	mg/L				<0.005	<0.005	<0.005	<0.005	0.006	0.006	<0.005	<0.005

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Hydrology

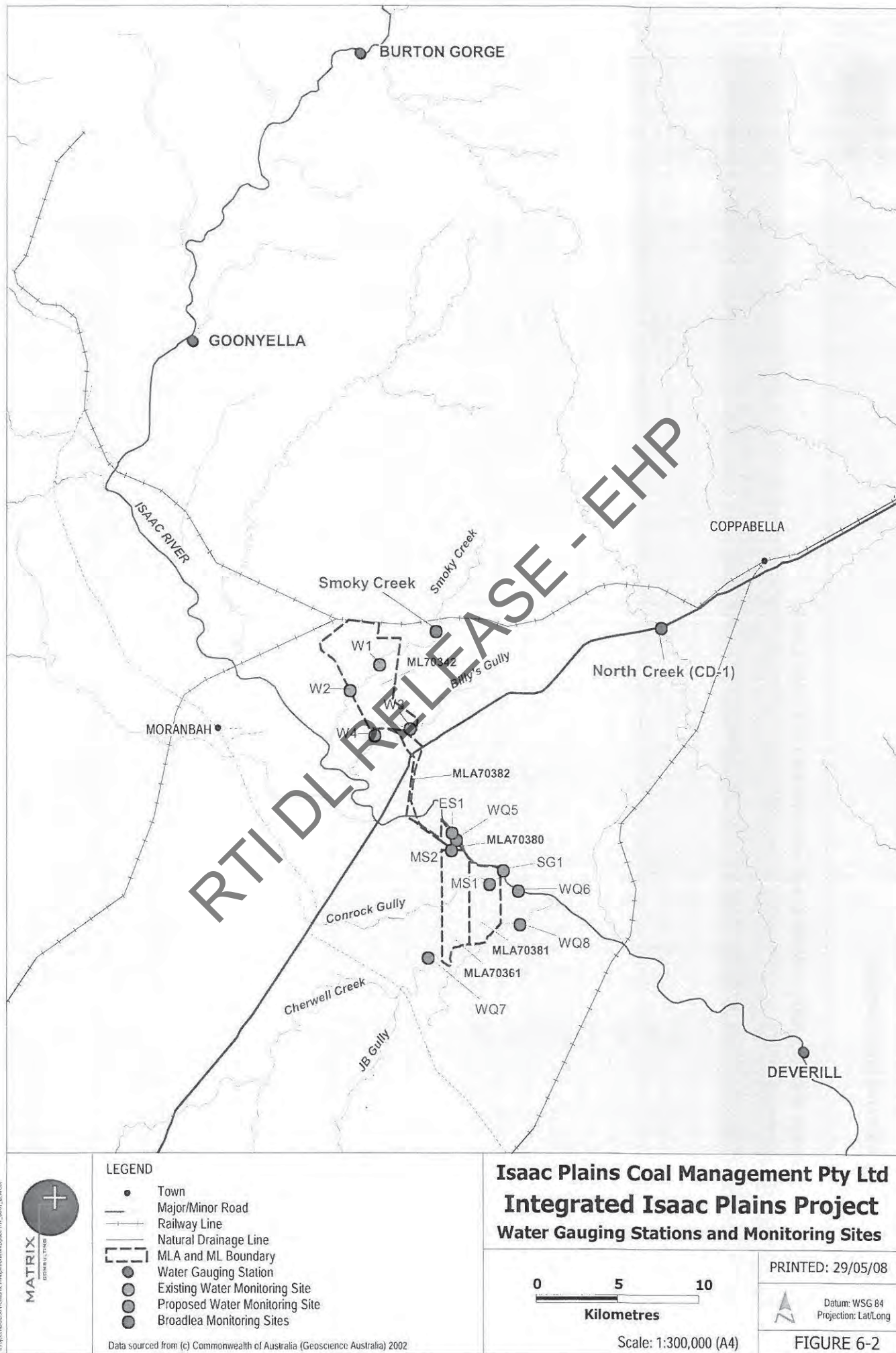
Parameter	Units	ANZECC Irrigation	ANZECC Stock	QWQG/ANZECC Ecosystem	Water Quality Monitoring Station or Stream Gauging Station							
					W1	W2	W3	W4	SD2	SD3	SD4	Release Dam
Mercury	mg/L				<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Fluoride	mg/L	1.0	2.0		0.1	0.1	0.4	0.5	0.5	1.0	0.8	0.9
Nitrite as N	mg/L				0.02	0.02	0.02	0.02	0.01	<0.01	<0.01	0.05
Nitrate as N	mg/L		400	0.015	0.39	0.39	0.31	0.43	0.07	<0.01	<0.01	0.37
Nitrite plus Nitrate as N (NO _x)	mg/L		30		0.42	0.41	0.32	0.45	0.08	<0.01	<0.01	0.42
Total Kjeldahl Nitrogen as N	mg/L				2.95	3.10	2.75	3.50	2.40	0.60	0.40	0.45
Total Nitrogen as N (TKN + NO _x)	mg/L	5.00		0.25	3.35	3.50	3.10	3.90	2.50	0.60	0.40	0.90
Total Phosphorus	mg/L	0.05		0.03	1.29	1.28	1.29	1.99	0.07	0.20	0.02	0.03
Total Anions	mg/L				1.02	1.01	2.60	2.19	36.20	35.10	10.20	41.75
Total Cations	mg/L				1.15	1.08	2.51	2.06	3.56	0.94	2.00	42.44

Table 6-4 Existing Isaac Plains Mine Monitoring Station Metadata

Station	Description	Area (ha)	Monitoring Period	Frequency
W1	Smokey Creek upstream mine	149	July 2006 – August 2007	3
W2	Smokey Creek downstream mine	165	July 2006 – August 2007	3
W3	Billy's Gully upstream mine	47.7	July 2006 – August 2007	3
W4	Billy's Gully downstream mine	50.4	July 2006 – August 2007	3
SD2	ROM (17 ha), Spoil (25 ha), undisturbed (32 ha) approx	74	July 2006 – August 2007	1
SD3	SD2 catchment plus 11 ha of undisturbed	85	July 2006 – August 2007	1
SD4	SD3 catchment plus 33 ha spoil/road and 55 ha undisturbed	173	July 2006 – August 2007	1
Release Dam 1	SD4 catchment plus 8 ha spoil/road and 48 ha undisturbed plus pumped pit water	229	July 2006 – August 2007	1

Table 6-5 Average Water Quality – North Creek and tributary to Smoky Creek

Parameter	Units	North Creek (CD1)	Smoky Creek	ANZECC		
				Irrigation	Stock	Ecosystem
pH	pH Units	7.3	7.3	6-9	6.5-8.5	6.5-7.5
EC	µS/cm	145	134	1,300	2,000	350
TDS	mg/L	652	227	-	2,400	-
SS	mg/L	3,251	1,107	-	-	-
SO ₄	mg/L	3	4	-	1,000	-
Cl	mg/L	16	8	175	-	0.02
Ca	mg/L	6	8	<60	1,000	-
Mg	mg/L	3	4	0.2	N/A	-
Se	mg/L	ND	ND	-	-	-



6.3.2 Existing Water Quality

The water quality in the Isaac River and the representative tributary creeks is generally suitable for stock watering (refer to **Table 6-1** and **Table 6-2**).

River water quality is described by the water quality at the three gauging stations on the Isaac River and is likely to be representative of water quality downstream of the creeks draining the IIPP site. The median data from these stations highlights:

- turbidity readings that show at Goonyella and Deverill stations indicate ranges above those recommended in ANZECC and QWQG values;
- conductivity is considered suitable for irrigation and stock watering with a range from 566 $\mu\text{S}/\text{cm}$ (Goonyella) to 241 $\mu\text{S}/\text{cm}$ (Deverill). Background conductivity at Goonyella and Burton Gorge exceeds the ANZECC criteria for aquatic ecosystem protection (350 $\mu\text{S}/\text{cm}$);
- water pH is suitable for stock and irrigation ranging from (pH 7.6 – pH 7.8), however, the pH range lies outside that for ecosystem protection (pH 6.5 – pH 7.5);
- most metals, cations and anions are within the ANZECC criteria with the exception of Chloride (30 – 188.6 mg/L) and marginally Magnesium (7.7 – 15 mg/L). Chloride exceeds the ANZECC ecosystem protection standard (0.02 mg/L) but is suitable for irrigation (<175 mg/L), while Magnesium concentrations are not acceptable for irrigation under ANZECC guidelines;
- there is insufficient data available to make any conclusions regarding nutrients, however nitrate levels that were obtained were higher than those recommended for aquatic ecosystem protection;
- the median concentration for Total Suspended Solids (TSS) is high, but decreases in a downstream direction from Burton Gorge (230 mg/L) to Goonyella (170 mg/L) and then to Deverill (127.5 mg/L); and
- receiving waters have a moderate hardness (78 to 142 mg/L CaCO_3) which is considered unsuitable for irrigation.

Regional water quality is described by the water quality data for Phillips Creek and Devlin Creek which have similar characteristics and catchment sizes as Cherwell Creek and Conrock Gully. A review of the median water quality data indicates:

- the concentrations of TSS are moderately high with a median range of 46 - 64 mg/L;
- total dissolved solids (TDS) do not appear to be above recommended guideline values and are considered to be typically low with median concentrations ranging from 97 – 300 mg/L;
- water pH is slightly alkaline varying from pH 7.2 to pH 8.1, however, the pH range lies outside that for ecosystem protection (pH 6.5 – pH 7.5);
- the major ions are bicarbonate, calcium, chloride, fluoride and sulphate. Chloride levels are higher than the ANZECC standards for aquatic ecosystem protection, while fluoride and calcium levels are low;
- conductivity is above ANZECC and QWQS guidelines for aquatic ecosystem protection within Phillips Creek. However, this is still considered suitable for irrigation and stock watering; and
- levels of magnesium are above ANZECC guidelines, ranging from 4.4 mg/L to 22 mg/L.

The results provided in **Table 6-3** and **Table 6-4-5** are based on a small sample population and are presented for background data only.

6.4 GEOMORPHOLOGY

A preliminary geomorphic assessment was undertaken to establish the stability of those waterways within the IIPP which have the potential to be impacted upon by IIPP activities. The assessment included a field inspection of all waterways and particle size analyses of representative samples from Cherwell Creek and Conrock Gully.

The geomorphological characteristics of each of the waterways located within or adjacent to the Expansion Area are discussed below, as well as Smoky Creek within the existing Isaac Plains Coal Mine which is proposed to be diverted. Photographs showing typical cross-sections of these waterways are included in **Appendix G1** with representation cross sections illustrated in **Plate 6-1 to Plate 6-4**.

6.4.1 Conrock Gully

Conrock Gully is an ephemeral creek draining the northern half of the proposed Expansion Area. Based on advice from DNRW, Conrock Gully is not considered to be a watercourse under the provisions of the Water Act. It discharges into the Isaac River approximately 2.5 km upstream of Cherwell Creek. Conrock Gully will be permanently diverted to enable mining.

The lower reaches of Conrock Gully are relatively flat and the main channel of the creek receives flows from two minor tributaries. The overall channel dimensions of Conrock Gully remain largely unchanged throughout the site. The typical dimensions of the Conrock Gully are:

- bed width 3 to 5 m;
- top width 10 m; and
- a depth of 1 to 2 m.

The majority of the riparian vegetation along Conrock Gully has been cleared for grazing. However, a narrow riparian zone with scattered mature trees remains on both banks (refer to **Section 10** for further details). Pastures are the dominant groundcover in the riparian zone and considerable die back of trees is evident. The main features of the Conrock Gully are as follows:

- the low flow channel and riparian zone have been impacted by cattle grazing;
- the low flow channel is mobile and there is considerable erosion on the outside bends of meanders;
- the bed is mobile and consists mainly of alluvial sediments; and
- no aquatic vegetation is present in the low flow channel.

The lower reaches feature dispersive clayey soils with considerable sections of banks that are experiencing gully and tunnelling.

Plate 6-1 illustrates a representative section of Conrock Gully within the Expansion Area.

6.4.2 Cherwell Creek

Cherwell Creek is a major tributary of the Isaac River, located on the southern boundary of the proposed Expansion Area. The creek is incised with a well defined active flow channel and a densely vegetated riparian zone approximately 20 m wide on each bank. The typical characteristics are:

- a base width of 20-30 m wide;
- a 40-50 m top width with steep banks; and
- a depth of 3.5-6 m.

The active flow channel is stable and well vegetated with established mature trees. Bedrock outcrops in the banks and in the stream benches. In-stream vegetation increases in the lower reaches and both banks of the channel are stabilised by a healthy and diverse cover of riparian vegetation.

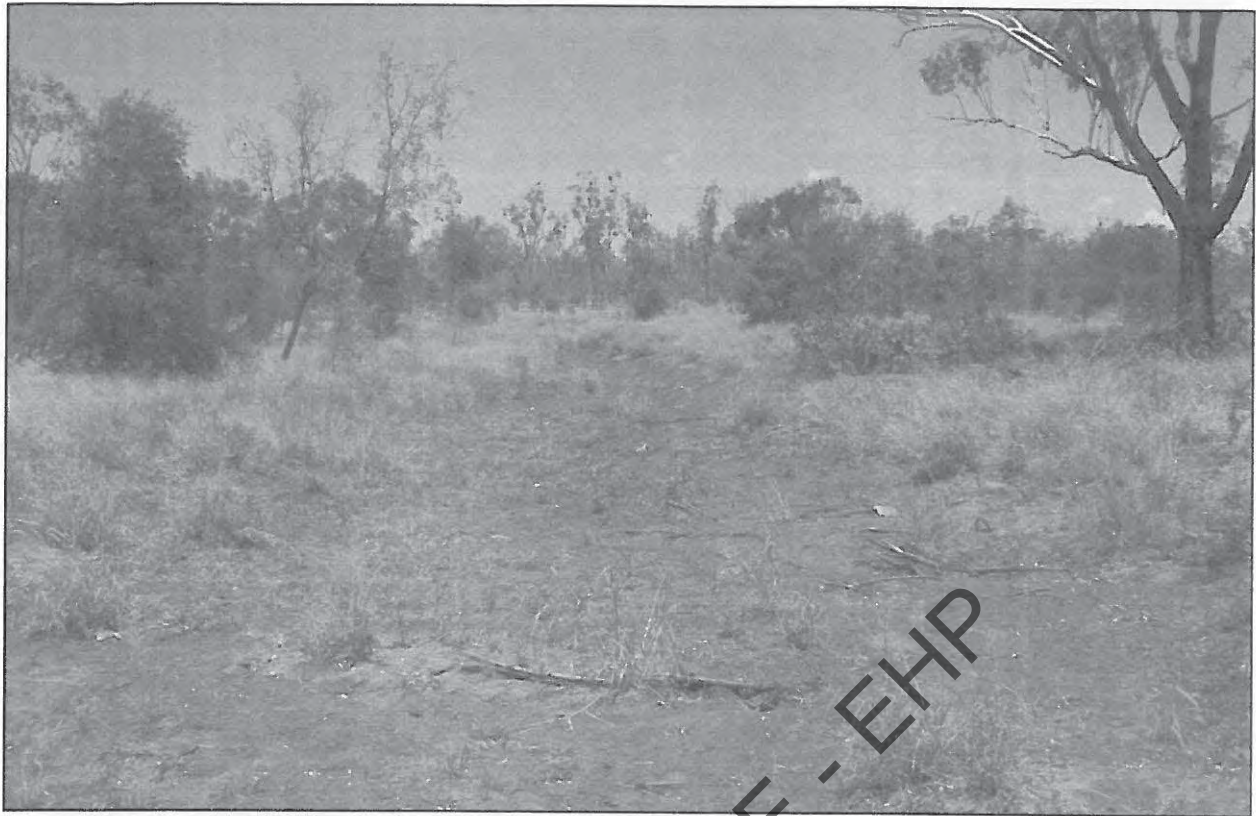


Plate 6-1 Conrock Gully

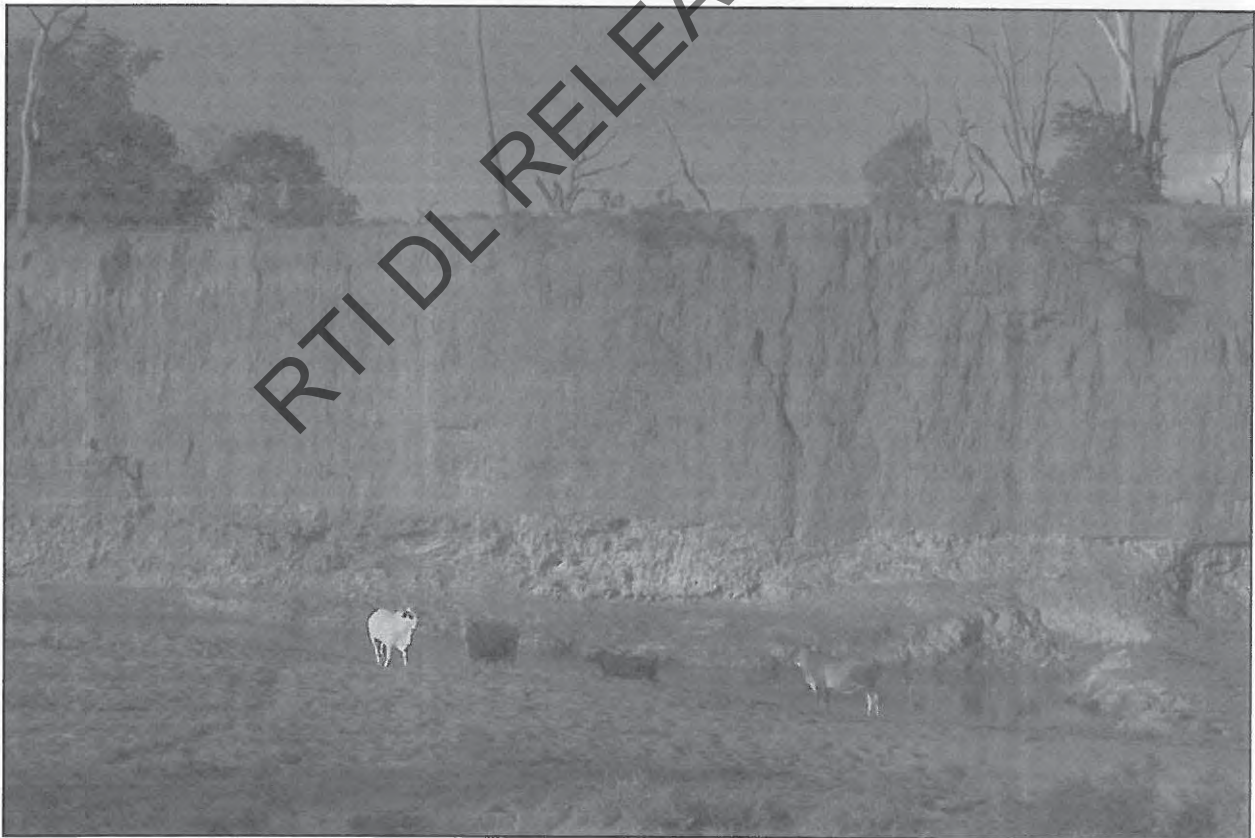


Plate 6-2 Cherwell Creek

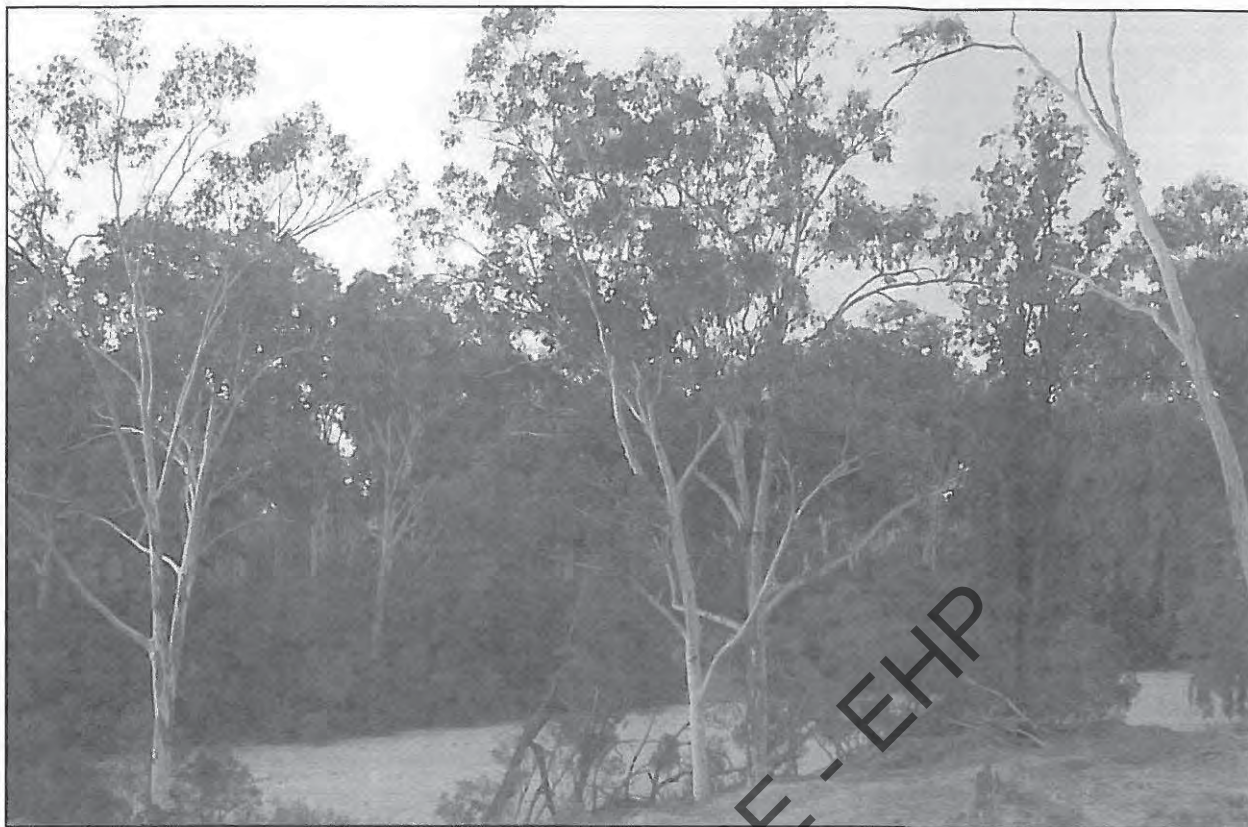


Plate 6-3 Isaac River



Plate 6-4 Smoky Creek

Hydrology

The colonisation of benches within the channel at the downstream limits has caused braiding of the low flow channels which divert flows towards the outside banks in the active flow channel. This has contributed to the erosion of isolated sections of the bank. However, it is not a widespread occurrence throughout the reach.

The predominant bed load is fine grained sands and silts with extensive deposition of sediments over the base of the creek. The creek bed is extremely mobile with each flood event causing a redistribution of the low flow channel and ponds. Both the riparian zone and the active channel have been subject to grazing. **Plate 6-2** illustrates a representative section of Cherwell Creek.

6.4.3 Isaac River

Initially, during the field assessment, only a limited reach of the Isaac River could be accessed, predominately the area immediately upstream and downstream of the confluence with Cherwell Creek. Subsequently surveyors were able to access the river and provide surveyed cross sections and photographs of the river for the reach adjacent to the lease. The Isaac River is an incised well defined river with an extensive and densely vegetated riparian zone (refer to **Section 10** for further details). Both the riparian zone and the active channel have been subject to grazing.

The typical cross-section observed exhibited:

- a 40–60 m base width;
- side slopes of 1(v) in 3.5 (h) – 1(v) in 6 (h); 1:35 (V:H) to 1:6 (V:H);
- top width of 120–140 m; and
- flood benches and runners.

The river banks in this reach of the Isaac River are stable and there was no evidence of any migratory behaviour, such as under-cutting of the banks. The dominant bed load within the channel is highly mobile, fine grained sand and silt particles. The bar of sediment across the mouth of Cherwell Creek at the confluence with the Isaac River is evidence that significant volumes of fine grained sediment depositing in the channel are being supplied from the tributaries upstream of the confluence. **Plate 6-3** illustrates a typical section of the Isaac River.

6.4.4 Smoky Creek

Smoky Creek is an ephemeral creek draining through the existing Isaac Plains Coal Mine to the Isaac River. It discharges into the Isaac River approximately 8 km upstream of Cherwell Creek and 3.5 km downstream of the Peak Downs Highway. A diversion of a reach of Smoky Creek is proposed for the IIPP to enable access to economic reserves of coal that have been identified beneath the waterway.

The lower reaches of Smoky Creek are relatively flat (0.2%) and the main channel of the creek receives flows from a number of minor tributaries not regarded as waterways for the purposes of the Water Act. The overall channel dimensions of Smoky Creek remain largely unchanged throughout the site.

The typical dimensions of the creek channel are:

- bed width 5 to 10 m;
- top width 20 to 30 m with steep banks; and
- depth 3 to 5 m.

Previous broad-scale grazing has resulted in a relatively sparse riparian vegetation. The riparian zone is narrow with scattered mature trees on both banks. Pastures are the dominant groundcover in the riparian zone. The main features of the waterway are:

- the low flow channel and riparian zone have been impacted by cattle grazing;
- the low flow channel is mobile and there is considerable erosion on the outside bends of meanders;
- the bed is mobile and consists mainly of alluvial sediments; and
- there is no aquatic vegetation in the low flow channel.

Hydrology

The low flow channel has minimal potential for disturbance of the aquatic ecosystem, with, on average, eight flow days between December and March and five flow days between April and November. **Plate 6-4** illustrates a typical section of Smoky Creek.

6.5 STREAMFLOW

The quantity and timing of streamflows require characterisation in order to:

- determine the natural flow regime of the waterways;
- provide a baseline to assess the potential impact of mining on downstream flows; and
- identify the potential for the discharge of mine water to adjacent waterways without adverse environmental impacts.

The *Australian Water Balance Model* (AWBM) is a catchment water balance model that is used to determine catchment runoff based on rainfall depth, evapo-transpiration, soil storage depths and surface and baseflow recession constants. The model is calibrated by using long-term stream gauging records, daily rainfall and pan evaporation values and by adjusting the soil storage parameters, surface and base flow recession parameters until a close match is achieved between the measured and modelled streamflows. The calibrated model can then be used to either extend the flow gauging record by generating daily flows for the full period of the rainfall records or to generate daily flows for an ungauged catchment with similar catchment characteristics.

For this assessment, streamflows have been quantified only in the immediate vicinity of the IIPP because of the need to protect the environmental values of the downstream waterways (Isaac River and Cherwell Creek) from the long-term, relatively intensive, operational activities associated with the IIPP.

To enable investigation of diversion options for Conrock Gully, streamflow sequences of all three waterways within the Expansion Area were assessed. The AWBM model was used to generate streamflow sequences in the Isaac River, Cherwell Creek and Conrock Gully, in order to provide a baseline upon which design outcomes for the diversion of Conrock Gully have been assessed.

Streamflows for Smoky Creek have been quantified in the previous surface water assessments for the approval of the existing Isaac Plains Coal Mine (refer to **Appendix G2**). The proposed diversion will not involve the construction of any additional water storages and there will be no change to the streamflows in Smoky Creek due to the proposed works.

6.5.1 Data

Data obtained for the existing Isaac Plains Coal Mine has been reviewed and used as the basis for the hydrological assessment for the Expansion Area. Additional data specific to the Expansion Area has also been obtained. The data reviewed and the purpose for reviewing it described below:

- topographic maps at a scale of 1 in 100,000 with a 20 m contour interval – used to define sub-catchments and to calculate catchment areas;
- aerial photogrammetry specifically obtained of the Expansion Area – used to define flood plain topography for hydraulic modelling and to develop conceptual designs for diversions and the mine water management system;
- aerial photography of the Expansion Area and adjacent land – used to define hydraulic model roughness;
- digital details of existing and proposed mining operations (haul roads, pits, spoil dumps and access roads) – used to determine the mine water management system and conceptual designs;
- detailed cross-sectional surveys of the waterways – used to define the in-stream cross-sections for the hydraulic modelling;
- rainfall and pan evaporation data obtained from the BoM – used for the water balance assessment of the streamflows;
- streamflow gauging data for Isaac River, Phillips Creek and Devlin Creek – used to calibrate the water balance model; and

- a RAFTS-XP hydrologic model previously developed for the existing Isaac Plains Coal Mine – used to quantify the peak design flows for the 1%, 2%, 5%, 20% and 100% Average Exceedence Probability (AEP) floods.

6.5.2 Rainfall and Evapotranspiration

Long-term rainfall records from the three nearest BoM rain gauges were analysed. A summary of rainfall averages for the stations is included in **Table 6-56**. The available period of records for each station is shown in **Table 6-66**.

Table 6-6 Annual Rainfall Statistics for BoM Stations

	Moranbah	Twin Hills	Clermont
10th Percentile (Dry) (mm)	357	329	396
Median Values (Typical) (mm)	556	601	623
90th Percentile (Wet) (mm)	869	905	989

Table 6-7 BoM Records – Data Type and Duration

Station	Data Type	Duration of Record	
		From	To
Moranbah Water Treatment Plant	Evaporation	10/01/1986	31/12/2005
	Rainfall	01/04/1972	31/12/2005
Twin Hills Post Office	Evaporation	08/03/1967	12/10/1985
	Rainfall	01/01/1905	31/10/1985
Clermont Post Office	Evaporation	19/10/1979	31/12/2005
	Rainfall	01/01/1900	31/12/2005

The Moranbah Water Treatment Plant rain gauge is located within the Isaac River catchment and is the nearest gauge to the Expansion Area. However, only 32 years of rainfall records are available for the station. The Moranbah rainfall record was compared with two nearby gauging stations, Twin Hills Post Office and Clermont Post Office. The stations have much longer periods of record, with the analysis indicating that rainfall records at Moranbah are not significantly different to those at Twin Hills, and similar to those at Clermont, albeit, Clermont is generally higher. The rainfall sequence for Moranbah was extended using the Clermont gauge.

6.5.3 AWBM Catchment Modelling

As discussed in the section above, the AWBM models prepared for this study were based on a previous study completed in 2005 by Matrix+ for the existing Isaac Plains Coal Mine (refer to **Appendix G2**).

Pan evaporation data from the Moranbah and Twin Hill climate stations was converted into evapotranspiration values by applying seasonal pan adjustment factors sourced from Table 4.4.1 *Hydrological Recipes, Cooperative Research Centre for Catchment Hydrology (CRCCH) May 2004*.

The rainfall-runoff relationship was calibrated to the recorded streamflows at the Isaac River, Develin Creek and Phillips Creek gauging stations. The calibrated model parameters are provided in **Table 6-78**.

Due to catchment similarities, calibration parameters derived for Phillips Creek were applied to Cherwell Creek and Conrock Gully to generate daily flows. Phillips Creek was selected as being the most appropriate as the catchments have similar topography, land uses and the catchment areas are also of comparable size.

Hydrology

Calibration parameters derived for the Deverill gauging station were used to generate flows in the Isaac River. Deverill is the closest stream gauge on the Isaac River to the Expansion Area. It is located south-east of the Expansion Area, downstream of the confluence with Cherwell Creek (refer to **Figure 6-2**).

Table 6-8 Model Calibration Parameters

Model Parameter	Isaac River			Devlin Creek	Phillip Creek
	Burton Gorge	Goonyella	Deverill		
A1	0.142	0.248	0.16	0.158	0.174
A2	0.0	0.0	0.0	0.0	0.0
BFI	0.0	0.0	0.0	0.0	0.0
C1	27.2	30.0	18.5	26.6	14.8
C2	283.6	138.8	18.9	253.4	150.7
C3	576.1	277.6	378.6	506.7	301.5
K _{base}	0.795	0.795	0.795	0.795	0.795
K _{surf}	0.0	0.0	0.0	0.0	0.0

Table 6-8-9 presents the predicted total runoff depths and the observed total runoff depths for the Isaac River at Deverill and Phillips Creek at Tayglen. The results demonstrate that a close match was achieved for the total flow volumes for the full period of record. The calibration also achieved a close match between the modelled and predicted flow volumes for both stations, although there was considerable variation in the modelled and predicted peak flow rates for individual events.

The model calibrated to the Deverill gauge has been assessed and was considered suitable for predicting the total flows and monthly flows in the Isaac River adjacent to the Expansion Area. Similarly the model calibrated to the Phillips Creek gauge is suitable for predicting the total flows and monthly flows in the Conrock Gully and Cherwell Creek Area.

Table 6-9 Total Observed and Predicted Runoff at Deverill and Phillips Creek

Location	Observed Runoff	Predicted Runoff
	(mm)	(mm)
Isaac River at Deverill	1,254	1,249
Phillips Creek	634	636

6.5.4 Daily Flows

The calibrated models were used to generate daily flows for the waterways within and adjacent to the Expansion Area. The flow characteristics of these waterways are described in the following sub-sections.

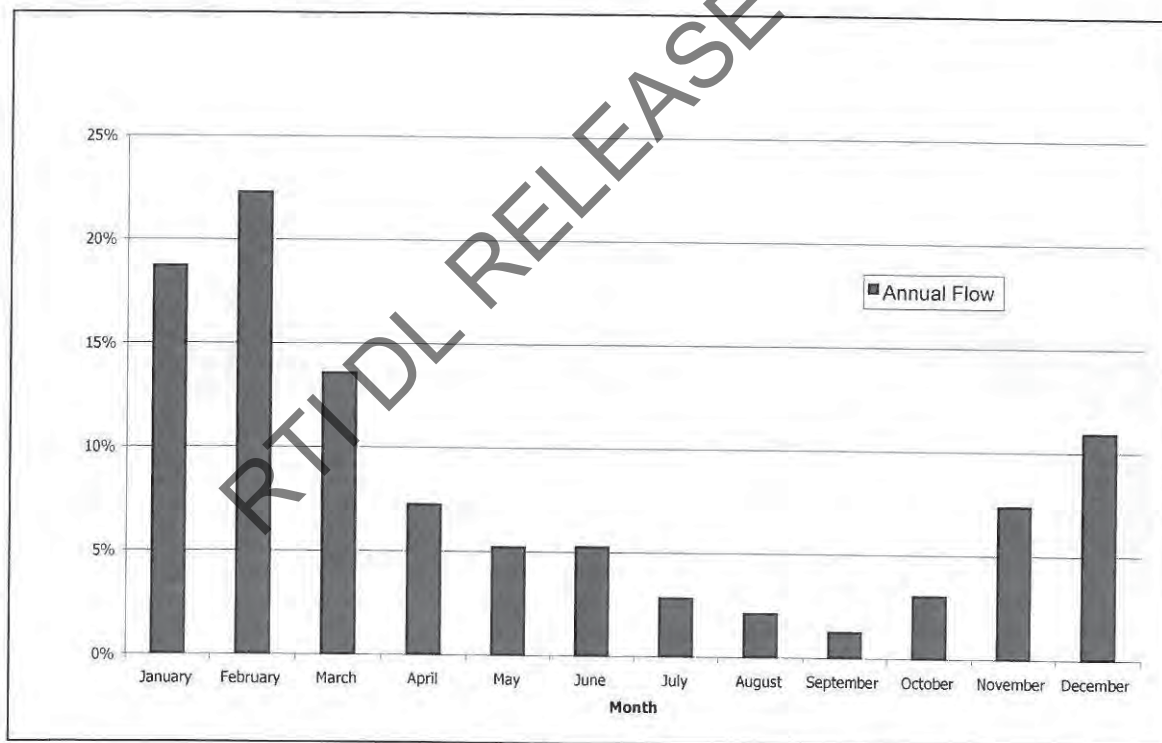
6.5.4.1 Isaac River

Daily flows were generated for the Isaac River at the confluence with Cherwell Creek for the period from 1900 to 2005. The flows were analysed to determine monthly flow volumes and the number of flow days per month. Monthly flows were statistically analysed for maximum monthly flows, median monthly flows, 80th percentile (wettest month) and 20th percentile (driest month) and are shown in **Table 6-910**.

The monthly flow volumes and number of flow days per month are shown graphically in **Figure 6-3** and **Figure 6-4**. The results demonstrate that the majority of flows (66%) occur during the wet season from December to March.

Table 6-10 Summary of Isaac River Flows at Cherwell Creek Confluence

Month	Total Flow (ML)	Maximum Flow (ML)	80 th Percentile	Median Flow (ML)	20 th Percentile	Flow Days in 106 years	% Flow Days/Month
January	2,492,000	211,000	48,000	7,000	0	207	6.7
February	2,966,000	217,000	54,000	13,000	0	236	8.4
March	1,808,000	169,000	23,000	4,000	0	141	4.6
April	967,000	181,000	14,000	0	0	69	2.3
May	696,000	82,000	8,000	0	0	76	2.5
June	702,000	167,000	12,000	0	0	73	2.4
July	380,000	42,000	4,000	0	0	54	1.7
August	284,000	65,000	1,000	0	0	39	1.3
September	169,000	38,000	0	0	0	20	0.7
October	405,000	56,000	2,000	0	0	40	1.3
November	985,000	104,000	12,000	200	0	98	3.3
December	1,455,000	81,000	30,000	5,000	0	153	4.9

**Figure 6-3 Monthly Distribution of Flows in the Isaac River**

Hydrology

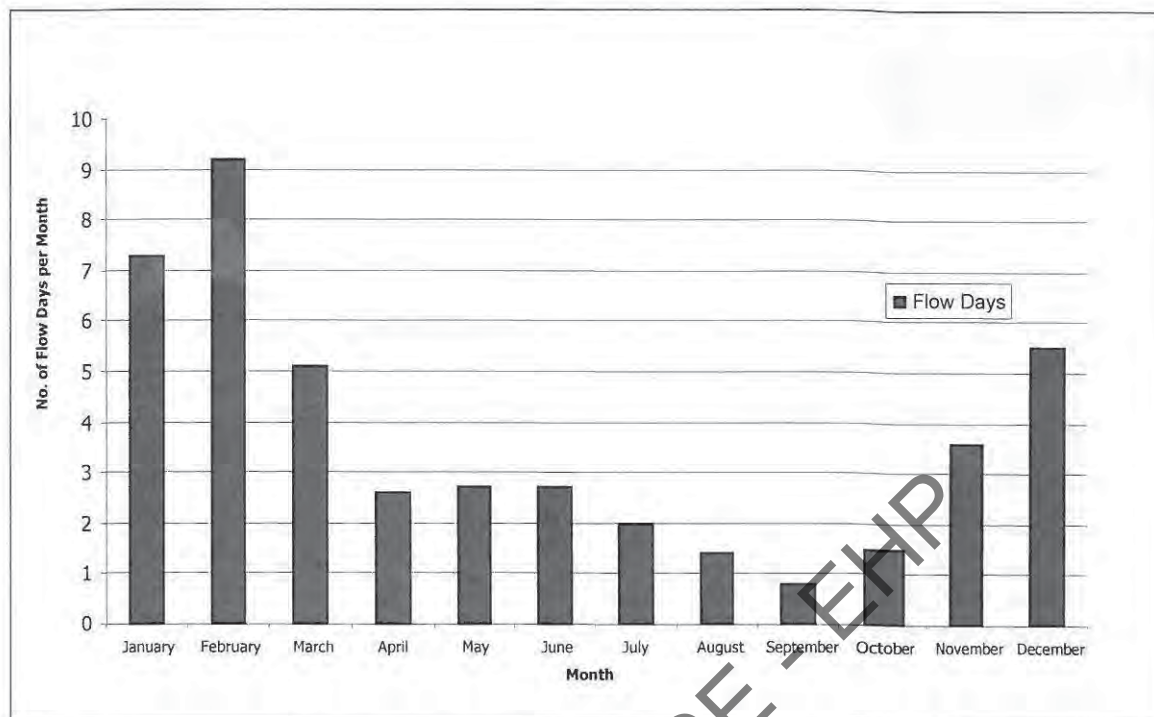


Figure 6-4 Flow days per month in the Isaac River

6.5.4.2 *Cherwell Creek and Conrock Gully*

Daily stream flows were generated for Cherwell Creek and Conrock Gully. The daily flow values generated were statistically analysed for each calendar month and are presented in **Table 6-101**. The median, maximum, 80th percentile (wet), and 20th percentile (dry) monthly flows for the entire period are summarised in **Table 6-112**.

Table 6-11 Monthly Flow Volumes in Cherwell Creek and Conrock Gully

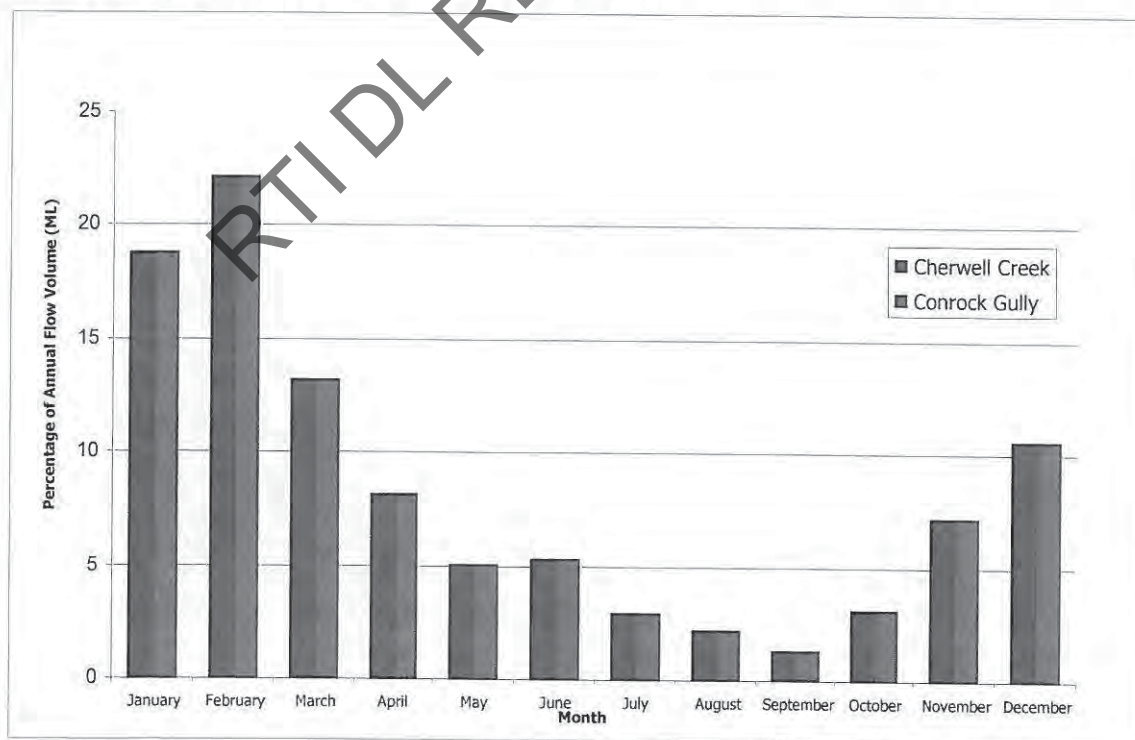
Month	Cherwell Creek Total Flow (ML)	Conrock Gully Total Flow (ML)	Flow Days in 106 years	% Flow Days/Month
January	661,536	66,011	226	7.3
February	777,592	77,592	257	9.2
March	464,566	46,357	158	5.1
April	286,770	28,615	79	2.6
May	178,411	17,803	85	2.7
June	186,568	18,617	81	2.7
July	103,358	10,314	63	2.0
August	76,080	7,592	44	1.4
September	46,523	4,642	23	0.8
October	107,573	10,734	47	1.5
November	253,007	25,246	109	3.6
December	371,477	37,068	171	5.5

Table 6-12 Monthly Flow Statistics for Cherwell Creek and Conrock Gully

Month	Cherwell Creek				Conrock Gully			
	Maximum Flow (ML)	80 th Percentile	Median Flow (ML)	20 th Percentile	Maximum Flow (ML)	80 th Percentile	Median Flow (ML)	20 th Percentile
January	105,230	11,775	2,355	0	10,500	1,175	235	0
February	113,470	13,169	3,534	0	11,323	1,314	353	0
March	50,754	5,906	1,507	0	5,064	589	150	0
April	66,667	0	0	0	6,652	381	0	0
May	19,458	3,170	0	0	1,942	251	0	0
June	46,464	3,170	0	0	4,636	316	0	0
July	9,838	1,543	0	0	982	154	0	0
August	15,636	744	0	0	1,560	74	0	0
September	9,484	0	0	0	946	0	0	0
October	13,087	1,014	0	0	1,306	101	0	0
November	24,468	3,609	468	0	2,442	360	47	0
December	19,167	7,754	1,620	0	1,913	774	162	0

Figure 6-5 shows the monthly distribution of streamflows for both waterways and **Figure 6-6** illustrates the number of days that flows occur in these waterways.

The calibration data and modelling demonstrate that Cherwell Creek, Conrock Gully and Isaac River are strongly ephemeral. Both the Isaac River and Cherwell Creek drain large catchments and have significant total annual flows. However, the majority of the flow for these systems occurs during large storms in the wet season, as is the case for Conrock Gully.

**Figure 6-5 Monthly Flow Distribution in Cherwell Creek and Conrock Gully**

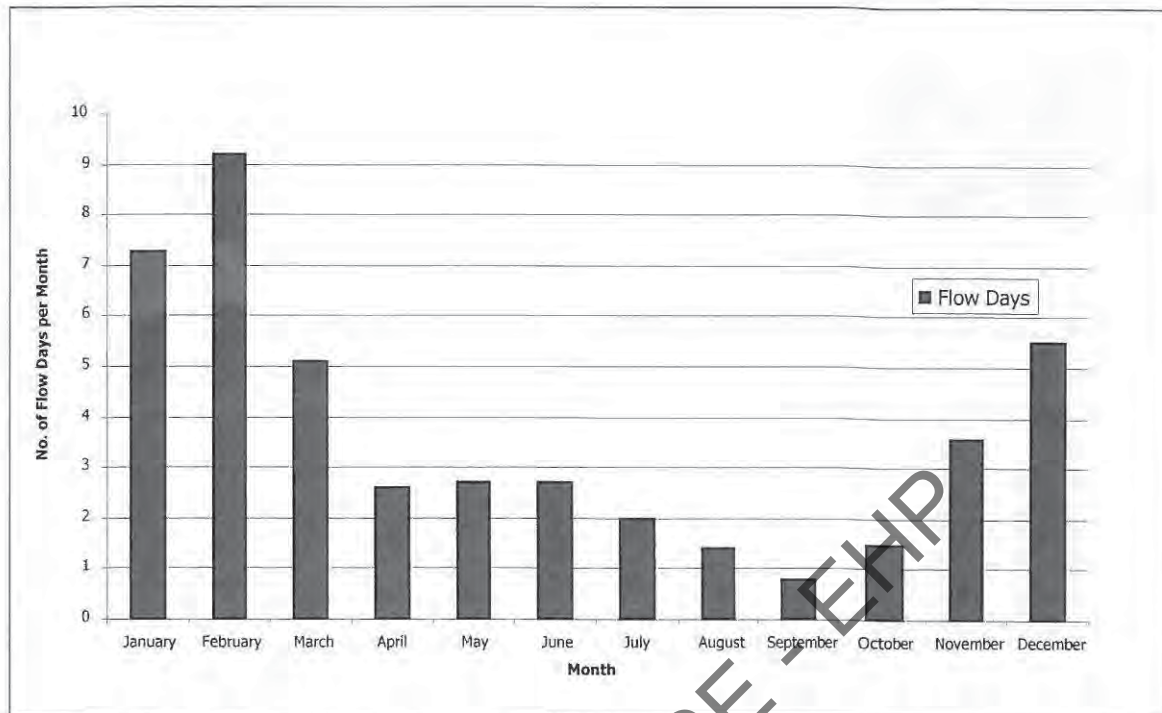


Figure 6-6 Number of Flow Days/Month for Cherwell Creek and Conrock Gully

The limited number of events and long dry periods between these events mean that the beneficial uses of these waterways are limited. Pools and ponds provide water supplies for stock and some aquatic habitat for a limited period. However, this provides limited ecosystem or water supply benefits as the river and creek beds are covered in alluvial sediments. Based on the scour and deposition patterns of these sediments, it is apparent that the pools and low flow channels are mobile and alter subsequently to each flood.

6.6 SURFACE WATER MANAGEMENT OBJECTIVES

6.6.1 General

For surface water management system purposes, the surface water generated in the Expansion Area is divided into three types based on water quality:

- Clean – surface runoff from areas where water quality is unaffected by mining operations. Clean water includes runoff from undisturbed areas and any established rehabilitated areas;
- Dirty – surface runoff water from areas that are disturbed by mining operations. This runoff may contain silt and sediment or high salt concentrations, but does not contain contaminated material. However, this runoff must be of sufficient quality, prior to discharge into natural water courses, if required; and
- Contaminated – surface water from areas affected by mining operations and potentially containing chemicals or hydrocarbons of various types used in the mining operations. There are restrictions on the use and release of this water. Contaminated water areas include sumps, stockpile areas, service bays and fuel storage areas. Rainfall and resulting runoff from these areas are also potentially contaminated, i.e. ARD and therefore must be managed to avoid discharge of potentially contaminated water into the natural water courses.

A water balance model is used to design the mine water management system. The model identifies water supply and discharge requirements based on water demands to operate the mine and water generated through the operations. The water balance and mine water management system are discussed in detail in **Section 6.9**.

In relation to the diversions, the main mechanism of potential impact on water quality comes from the physical characteristics of the flow (i.e. hydraulics). Appropriate engineering design minimises impacts on water quality, from a sediment erosion and deposition perspective, by ensuring velocities are kept to acceptable levels consistent with existing levels.

6.6.2 Management Measures

The general surface water management principles for the various construction and mining phases of the Expansion Area are as follows:

- the fullest separation possible of clean, dirty and contaminated water runoff;
- minimise the area of surface disturbance, thus minimising the volume of dirty or contaminated runoff;
- contain and reuse on site any dirty water runoff that has high sediment or salinity concentrations whenever possible. If not, release it in a controlled manner in compliance with water quality discharge criteria;
- collect and contain all potentially contaminated water on site. Recycle this water for use on the site without releasing it to the natural watercourses. If not, treat this water to water quality compliance criteria prior to release into the surrounding environment; and
- maximise the use of on-site water and thus minimise the need for external water.

6.6.3 Water Quality Compliance Requirements

The water quality guidelines that are of relevance to this project are the ANZECC & ARMCANZ (2000) guidelines. These guidelines suggest that site specific water quality data should be used where possible to estimate the target values for each water quality parameter, below which there is no unacceptable effect on ecosystem health.

An analysis of locally available water quality data summarised in **Table 6-1** and **Table 6-2**, shows that water quality, particularly EC values, is significantly higher when there is no or low flows at the time of taking the sample. It is possible that these samples were taken from stagnant pools, which could explain the highly exaggerated readings. For the purpose of developing water quality compliance criteria (trigger values) for the Isaac River and Cherwell Creek, all water quality results recorded when flows were less than 100 ML/d were ignored. The median, 20th percentile and 80th percentile pH, conductivity and total suspended solid concentrations for the Isaac River (based on **Table 6-1** and **Table 6-2**) are given in **Table 6-12-13**. The guideline ANZECC trigger values for each parameter are also shown for comparison.

Table 6-13 Adopted Isaac River Water Quality Criteria

	pH	Conductivity (μ S/cm)	Total Suspended Solids (mg/l)
Count	37	36	36
Median concentration (Isaac River)	7.4	180	1,500
20 th percentile concentration (Isaac River)	7	120	245
80 th Percentile Concentration (Isaac River)	7.8	320	3,722.5
Guideline ANZECC trigger value	6.0 – 7.5	2-250	2-15 NTU* <u>Not stipulated, to be developed</u>
Adopted criteria	7-7.8	250-320	15 NTU* 3,722.5

* Turbidity values adopted as no TSS concentrations stipulated.

Hydrology

Section 7 indicates that the conductivity of the pit water and therefore the water stored in Release Dam 3 may be up to 5,700 $\mu\text{S}/\text{cm}$, which far exceeds the default trigger values for chemical and physical stressors in Tropical Australian upland rivers. It is proposed to pump release water from Release Dam 3 only when there is sufficient flow in the Isaac River to dilute the combined pit release and Isaac River flows to below the ANZECC trigger adopted criteria value of 250-320 $\mu\text{S}/\text{cm}$. This value was adopted because it is lower than the 80th percentile EC concentration.

Releases can be made from Release Point 1 (RP1), Release Point 2 (RP2) to achieve the adopted criteria at Water Quality Site 6 (WQ6) downstream of the mine. These values are equivalent to the 80th percentile water quality concentration provided in **Table 6-13**. The locations of RP1, RP2 and WQ6 are illustrated in **Figure 20-12**.

It is noted that TSS concentrations cannot be measured in the field at the time of a release. It is proposed to develop an NTU turbidity value that approximates the adopted TSS concentration when future Isaac River water quality data is collected. Until an appropriate NTU value is determined, compliance with the TSS criteria cannot be complied with prior to a release being made.

6.7 PROPOSED SURFACE WATER MANAGEMENT CONTROLS

6.7.1 General

Surface water management controls would be implemented within the Expansion Area during both construction and operational phases in line with the surface water management objectives outlined in **Section 6-6**. The proposed mitigation measures of main areas of disturbance are as follows:

- a mine site water management system to collect potentially dirty and contaminated water from the disturbed areas of the site;
- a clean water diversion dam on Conrock Gully and diversion channel immediately upstream of the haul road to divert clean water, from upstream catchments, to the Isaac River;
- flood protection levees along the Isaac River and Conrock Gully Diversion;
- a stream diversion of Smoky Creek; and
- the construction of low level crossings across the Isaac River and Billy's Gully.

Mitigation measures have been devised to provide protection of the surface water resources and associated environmental values for the Expansion Area including the diversion of Conrock Gully and Smoky Creek (as the IIPP will not result in any significant changes to the existing Isaac Plains Coal Mine water management system). Descriptions of the proposed measures are given below.

6.7.2 Mine Site Water Management System

During the construction and operation of the mine within the Expansion Area, drainage from operational areas will include runoff from large areas of disturbed ground, including haul roads, waste rock dumps, pre-strip areas, coal stockpiles, the mine infrastructure area and mine pits. A mine site water management system has been developed to collect and capture runoff from these areas to prevent contaminants reaching the downstream waterways of the Isaac River and Cherwell Creek.

Staged concept design plans for the mine site water management system are illustrated in **Figure 6-7**, **Figure 6-8**, **Figure 6-9**, and **Figure 6-10**. A schematic of the mine water management system for the Expansion Area is illustrated in **Figure 3-6**. The main elements of the system are detailed below:

- a clean water diversion dam on Conrock Gully and diversion channel immediately upstream of the haul road to divert clean water, from the upstream catchments, to the Isaac River;
- flood protection levees along the Isaac River to separate clean Isaac River water from the potentially dirty operational areas;
- a mine water dam of approximately 1,200 ML storage capacity, (Release Dam 3), allowing mine water to be reused and allowing controlled releases to the Isaac River during flood flows;

Hydrology

- pit sumps that collect pit water to be pumped to Release Dam 3;
- highwall pit dewatering pumps to allow the open cut pit to be dewatered and water discharged to Release Dam 3;
- sediment dams to allow runoff from the rehabilitated and unrehabilitated areas of the spoil dumps to be captured and treated and pumped to Release Dam 3. A temporary release sediment dam will be installed prior to construction of Release Dam 3. Overflows from the sediment dams will drain to the pit. If water is not required, and the quality of the captured runoff meets the water quality compliance criteria, the sediment dam water may be pumped directly to Cherwell Creek or the Isaac River under discharge licence conditions;
- a retention pond to allow runoff from the ROM Stockpile and mine infrastructure area (referred to as MIA Retention Pond) to be collected and pumped to the Release Dam 3. If water is not required, and the quality of the captured runoff meets the water quality compliance criteria, water from the MIA Retention Pond water may be pumped directly to the Isaac River;
- a transfer pipeline to allow excess mine water to be pumped to the Isaac Plains CHPP for use in processing coal and for dust suppression as required; and
- water fill points linked to Release Dam 3 to allow mine water to be used for dust suppression.

Release Dam 3 and the MIA Retention Pond are the primary water dams to manage surface and groundwater runoff from the operational areas of the Expansion Area. Release Dam 3 will collect pumped inflows from the spoil dump sediment dams, the MIA Retention Pond, the open cut pit together with runoff from the undisturbed catchment downstream of the mine pit high wall. The MIA Retention Pond will collect runoff from the MIA and the ROM. The water quality within Release Dam 3 is expected to be similar to the release dam for the existing Isaac Plains Coal Mine, which is not considered as a hazardous dam.

6.7.3 Release Dam 3

A summary of the configuration of Release Dam 3 is as follows:

- the proposed stage-storage-surface area details are given in **Table 6-134**;
- the volume of the dam at full supply level (FSL) (198.57 m AHD) is approximately 1,200 ML;
- the crest level of the levee at the dam wall is 200.2 m AHD;
- a 1.8 m diameter morning glory type spillway with a one way flap valve will be constructed with a crest elevation of 198.57 m AHD, which is equivalent to the 100 year ARI design flood level in the Isaac River. The spillway will prevent the dam wall from being overtopped by local stormwater runoff from the inside and also prevent backflow of Isaac River floodwater during flood events greater than the 100 year ARI event;
- a single 900 mm diameter pipe will be installed to allow controlled releases from the dam. The pipe will be fitted with a butterfly valve at the exit that can be opened remotely (from the top of the dam wall). Access to the valve outlet will be prevented by high Isaac River levels during release events; and
- a levee will be constructed along the eastern edge of the proposed pit to prevent Release Dam 3 water draining back into the pit (refer to **Figure 6-8**).

Table 6-14 Release Dam 3 Configuration

Elevation (m AHD)	Surface Area(Ha)	Storage Volume(ML)
192.5	0	0
193	0.5	1
194	0.9	8
195	8.7	56
196	12.4	162
197	37.8	413
198	48.5	844
199	87.0	1,521

6.7.3.1 Proposed Controlled Release Rules

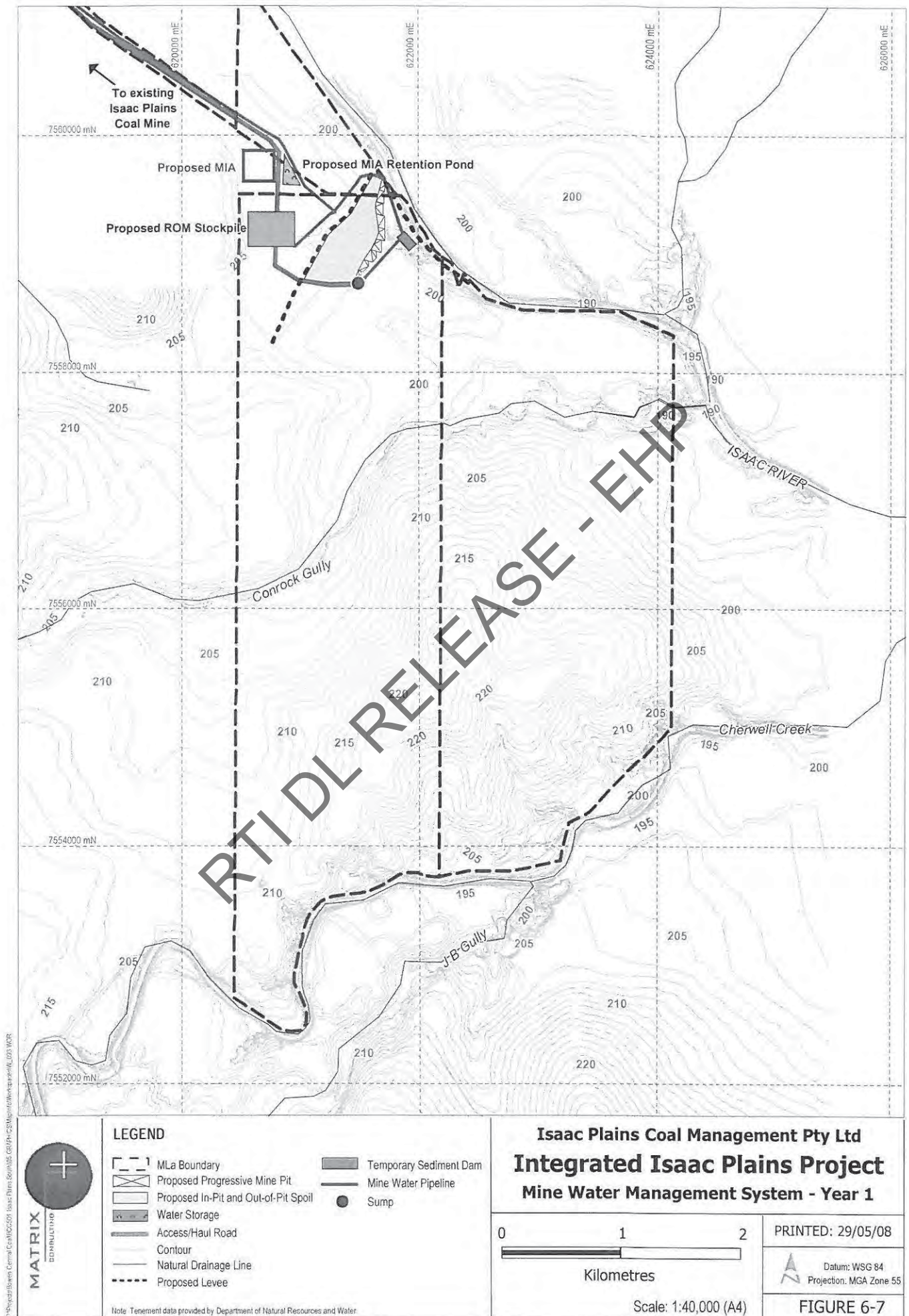
Controlled releases will be made from Release Dam 3 to minimise the risk of uncontrolled spills that may potentially contaminate the Isaac River. It is anticipated that the in-situ level of electrical EC will determine the quantity of mine water that can be released to the river and the release rules have been developed accordingly. The following release rules are proposed for Release Dam 3:

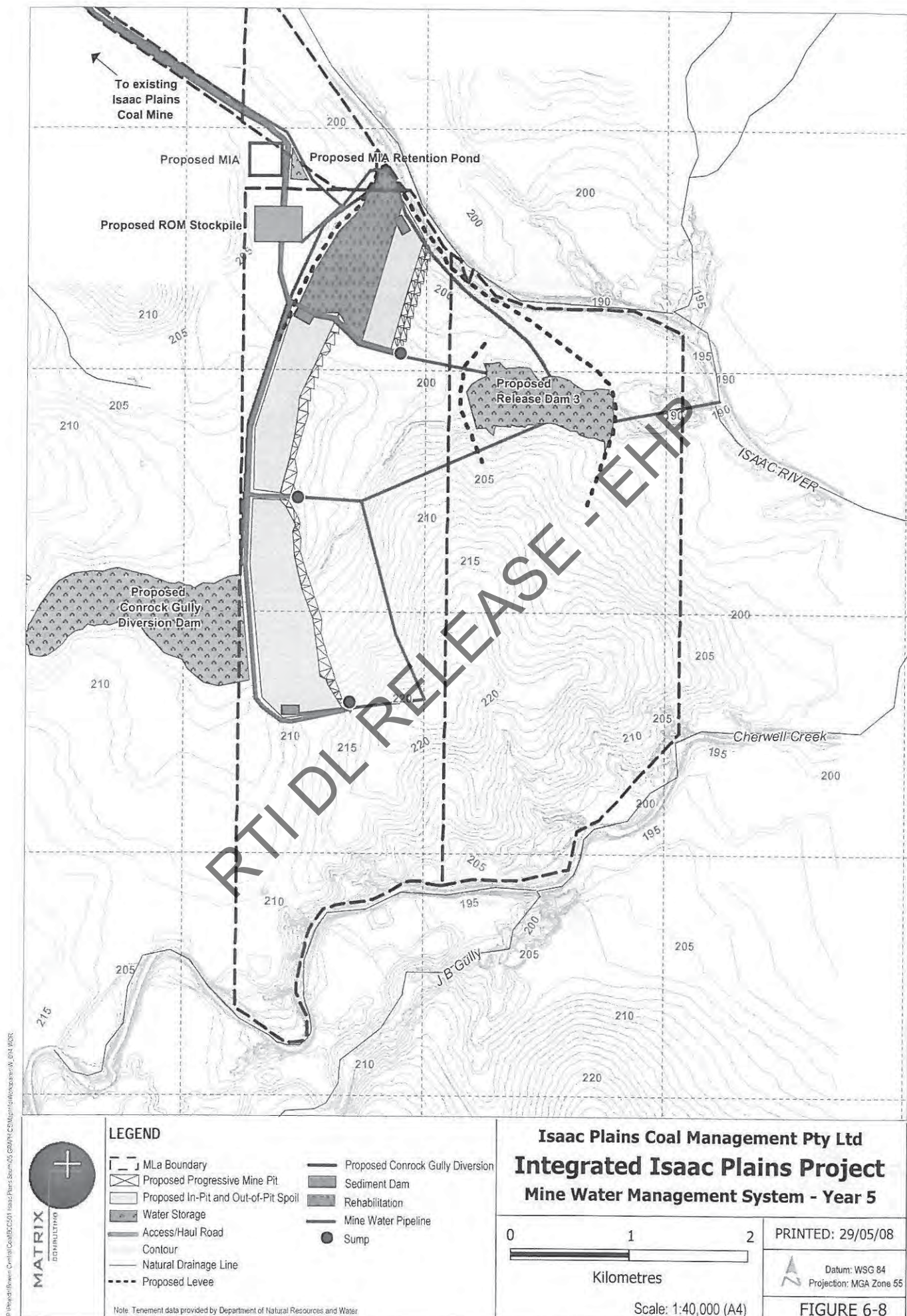
- no releases are made when the stored volume in Release Dam 3 is less than 500 ML;
- no releases are made when the Isaac River flow is less than 5,200 ML/d and a median EC of 180 $\mu\text{S}/\text{cm}$;
- releases are made at a rate of 110 ML/d when the flow in the Isaac River is between 5,200 ML/d and 10,400 ML/d; a maximum release of 30 ML/day will be made from Release Dam 3 to ensure the combined Isaac River and release water quality at WQ6 downstream of the mine does not exceed the adopted water quality compliance criteria presented in **Table 6-13**;
- when the water quality in the Isaac River at WQ5 upstream of the Expansion Area exceeds the adopted water quality compliance criteria for pH, EC and Total Suspended Solids (TSS) outline below, the quality of water released from the Expansion Area must not exceed the quality of water in the Isaac River at WQ5; and
- Release Dam 3 water quality releases will be limited to a pH of 6 to 9 and a maximum EC of 5,000 $\mu\text{S}/\text{cm}$.
- releases are made at a rate of 220 ML/d when the flow in the Isaac River exceeds 10,400 ML/d; controlled releases can be made when the Isaac River water quality exceeds the adopted water quality compliance criteria, defined in **Table 6-13**. When this occurs, the quality of water released must not exceed the quality of water in the Isaac River;
- both the quality of the releases and flows in the Isaac River upstream and downstream of the release point will be monitored during a release event to ensure the water quality is less than the adopted water quality compliance criteria, defined in Section 6.6.2 **Table 6-13**; and
- all pumping from the open pits, MIA Retention pond and sediment dams to Release Dam 3 will cease when the available flood storage below the spillway crest level falls below the 10 % AEP 24 hour duration storm volume (minus losses). For the first year, the 10 % AEP 24 hour duration storm volume is 400 ML. (However, the minimum flood storage volume will reduce as the dam catchment becomes mined). the target water level, where all pumping from the open pits, MIA Retention Pond and sediment dams will cease is 198 m AHD. This provides sufficient flood storage capacity below the spillway to contain the runoff from the dam catchment in a 10% AEP 24 hour duration storm and minimises operational problems of water draining back to the pit when the level in Release Dam 3 exceeds 198 m AHD. The levee between Release Dam 3 and the pit will prevent this from occurring.

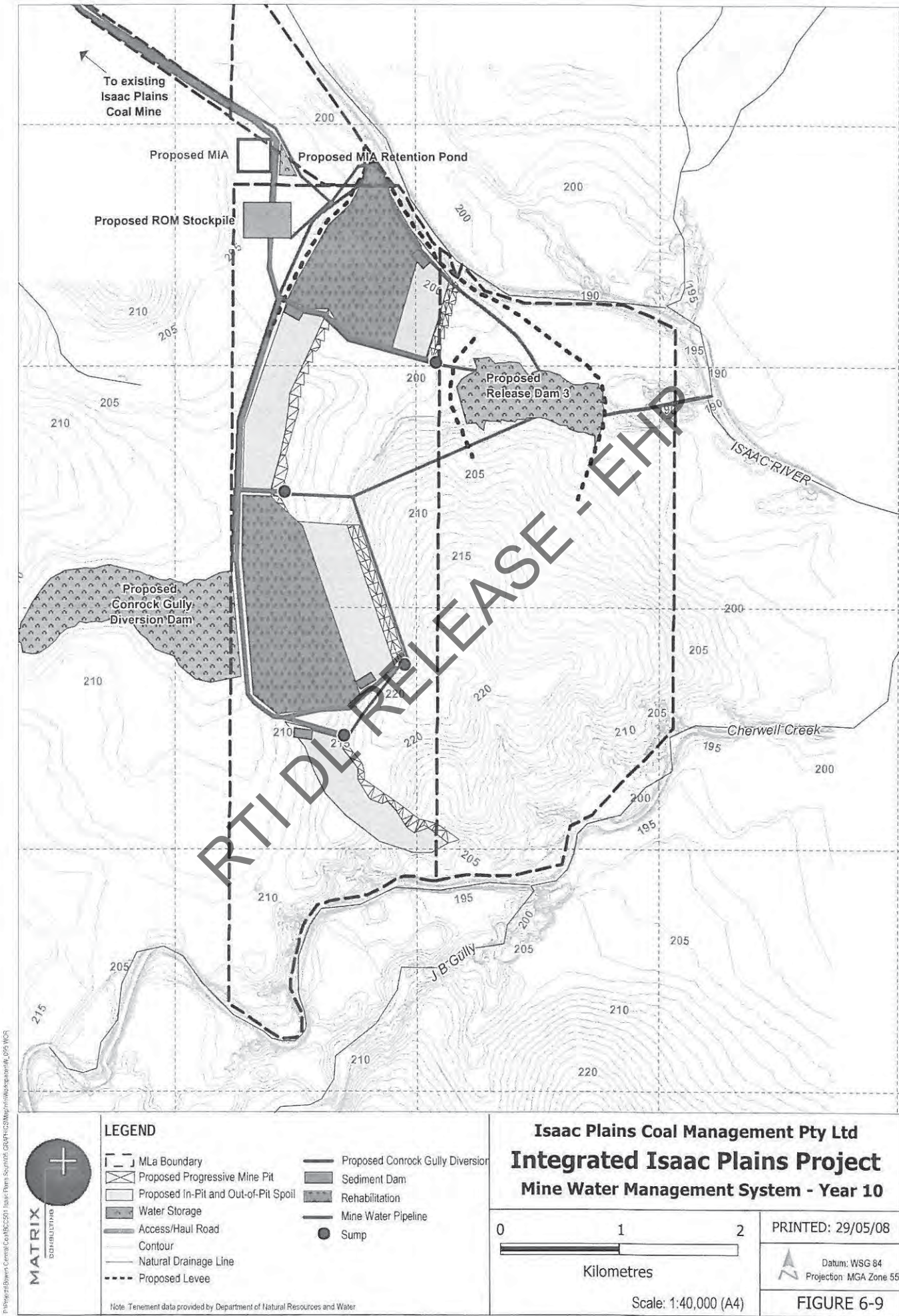
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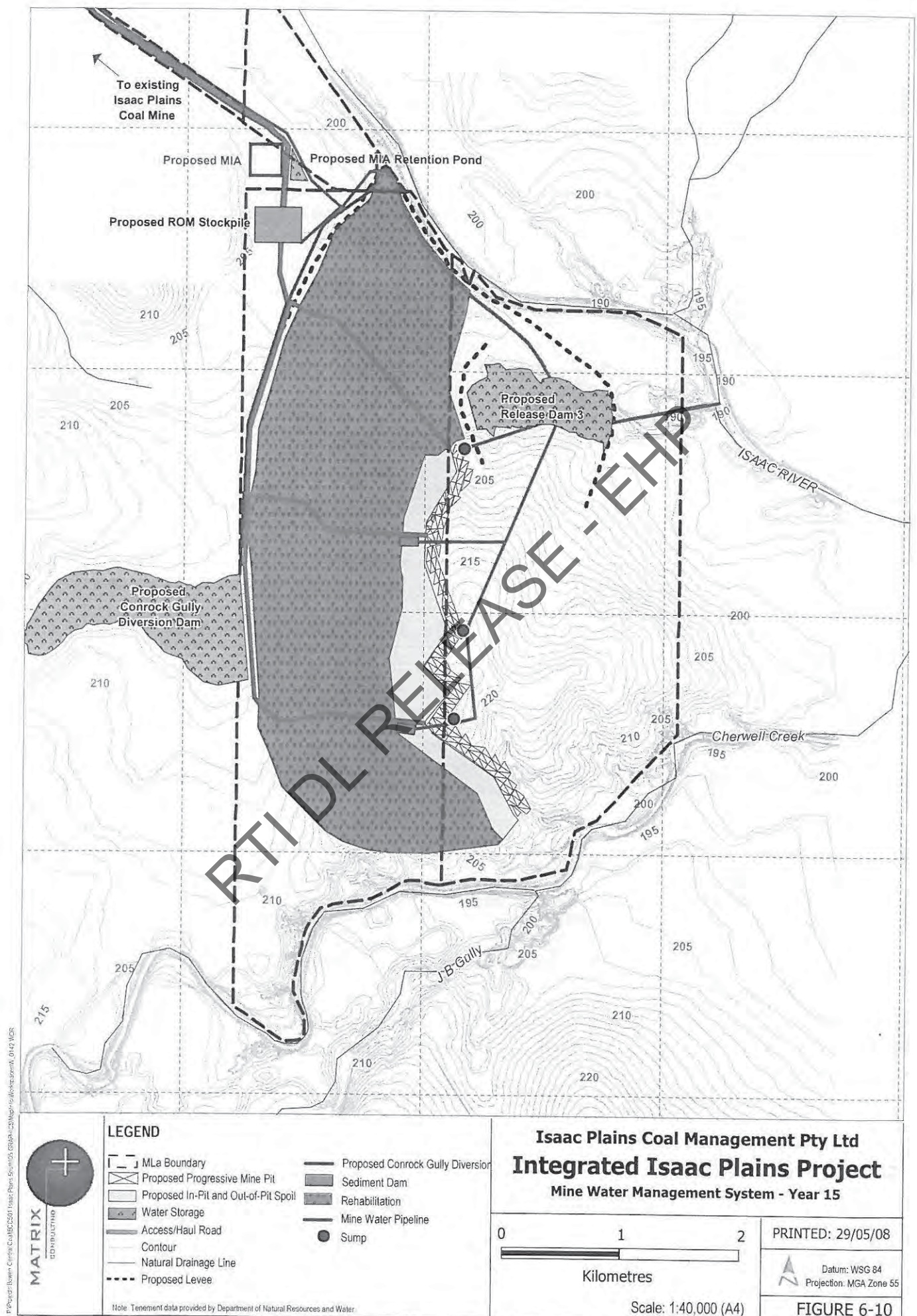
The minimum dilution ratio under this scenario is 47 to 1. An analysis of the impact of these rules on Isaac River EC concentrations is given in **Section 6.9.6**.

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6.7.4 Mine Infrastructure Area Retention Pond

Runoff from the mine infrastructure area and ROM stockpile could potentially be dirty. The following measures are proposed to manage runoff from the mine infrastructure area and ROM stockpile areas:

- any potentially contaminated areas, such as fuel storage areas, will be sufficiently bunded in accordance with EPA and AS1940 requirements;
- runoff from workshop/machinery areas will be directed to a triple interceptor/gross pollutant trap to remove oils and greases;
- a retention pond (MIA Retention Pond) will be constructed to collect runoff from the mine infrastructure area and ROM stockpile;
- diversion drains will be constructed to direct clean runoff from the upstream catchment area around the mine infrastructure area and dirty runoff to the MIA Retention Pond;
- the MIA Retention Pond has been sized to contain runoff from its contributing catchment such that it does not overflow during a 10% AEP 24-hour duration storm event;
- if the stored water collected in the MIA Retention Pond meets the water quality compliance criteria, it will be released to the Isaac River such that the pond is empty within 7 days of the storm event; and
- if the stored water collected in the MIA Retention Pond does not meet the water quality compliance criteria, or there is no Isaac River flow recorded at WQ5, the water will be pumped to Release Dam 3 at a rate of 5ML/day.

The approximate stage-storage-surface area details of the MIA Retention Pond are provided in **Table 6-14**. The volume of the pond at a FSL of 203.4 m AHD is 44 ML which is sufficient to store the 10 year ARI, 24 hour rainfall event assuming a 30 ha catchment. The crest level of the dam wall (haul road) is 203.5 m AHD. It is assumed that a spoon drain across the haul road will be used as the spillway. Details of the spill behaviour of the MIA Retention Pond are provided in **Section 6.9.5**.

Table 6-15 MIA Retention Pond Configuration

Elevation (m AHD)	Surface Area (ha)	Storage Volume (ML)
201.5	2.1	0
203.5	2.5	46.1

6.7.5 Conrock Gully Diversion

To enable efficient mining of the coal resources to the north, south and beneath Conrock Gully, Conrock Gully will be diverted from its current course to allow development of the mine pit. Under current conditions, approximately 44-45 km² of the Conrock Gully catchment and a further ±6-17 km² of the catchment to the north of Conrock Gully, drains to the Expansion Area.

Two diversion options were considered:

- a 4 km diversion to the south to Cherwell Creek (Option 1); or
- a 2.4 km diversion to the north to the Isaac River (Option 2).

For both options, it would be necessary to construct a dam across Conrock Gully at the western boundary of the Expansion Area, within the ML, to raise water levels sufficiently so that water can discharge under gravity, into the diversion channel. Prior to the end of mining, the area impounded by the dam will be filled by compacted overburden so that the impounded area freely drains into the constructed diversion channel without ponding water. The raised upstream end of the diversion channel will minimise cut volumes but will also cause water to pond on the adjoining property to the west for extended periods and reduce flows draining along Conrock Gully to the Isaac River.

It is noted that the bed level of Conrock Gully at the proposed dam wall is some 3 to 4 m below the 1% Annual Exceedence Probability (AEP) flood level in both Cherwell Creek and the Isaac River.

Therefore, the diversion channel under both options will experience some backflow from the downstream receiving waters of the Isaac River.

6.7.5.1 Investigation of Diversion Options

An analysis of the two diversion options with a range of spillway crest elevations was been undertaken to determine the optimum diversion and dam configuration. For all scenarios, it was assumed that the diversion channel consisted of a 20 m wide base and 1V:3H side slopes. The results of the analysis are provided in **Table 6-1516**.

Table 6-16 Conrock Gully Diversion Options

Option	Spillway Crest Elevation (mAHD)	Storage Volume (ML)	Diversion Bed Slope (%)	Diversion Cut Volume (m ³ x1000)	Reduction in Conrock Gully Flow Volumes (%)
To Cherwell Creek					
1A	205.6	1294	0.23	615	52
1B	204.6	551	0.19	671	26.5
To Isaac River					
2A	205.6	1294	0.20	213	52
2B	204.6	551	0.17	280	26.5
2C	203.6	226	0.15	354	13.2
2D	202.6	70	0.12	436	4.3

The results illustrate that the diversion to Cherwell Creek options require significantly more excavation than the Isaac River diversion options. Therefore, the diversions to Cherwell Creek options have not been considered further.

For the diversion to Isaac River options shown in **Table 6-156**, Option 2A is the most acceptable on economic grounds because it requires the least excavation of the four options. The Option 2A diversion is not as deep and has a bed slope that is closest to the bed slope of Conrock Gully upstream of the diversion (0.22%), which means that natural channel design features can be incorporated into the design. It is likely that the other options would require a deep trapezoidal channel and could not be designed using natural channel design principals. On this basis, Option 2A was the preferred option for the EIS.

DNRW subsequently provided comment on the draft EIS and requested that the Proponent provide a comparison of options to demonstrate the selected option provides an optimal balance between economic considerations and to minimise loss of flows 'in the spirit of the Fitzroy ROP'.

A review of the results in **Table 6-15-16** shows that Option 2A would reduce Conrock Gully flow volumes by 52%. Although significant for Conrock Gully, the impact on the downstream Isaac River flows, which has a catchment area some 78 times that of Conrock Gully, would be less than 0.5%. Notwithstanding, the results show that the remaining options with lower spillway levels have significantly less impact on Conrock Gully flows when compared to Option 2A. However, they also require correspondingly higher excavation volumes.

With respect to Option 2C and Option 2D diversion channels, it is possible that sediment build up (aggradation) may become a long-term problem because the channel bed slopes are significantly lower than for the existing Conrock Gully. In addition, the spillway level of Option 2D is below the 1% AEP flood level of Isaac River, which may increase aggradation and cause increased Isaac River flooding on adjacent land.

Option 2B, which requires an additional 67,000 m³ of excavation over Option 2A, has less than half the storage volume of Option 2A and would reduce Conrock Gully flows by only 26.5%; approximately half of the flows lost due to Option 2A. The bed slopes and channel depth of this option are not as good as Option 2A but better than Option 2C and Option 2D. Overall, option 2B is considered to provide the optimal balance between economics (excavation costs) and reducing loss of flows from Conrock Gully into the Isaac River.

6.7.5.2 Description of Selected Option

The diversion will be constructed in two stages with the reach downstream of the dam constructed at the commencement of mining and the diversion across the backfilled dam reservoir area to be constructed at the completion of mining.

The concept design for the selected diversion option is as follows:

- a channel with a 10 m wide base and 1V:3H channel side slopes will be constructed along the upper and middle reaches of the diversion. The channel width will be reduced to 1 m at the lower end to conform with the existing channel that drains into the Isaac River at that location;
- the invert level of the stage 1 diversion, which is the spillway level of the proposed Conrock Gully dam prior to filling is 204 AHD;
- the finished surface level of the Conrock Gully dam fill will slope at a grade of 1V:250H towards the proposed diversion channel. A total of 3.3 million cubic metres (compacted in place) of material is required to fill the dam;
- the diversion connects to an existing flood channel that drains into the Isaac River in a similar manner to the existing Conrock Gully Channel. The adopted bed gradient in this lower reach is consistent with the bed gradient of the flood channel as it drains into the river; and
- the estimated volume of material to be excavated for the diversion is 533,000m³.

The proposed diversion channel was assessed using the ACARP recommendations for river diversions within the Bowen Basin. The existing Conrock Gully was also used as a 'template' to assist with the design of the channel properties.

- the adopted bed grade for the upper reach is lower than the upper and middle 'template' reaches of Conrock Gully due to the physical constraints of the proposed fill extents.
- the adopted bed grade for the middle reach is consistent with the upper and middle template reaches.
- the channel across the Conrock Gully dam fill (upper reach) has a capacity marginally larger than the 2 year ARI event and is similar to the upper reach of the existing Conrock Gully;
- the hydraulic characteristics of the upper reach are consistent with the ACARP recommendations for 2 year ARI event channels with vegetation.
- the middle reach generally has a channel capacity in excess of the 100 year ARI Conrock Gully design flow. However, the 100 year ARI design flows do break out as the channel crosses the Conrock Gully tributary (Table 4.2 of Appendix G6). The Conrock Gully tributary flows would also inundate this area to a similar extent.
- the hydraulic characteristics of the middle reach are consistent with the ACARP recommendations for 50 year ARI event channels with vegetation.

Given that the proposed diversion meets the ACARP criteria and is generally consistent with the existing Conrock Gully channel, the proposed Conrock Gully Diversion (post-mining) should be stable in the long term.

- the construction of a dam across Conrock Gully (the access/haul road) at a level of 208.9 m AHD to raise water levels sufficiently to allow water to discharge into a diversion channel;
- the construction of a diversion drain from Conrock Gully dam northward to the Isaac River. The base of the diversion at Conrock Gully will be 204.6 m AHD and will grade at approximately 0.17% to the Isaac River. The channel will be designed using natural channel principals where possible. It is noted that the diversion channel is longer and has a flatter bed slope than the existing Conrock Gully channel and will therefore not mimic the current natural channel features;

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- the construction of a culvert crossing on the diversion under the haul road; and
- the raising of the ROM stockpile pad and mine infrastructure area to prevent flooding.

It is noted that there will be no significant change in the total flow volume or frequency of stream flows in the Isaac River as a result of this diversion due to the relative differences in catchment area.

The configuration alignment of the proposed diversion and the dam reservoir area are is given shown in **Figure 6-11**, and typical sections for the diversion are illustrated in **Figure 6-12**. The stage-storage-surface area details of the Conrock Gully dam are provided in **Table 6-16** and **Table 6-17**. The volume of the dam at FSL (204.6 m AHD) is 551 318 ML. The crest level of the dam wall (access/haul road) is 208.9 m AHD.

Table 6-17 Conrock Gully Diversion Dam Configuration

Elevation (m AHD)	Surface Area (Ha)	Storage Volume (ML)
200	0	0
201	1.7	9
202	2.9	325
203	14.75	120
204	24.93	318
205	71.51	800

The water collected in the Conrock Gully dam will evaporate or overflow along the diversion channel back into the Isaac River. It is not proposed to use the water stored in Conrock Gully dam for mine site use, except during an emergency which is 'in the spirit of the Fitzroy ROP'. However, the dam will potentially reduce the Isaac River flows downstream of the mine. The impact of the diversion dam on Conrock Gully and Isaac River flows is given in **Section 6.9.5.4**.

Anglo Coal Australia is exploring in EPC602 and EPC548 to ascertain the suitability of a potential underground coal mine. Accordingly, IPCM are in negotiation with Anglo Coal and Exxaro to obtain the conditional consent for mine infrastructure to be established and the inundation area of Conrock Gully Dam on those tenements not held by Vale. It is understood that Anglo Coal Australia, are considering a future longwall mine in the vicinity of the dam. Should this occur, the impounded water behind the Conrock Gully dam will be pumped to the Isaac River via the diversion channel during appropriate Isaac River flow events.

As discussed above, the diversion channel is longer and has a flatter bed slope than the existing Conrock Gully channel and will therefore it will not be possible to mimic the current natural channel features. However, the change in the hydraulic gradient and hence sediment carrying capacity of the channel, is likely to compensate for the reduction in sediment supply from the upstream catchment caused by the construction of Conrock Gully dam. The Conrock Gully flood diversion channel will be excavated predominately in rock, reducing the potential for erosion and scour of the channel thereby reducing the sediment supply to the channel. On this basis, sediment loads within the Isaac River are not likely to increase as a consequence of the Conrock Gully diversion.

Detailed design plans of the dam and diversion will be prepared and will be included in the PoO for the time period in which IPCM propose to undertake the works. The preparation and supply of the detailed design plans for the PoO are commitments made by IPCM in the EM Plan (refer to **Section 20**).

For the proposed option described above, it will be necessary to construct a dam across Conrock Gully at the western MLA boundary to raise water levels sufficiently so that water can discharge under gravity into the diversion channel. Prior to the relinquishment of the mining lease, IPCM will have responsibility for filling the dam reservoir area impounded by the dam (approximately 170 ha) with compacted overburden so that the impounded area is stable and freely drains freely into the constructed diversion channel without ponding water (Appendix G6).

The precise timing of the filling of the dam reservoir area impounded by the dam and rehabilitation works has been not been scheduled at this stage, however it will be prior to the relinquishment of the mining lease. The cost of filling in the area impounded by the dam and establishing a stable channel

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and floodplain is estimated to be in the order of \$10 million (based on contract rates from August 2008).

The proposed diversion alignment downstream of the diversion has been slightly modified from that proposed above to reduce the impact on existing vegetation and to improve the connection of the diversion with the Isaac River. This location may change again during the detailed design of the mine infrastructure area (MIA), which will be undertaken as part of the Plan of Operations. However, the general principles of the design are unlikely to change.

The concept design of the proposed channel will be as follows:

- a channel with a 10 m wide base and 1V:3H channel side slopes will be constructed along the upper and middle reaches of the diversion. The channel width will be reduced to 1 m at the lower end to conform with the existing channel that drains into the Isaac River at that location;
- the invert level of the stage 1 diversion, which is the spillway level of the proposed Conrock Gully dam prior to filling is 204 AHD. This level is approximately 0.6 m lower than that recommended. It will be necessary to lower the level of the diversion channel at this location to include sufficient grade of the dam to drain once it has been filled;
- the finished surface level of the Conrock Gully dam fill will slope at a grade of 1V:250H towards the proposed diversion channel. A total of 3.3 million cubic metres (compacted in place) of material is required to fill the dam. This corresponds to a loose volume of spoil material of approximately 4.5 million cubic metres assuming a volume compaction factor of 36%;
- the diversion connects to an existing flood channel that drains into the Isaac River in a similar manner to the existing Conrock Gully Channel. The adopted bed gradient in this lower reach is consistent with the bed gradient of the flood channel as it drains into the river;
- the estimated volume of material to be excavated for the diversion is 533,000m³.

There are many tens of millions in excess of 250 million of cubic metres of spoil in open cut spoil dump available for the filling of the area impounded by the dam the dam reservoir area. The estimated volume of material required to fill the dam reservoir area is 4.5 million cubic metres (loose). The fill material will need to be geochemically benign and have a suitable particle size distribution to facilitate control filling. The results of the geochemical characterisation of the spoil and preliminary geotechnical advice indicate that the large majority of the spoil will be suitable to use as fill material. This conclusion is supported by experience with the use of spoil from the existing Isaac Plain Mine and other Bowen Basin open cut mines for compacted road pavement and hardstand construction. Geochemical characterisation will be conducted on the selected fill prior to using the spoil in the Conrock Gully Dam area.

In relation to the impact of the timing of the fill work, even in the event that the filling of the reservoir area occurs at the end of the mine life, more than adequate suitable fill material could be sourced from the low wall area of the spoil dump, without the need to disturb any rehabilitation.

To maintain a stable landform and minimise infiltration and erosion, preliminary geotechnical advice indicates that bulk backfill should be compacted to 90% Standard Dry Density (SDD) and fill within 1 m of the bed of the channel should be compacted to 98% SDD. This will ensure erosion stability and limit post-construction consolidation settlement of the constructed channel. Based on experience with earthworks construction using spoil at other Bowen Basin mines, these levels of compaction should be readily achievable for the large majority of spoil material.

Erosion of the channel and floodplain will also be controlled by the placement of topsoil on the backfilled area and the planting of grass for erosion protection. The existing channel is grassed and very stable. The calculated flow velocities in the constructed channel are similar to the natural channel and the erosion potential will be similar. Grassed cover should therefore be effective in controlling erosion in the constructed channel and floodplain.

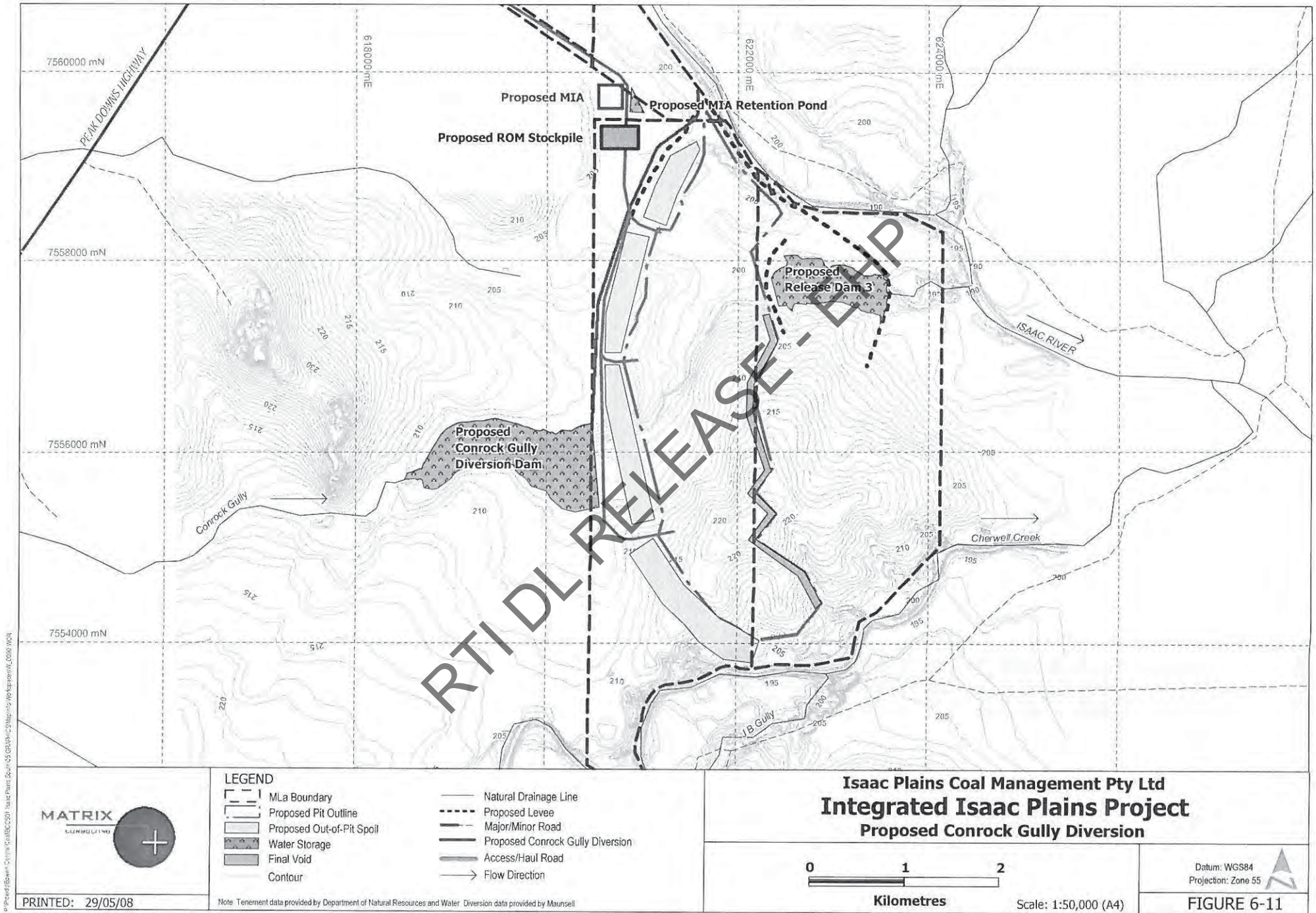
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The proposed diversion channel was assessed using the ACARP recommendations for river diversions within the Bowen Basin. The existing Conrock Gully was also used as a 'template' to assist with the design of the channel properties:

- the adopted bed grade for the upper reach is lower than the upper and middle 'template' reaches of Conrock Gully due to the physical constraints of the proposed fill extents;
- the adopted bed grade for the middle reach is consistent with the upper and middle template reaches;
- the channel across the Conrock Gully dam fill (upper reach) has a capacity marginally larger than the 2 year ARI event and is similar to the upper reach of the existing Conrock Gully;
- the hydraulic characteristics of the upper reach are consistent with the ACARP recommendations for 2 year ARI event channels with vegetation;
- the middle reach generally has a channel capacity in excess of the 100 year ARI Conrock Gully design flow. However, the 100 year ARI design flows do break out as the channel crosses the Conrock Gully tributary (Table 4.2 of Appendix G6). The Conrock Gully tributary flows would also inundate this area to a similar extent;
- the hydraulic characteristics of the middle reach are consistent with the ACARP recommendations for 50 year ARI event channels with vegetation;

Given that the proposed diversion meets the ACARP criteria and is generally consistent with the existing Conrock Gully channel, the proposed Conrock Gully Diversion (post mining) should be stable in the long term.

Figures 6-13 and 6-14 illustrate the natural ground contours and the aerial extent of filling the area impounded by the dam. Cross sections of the existing and proposed diversion levels and channel geometry are described in more detail in Appendix G6.



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Flood Protection Levees

To maintain safe operation of the Expansion Area pit and mine infrastructure area during mining operations, a levee is required to prevent encroachment of floodwaters from the Isaac River. The proposed levee extends for approximately 4.2 km on the western side of the Isaac River from 1 km upstream of the proposed pit to the southern side of Conrock Gully. The levee height will be up to 1 m above the 1% AEP flood height. The Expansion Area 1% AEP flood height location is located in **Figure 6-13**. The location of the proposed levee is illustrated in **Figure 6-14**.

Section 6.8 details the flood modelling undertaken to determine the design flood levels and the impact of the proposed levees on flood levels. The determined levels for the flood levee are given in **Table 6-178**.

Table 6-18 — Isaac River Flood Levee Elevations

3.260	204.2
3.250	203.6
3.240	202.2
3.230	200.9
3.220	200.8
3.210	200.2

Given the existing high velocities within Isaac River, it is unlikely that the levee will increase the scour or erosion potential of the Isaac River creek bed or banks given that the river is accustomed to high flow velocities.

Feedback received on the EIS raised concerns over the risk of levee failure and migration of an erosion channel into the Isaac River. Such feedback has necessitated further assessment to minimise this risk of catastrophic failure of the levee and to provide a long term self-sustaining landform. The need for such assessment has been highlighted to some extent by the levee failure that occurred at the Ensham mine during extreme weather in the period since the EIS.

A levee can fail either when the material in which it was constructed becomes geotechnically unstable or if it is overtopped and is subsequently undermined by erosion. For the Expansion Area levee, the levee will be designed in detail by a registered professional engineer of Queensland to ensure the materials used in construction, and the method of construction, will achieve the requisite geotechnical stability. These details will be provided in the PoO prior to construction.

In relation to the risk of overtopping, the levee has been designed to the 1% AEP height plus 1 m. **Section 6.8.4.1** provides a discussion on the estimated AEP for the additional 1 m height to be in the order of 0.5% to 0.1% AEP. To further eliminate the risk of overtopping, the mine plan has been reconfigured adjacent to the Isaac River to eliminate the final void that ran parallel to the Isaac River, as shown in the EIS. The levee will now be buttressed into the spoil dump. The spoil dump, which rises to up to 40 m above natural surface will prevent flood flows from entering the mine pit, thereby removing the risk of levee failure and headward erosion into the Isaac River.

The final void that runs perpendicular to the Isaac River, at the easternmost side of the Expansion Area pit, will be progressively backfilled after final mining for 1.2 km up to the 202 m AHD contour (the location coincides with station 3.240 in **Table 6-178**). This backfilling will provide flood protection to the final void.

Further information in relation to backfilling the void is provided in **Section 19.1.3** and **Section 19.1.6**.

6.7.6 Smoky Creek Diversion

To mine the coal seam under Smoky Creek, the creek will be diverted alongside spoil for a length of approximately 1.2 km on a new alignment to the south (refer to **Figure 6-1512**) adjacent to mine spoil. The diversion is in a geologically faulted corridor between S1 and S2 pits, where the northern bank of the diversion will run alongside the outer spoil dump of Pit S1 with the southern bank excavated into the earth opposite Pit S2. The S1 soil will act as a levee in the north while a levee will be constructed along the southern extent of the diversion.

A conceptual design for the Smoky Creek diversion has been developed and is illustrated in **Figure 6-1512**. Detailed engineering designs will be prepared for the diversion and be included in the relevant PoO prior to undertaking the works, and will incorporate the following features:

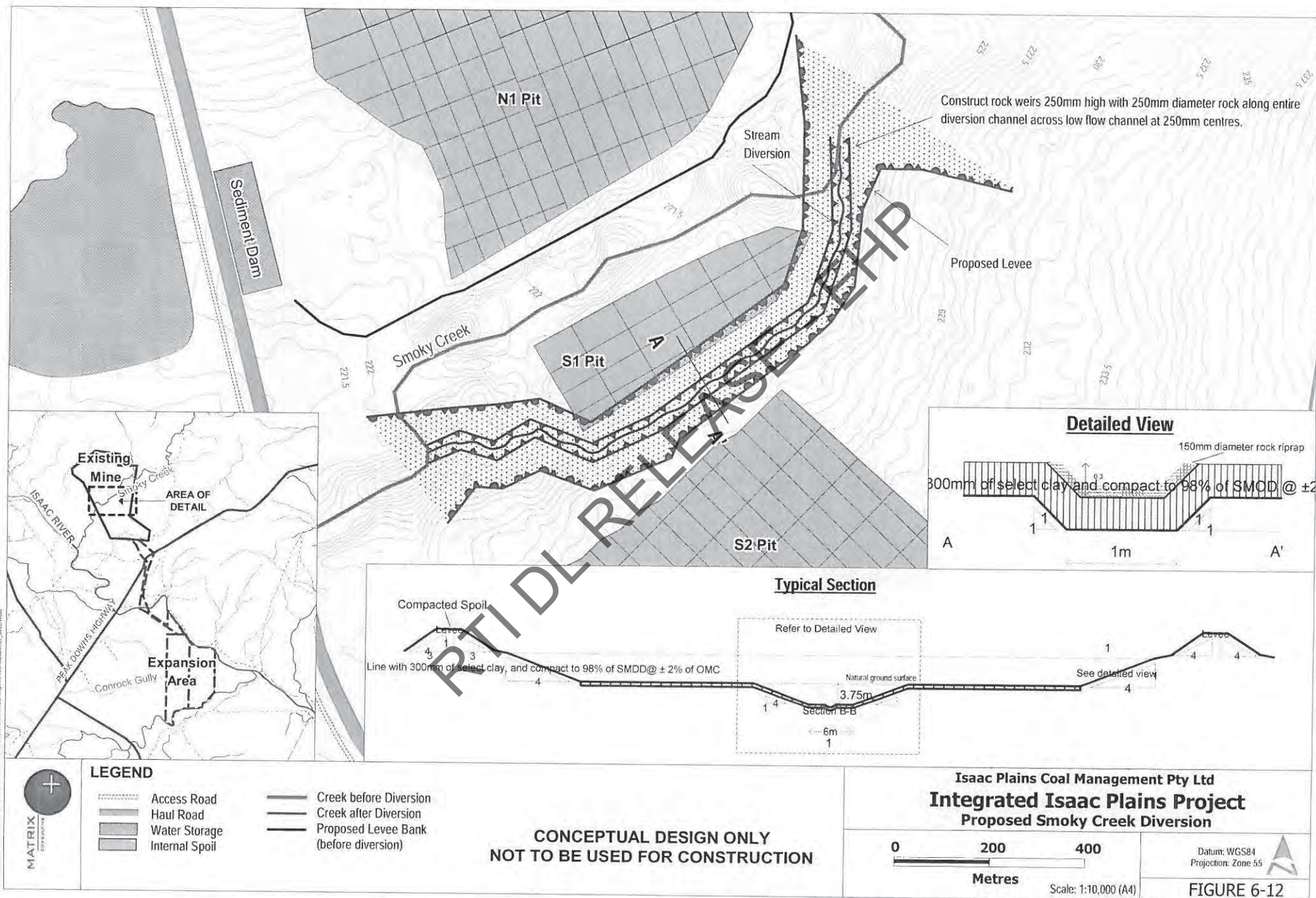
- matching the length of the diversion to the existing creek length;
- matching existing topography (creek inverts, levee levels);
- matching the existing low flow channel cross section;
- use of weirs and a stilling basin to divert flows into the diversion;
- compacting and pre-loading the spoil material along a 200 m corridor to improve the engineering properties of the spoil and reduce long-term settlement. This allows it to compact better to reduce the risk of long-term erosion;
- clay lining the diversion to minimise the risk of infiltration of water into the underlying spoil;
- rock lining and rock weirs to be used in some sections of the diversion to reduce the potential for erosion and sediment transport in high velocity zones;
- a minimum revegetation period of one year will be required after construction before the diversion will be sufficiently stable for commissioning; and
- sizing the diversion channel for the 100 year average recurrence interval (ARI) design flood, with sufficient freeboard to contain the PMF. This will provide sufficient operational safety in adjacent working pits and safely convey large floods, prior to final rehabilitation of the mine spoil.

The detailed design plans will be submitted in support of obtaining necessary approvals for disturbance of a watercourse under the Water Act. As is the case for the Conrock Gully diversion, the preparation and supply of the detailed design plans for the PoO and Water Act approval are commitments made by IPCM in the EM Plan (refer to **Section 20**).

Note that the diversion does not change the catchment area contributing to the creek or any other waterway and accordingly, flood flows will remain unaltered.

A flooding assessment was conducted using the previous HEC-RAS hydraulic model to size (Maunsell, 2007), develop and evaluate an appropriate concept design for the Smoky Creek Diversion (refer to **Section 6-8** and **Appendix G2**).

Smoky Creek was not included in the assessment for the existing Isaac Plains Coal Mine as at that time it was uncertain as to the quality of reserves beneath the creek. Since the approval of the existing Isaac Plains Coal Mine, further exploration has identified that the underlying coal can be cost-effectively extracted.



6.7.7 Isaac River and Billy's Gully Low Level Crossings

It will be necessary to construct a vehicular access across Billy's Gully and the Isaac River between the existing Isaac Plains Coal Mine and the Expansion Area. A low level crossing, either at or just above the bed level will be required, rather than a culvert, due to the sediment loads within the gully and river. The crossings will be designed by a suitably qualified engineer with the details provided in support of an application for a Riverine Protection Permit under the Water Act (DNRW) and PoO (EPA). Crossing will be constructed during the dry season.

On completion of dragline mining in the existing Isaac Plains Coal Mine, estimated to be 2016, the dragline will need to be moved (referred to as to 'walk the dragline') to the Expansion Area, across Billy's Gully and the Isaac River low level crossings. The low level crossings will be constructed with a sufficiently gentle grade and width from the outset to enable the dragline to ingress and egress from the crossings. Should any additional works be required to enable the dragline to be walked to the Expansion Area over the Isaac River, relevant engineering designs will be developed and provided in support of a Riverine Protection Permit under the Water Act (or subsequent legislation in force at the time, nominally Year 2016) and PoO.

The following additional strategies, which are included in the EM Plan (refer to **Section 20**), will be implemented to mitigate the impact of the crossings on flows in Billy's Gully and the Isaac River:

- speed limits will be imposed across the crossings to minimise the risk of coal spillages; and
- the crossings will be regularly inspected for spillages of coal with any spillages will be collected.

6.8 FLOOD ASSESSMENT

6.8.1 General Expansion Area

A flood assessment has been undertaken of the Isaac River, Cherwell Creek and Conrock Gully to determine the depth and extent of flooding in the Expansion Area for a range of design flood events. The flood modelling for the Isaac River indicates the flood extents encroach upon the Expansion Area without control. It is proposed to construct levees to protect the operational phase works and the post-mine landform at the IIPP Expansion Area from flooding. a levee to protect mining activities against flooding.

The proposed locations of the operational phase and the post-mining flood protection levees and typical cross section are shown on Figure 6-13. The flood modelling assessment report is included in Appendix G5.

6.8.1.1 General Findings

The levees will partially obstruct flood flows on the south-western floodplain of the Isaac River during large flood events. The operational phase levee is proposed to be 0.5 m higher than the 500 year ARI design flood level and will be partially relocated and raised to prevent flooding from the Probable Maximum Flood (PMF) post-mining. Hydrologic and hydraulic models were developed to determine design flood levels at the IIPP Expansion Area for pre-mine conditions as well as for the operational phase and the proposed post-mine landform conditions. The results of the modelling were used to determine the differences in flood levels, depths, extents and velocities to assess the impact of the proposed levees on the long term stability of the Isaac River at the IIPP Expansion Area.

6.8.1.2 Pre-mine Flood Behaviour

The pre-mine flood characteristics adjacent to the IIPP Expansion Area are as follows:

- The 20 year ARI design flood just exceeds the channel capacity of the Isaac River. It is likely that the Isaac River channel capacity will be exceeded about once in every 15 years on average.

Hydrology

- The difference between the 100 year ARI and 500 year ARI flood extents is not significant, particularly along the Isaac River channel. There is some additional over bank flooding along Cherwell Creek for the 500 year ARI flood.
- The PMF covers much of the northern half of the IIPP Expansion Area. The Cherwell Creek PMF overflows to the north and drains into Conrock Gully.
- Cherwell Creek flood levels are relatively independent of the Isaac River flows because the Cherwell Creek channel is "perched" above the Isaac River floodplain.
- Channel velocities along the Isaac River vary from 1 m/s to 3 m/s and average 2.1 m/s, 2.1 m/s and 2.2 m/s for the 20 year, 100 year and 500 year ARI events respectively.
- PMF channel velocities average 2.5 m/s and vary from 1.5 m/s to 4 m/s.
- Over bank velocities adjacent to the proposed mine are generally between 0.5 m/s and 1 m/s for the 20 year, 100 year and 500 year ARI events.
- PMF over bank velocities are generally between 1.5 m/s and 2 m/s.

6.8.1.3 *Operational Phase and Post-mine Landform Flood Impacts*

The impacts of the proposed levees used for the operational phase and post-mine landform on Isaac River, Cherwell Creek and Conrock Gully are as follows.

- The post-mine landform does not impact on Cherwell Creek channel design flood levels or flood velocities for any design flood up to the PMF.
- The post-mine landform does not impact on 20 year ARI design flood levels or flood velocities along the Isaac River. Therefore, the erosion potential of the Isaac River for floods up to the 20 year ARI design flood will not change.
- There is a significant change in water level at the northern most corner of the levee where the Conrock Gully drains into the Isaac River for the 500 year ARI design flood. Extensive erosion protection works or even a training wall may be required at this location.
- Flood levels along the Isaac River channel increase by a maximum of 0.3 m for the 100 year ARI design flood and 0.6 m for the 500 year ARI design flood immediately upstream of the mine. Additional inundation areas external to the MLA from these low probability events affect only limited areas of grazing land (13 ha for the 100 year ARI event) and would therefore not have a significant adverse impact on land use. The channel flood depth is about 12 m at the peak of the 100 year ARI design flood and about 13 m at the peak of the 500 year ARI event.
- Flood velocities along the Isaac River channel adjacent to the mine increase by about 0.25 m/s for the 100 year ARI design flood and about 0.3 m/s for the 500 year ARI design flood. Flood velocities upstream of the mine are decreased by a similar amount. The banks of the river channel and the floodplain are stable and well vegetated. The minor increase in channel flood velocities adjacent to the IIPP Expansion Area are therefore not expected to cause significant additional erosion during the 100 year and 500 year ARI design floods.
- Flood levels along the Isaac River channel increase by a maximum of 2.1 m for the PMF immediately upstream of the mine. The channel flood depth is about 19.5 m at the peak of the PMF.
- Flood velocities along the Isaac River channel adjacent to the mine increase by about 2 m/s for the PMF to about 4.5 m/s. Significant erosion is expected along the Isaac River channel adjacent to the IIPP Expansion Area for this event. However, the PMF significantly exceeds the recommended design criteria for the post-mine landform design.
- Long term maintenance of the Isaac River adjacent to the IIPP Expansion Area is not required or expected for the following reasons:

Hydrology

- A major channel avulsion of the Isaac River adjacent to the IIPP is unlikely because the channel is relatively straight.
- Given the extent of sand on the bed of the channel, significant erosion of the bed would be expected, in a similar manner to existing conditions. There appears to be a sufficient supply of sand from the upstream reach to 'self repair' any bed erosion.
- It is possible that successive extreme floods may cause significant bank erosion. Any widening of the channel during such an event will increase the channel capacity and thereby reduce the potential for further erosion.

6.8.1.4 Levee Construction Material

The alignments and typical cross sections of the Q500 and PMF levees are illustrated in **Figure 20-15**. The Q500 levee is approximately 8.3 km long and has a constructed volume of 325,000 m³. The PMF levee is approximately 8.9 km long and has an additional volume of 1.6 Mm³ (in addition to the initial Q500 levee volume).

There is approximately 260 Mm³ of overburden available from the Expansion Project. Based on logs from the exploration drill holes there is estimated to be approximately 25 Mm³ of clay overburden material that is likely to be suitable for levee construction. This material is located near the surface over the entire mining excavation area. The top of the clay layer varies from the surface down to a depth of approximately 10 m. The clay layer has a thickness ranging from 1 m to 10 m.

Based on these quantities suitable clay will be available near the surface at the commencement of operations to construct the Q500 levee. Mine planning and overburden dump scheduling will be conducted to ensure that suitable additional volumes of clay material are available and accessible in the final spoil dump for the construction of the PMF levee at mine closure.

Geochemical characterisation of clay spoil indicates that this material ranges from slightly to moderately sodic (**Appendix J**). Soil testing of potential levee construction material will be conducted to avoid the use of any highly sodic material in levee construction. If necessary, dependant on the test results, any sodic material used in levee construction will be treated with soil conditioner, such as dolomite, to restore the ionic balance. Constructed levees will also be topsoiled and grassed to minimise the potential for erosion of any sodic material.

6.8.1.5 MIA and ROM Stockpile Areas

The proposed MIA and ROM stockpile areas will be constructed on a raised pad above the Isaac River 500 year ARI design flood level to reduce the risk of inundation of these areas. The MIA and ROM stockpile pad will increase the extent of the flooding both on the Expansion Area MLAs and on adjacent grazing land upstream of the site. The additional inundation extent upstream of the site is unlikely to affect the present upstream land use of grazing.

To design the proposed levees and determine the impact of the levees on flood levels and velocities, the following analysis was undertaken:

- quantification of the peak flood discharges for a range of design storm events using the hydrologic model RAFTS XP (refer to Appendix G3);
- development of a hydraulic model HEC RAS for Isaac River, Conrock Gully and Cherwell Creek;
- prediction of existing flood levels and velocities; and
- prediction of the proposed flood levels and velocities for the mine during operations with the inclusion of levees and diversions.

NB: It is expected that the configuration of the site during mining operations will produce a greater impact on flood levels, i.e. worst case, when compared to the post-mine configuration, which has no levees and only the rehabilitated spoil dump. Therefore, an analysis of the post mine landform has not been undertaken.

In addition, a flood assessment of Smoky Creek has also been undertaken to determine the flood levels and flood velocities along the proposed diversion. Details of the Smoky Creek flood model are provided in **Appendix G2**. A summary of the results are given below.

6.8.2 Hydrologic Modelling

The previously developed and calibrated RAFTS XP hydrologic model of Isaac River (refer to **Appendix G3**) used for surface water assessments for the existing Isaac Plains Coal Mine was used as the basis of this assessment. The catchment parameters adopted for the relevant sub-catchments of Isaac River are outlined in the previous study. The model was updated to include Conrock Gully and Cherwell Creek. Catchment data was defined for their sub-catchments including slope, areas, impervious percentage, roughness and rainfall losses. Values defined for Conrock Gully and Cherwell Creek are presented in **Table 6-189**. The layout of the model is shown in **Appendix G2**.

The previous models used an initial loss of 10 mm, and adjusted the continuing loss until the peak flow matched within 10% of the measured peak flow. The previously adopted values for initial and continuing losses of local waterways in the existing Isaac Plains Coal Mine, were maintained for Conrock Gully and Cherwell Creek and are presented in **Table 6-1920**.

Flows between sub-catchments were routed using the Muskingham-Cunge method of channel routing. A typical cross-section was defined along with representative slope and roughness values to define the routing properties of flow paths between sub-catchments.

Design rainfall values were calculated using the following parameters (sourced from *Volume 2 of Australian Rainfall and Runoff (AR&R) 1987*):

- 2I1 = 45 mm/hr
- 50I1 = 75 mm/hr
- 2I12 = 6.51 mm/hr
- 50I12 = 13.2 mm/hr
- 2I72 = 1.7 mm/hr
- 50I72 = 3.9 mm/hr
- Skew = 0.14
- f2 = 4.06
- f50 = 17.1

The design temporal patterns for Zone 3 as recommended in *AR&R 1987 Volume 2* were used in the assessment. The hydrologic model was run for 20%, 5%, 2%, and 1% AEP storms with durations ranging from 90 minutes to 72 hours. Peak flows for the design AEPs are shown in **Table 6-201**.

Table 6-19 Contributing Catchment Data

Conrock Gully			
us1a	4.4	0.7	0.06
us1b	6.3	0.5	0.06
us1c	23.2	0.5	0.05
us1d	21.5	0.6	0.06
us2a	16.4	0.5	0.05
Cherwell Creek			
e1a	21.5	0.4	0.07
e1b	13.0	0.4	0.06
e1c	16.0	0.4	0.06
e1d	9.8	0.6	0.06



Hydrology

e1e	10.0	0.6	0.07
e1f	55	1.0	0.07
e1g	79	1.5	0.07
e2a	27	0.6	0.06
e3a	57	1.0	0.07
e3b	51	2.0	0.08
e3e	68	2.0	0.08
e3d	47.5	1.5	0.08
e4a	26	0.6	0.06
e5a	30	0.5	0.06
e6a	75	0.6	0.07
e7a	55.5	1.0	0.08
e7b	40.8	2.0	0.08
e8a	38	0.5	0.08

Table 6-20 Initial and Continuing Loss

Local waterways	10	5
Isaac River	10	4

Table 6-21 Peak Flows from RAFTS XP for Average Exceedence Probabilities

1%	185	1,690	3,780
2%	150	1,380	3,140
5%	110	1,000	2,380
20%	65	580	1,370

Critical storm durations for Isaac River, Cherwell Creek and Conrock Gully are summarised below:

- Isaac River (at IR13) — critical storm duration was 12 hours for 1% AEP;
- Cherwell Creek — critical storm duration was 9 hours for 1% AEP, 6 hours for both 2% and 5% AEPs, and 4.5 hours for 20% AEP; and
- Conrock Gully — critical storm duration was 6 hours for 1%, 2% and 5% AEPs; and 4.5 hours for 20% AEP.

Peak flows determined from the RAFTS XP modelling were applied to corresponding locations in the HEC RAS hydraulic model.

6.8.3 Hydraulic Modelling

The hydraulic modelling software HEC RAS was used to model the flood hydraulics of Isaac River, Cherwell Creek and Conrock Gully and to determine the impact on flood levels with the introduction of Expansion Area activities. The model was run for two cases:

- existing conditions; and
- during the proposed mining operations.

Hydrology

A similar approach was adopted for the waterways associated with the existing mine, including Smoky Creek and Billy's Gully, and was provided in documentation in support of the EA application for the existing Isaac Plains Coal Mine (refer to **Appendix G2**).

The HEC-RAS model defines flood levels and velocities from flood flows, channel and floodplain geometry, hydraulic roughness values and boundary conditions. Channel geometries were obtained from surveyed cross sections at 500 m intervals near the Expansion Area. Contours derived from photogrammetry and topographic maps (for areas outside the assessment area) were used to obtain elevations in the broader floodplain. The locations of the surveyed cross sections are shown in **Appendix G1**.

The values for roughness (Manning's n) were estimated from photographs of the surveyed cross sections (refer to **Appendix G1**). **Table 6-212** identifies the surveyed channel cross sections and the corresponding adopted roughness values. The roughness values adopted for Conrock Gully were 0.025 for the main channel, 0.07 for the riparian zone, and 0.05 for the floodplain.

Table 6-22 — Roughness values for HEC-RAS Cross Sections

1	3.320	0.07	0.025	0.07	1	2.105	0.08	0.025	0.08
2	3.310	0.07	0.025	0.07	2	2.100	0.08	0.025	0.08
3	3.300	0.07	0.025	0.07	3	2.095	0.08	0.025	0.08
4	3.290	0.07	0.025	0.07	4	2.090	0.08	0.025	0.08
5	3.280	0.07	0.025	0.07	5	2.085	0.08	0.025	0.08
6	3.260	0.07	0.025	0.07	6	2.080	0.08	0.025	0.08
7	3.250	0.07	0.025	0.07	7	2.075	0.08	0.025	0.08
8	3.240	0.07	0.025	0.07	8	2.070	0.08	0.025	0.08
9	3.230	0.07	0.025	0.07	9	2.065	0.08	0.025	0.08
10	3.220	0.07	0.025	0.07	10	2.060	0.08	0.025	0.08
11	3.210	0.07	0.025	0.07	11	2.055	0.08	0.025	0.08
12	3.190	0.07	0.025	0.07	12	2.050	0.08	0.025	0.08
13	3.180	0.07	0.025	0.07	13	2.045	0.08	0.025	0.08
14	3.175	0.08	0.025	0.08	14	2.040	0.08	0.025	0.08
15	3.171	0.07	0.025	0.07	15	2.035	0.08	0.025	0.08
16	3.170	0.07	0.025	0.07	16	2.030	0.08	0.025	0.08
17	3.160	0.07	0.025	0.07	17	2.00	0.08	0.025	0.08
18	3.150	0.07	0.025	0.07					
19	3.145	0.07	0.025	0.07					
20	3.135	0.07	0.025	0.07					
21	3.130	0.07	0.025	0.07					

Normal depths were used as boundary conditions for each of the waterways based on actual bed slopes.

Hydrology

6.8.4 Hydraulic Model Results**6.8.4.1 Isaac River**

Flood levels and velocities determined for the Isaac River from the HEC RAS modelling are shown in **Table 6-223** for existing flooding and for **Table 6-234** flooding with the inclusion of levees. Long sections showing the existing 1% AEP flood level for the Isaac River and Cherwell Creek are included in **Appendix G4** and **Appendix G5** respectively. Flood extents of inundation of the 1% AEP flood for both the existing case and the proposed case are illustrated in and **Figure 6-13** and **Figure 6-14**.

The results show the following:

- the Isaac River flood levee results in localised changes in flood levels by up to 500 mm for 1% AEP;
- the increase in flood height only affects grazing land to the north of the river. The additional inundation extent is unlikely to affect the present broad scale use of the land for grazing; and
- the minor changes in velocities calculated are unlikely to have any impact on bed and bank stability or on sediment mobility in the river.

The proposed levee will be approximately 1 m above the 1% AEP flood level (refer to **Table 6-178**). Modelling of more extreme flood events to determine the actual flood immunity of the levee has not been undertaken. However, given that the difference between the 1% AEP flood and the 2% AEP flood is at most 0.4 m, the probability of the levee being overtopped will be significantly lower than the 1% AEP and is likely to be of the order of 0.5% to 0.1% AEP.

Table 6-23 Existing Case Flood Levels for Isaac River

3.32	204.11	2.7	202.74	2.7	203.19	2.7	201.95	2.4
3.31	203.97	2.0	203.62	1.9	203.11	1.7	201.77	1.7
3.30	203.74	1.6	203.39	1.5	202.89	1.4	201.53	1.1
3.29	203.49	2.1	203.16	2.0	202.68	1.8	201.3	1.7
3.28	203.32	1.7	203.01	1.6	202.54	1.3	201.18	1.2
3.26	202.75	1.8	202.48	1.7	202.07	1.5	200.54	1.6
3.25	202.12	2.0	201.87	1.8	201.52	1.6	199.98	1.7
3.24	201.03	2.1	200.86	1.8	200.42	1.6	198.99	1.4
3.23	199.73	3.6	199.74	3.0	199.6	2.3	198.16	2.1
3.22	199.34	3.3	199.48	2.6	199.43	2.0	197.82	2.3
3.21	199.24	3.0	199.4	2.3	199.36	1.8	197.41	2.0
3.19	198.57	1.4	198.23	1.2	197.34	2.2	195.32	1.9
3.18	198.49	1.6	198.16	1.5	197.45	1.6	195.33	1.7
3.17	197.97	3.0	197.72	2.7	197.08	2.5	194.93	2.6
3.16	198.10	1.8	197.76	1.7	196.84	2.3	194.69	2.4
3.15	197.48	2.9	197.21	2.5	196.28	2.6	194.09	2.8

Table Isaac River Hydraulic Modelling Results with Levee

3.32	204.24	2.61	203.84	2.59	203.25	2.64	201.96	2.44
3.31	204.11	1.99	203.72	1.86	203.17	1.69	201.78	1.71

Hydrology

3.30	203.90	1.62	203.52	1.48	202.97	1.31	201.54	1.13
3.29	203.70	2.05	203.33	1.92	202.78	1.77	201.31	1.78
3.28	203.57	1.68	203.20	1.53	202.66	1.34	201.19	1.2
3.26	203.18	1.52	202.80	1.47	202.27	1.42	200.57	1.61
3.25	202.62	2.23	202.29	2.02	201.79	1.76	200.02	1.70
3.24	201.23	3.68	201.15	3.11	200.57	2.63	198.77	2.15
3.23	199.86	4.03	199.81	3.38	199.65	2.65	198.13	2.15
3.22	199.81	2.94	199.76	2.48	199.58	1.99	197.82	2.31
3.21	199.23	3.05	199.39	2.43	199.35	1.86	197.41	2.02
3.19	198.57	1.45	198.23	1.28	197.34	2.24	195.32	1.97
3.18	198.49	1.65	198.16	1.51	197.45	1.61	195.33	1.75
3.17	197.97	3.05	197.72	2.74	197.08	2.58	194.93	2.64
3.16	198.10	1.80	197.76	1.78	196.84	2.31	194.69	2.47
3.15	197.48	2.88	197.21	2.58	196.28	2.00	194.09	2.88

6.8.4.2 *Cherwell Creek*

Existing flood levels and velocities determined for Cherwell Creek from the HEC-RAS modelling are shown in **Table 6-254** which will remain unaffected by the project.

Table 6-254 Cherwell Creek HEC-RAS Results - 1% AEP Flood

2.105	206.85	3.3
2.1	206.27	3.11
2.095	205.68	3.62
2.09	205.51	3.27
2.085	205.25	3.03
2.08	204.91	3.18
2.075	204.11	4.29
2.07	203.34	3.54
2.065	203.15	3.08
2.06	203.08	1.5
2.055	203.04	1.2
2.05	202.61	2.42
2.045	202.66	1.03
2.04	202.66	0.91
2.035	202.44	1.53
2.03	202.15	0.96
2.00?	195.47	6.3

6.8.4.3 *Conrock Gully Diversion*

Flood levels and velocities along the Conrock Gully diversion are shown in **Table 6-256**. The diversion increases the extent of flooding both on the Expansion Area MLAs and on adjacent grazing land upstream of the site. Flooding on the Expansion Area MLAs can be controlled by protecting the box-cut pit spoil dumps with a levee or relocating the haul road against the spoil dump and either

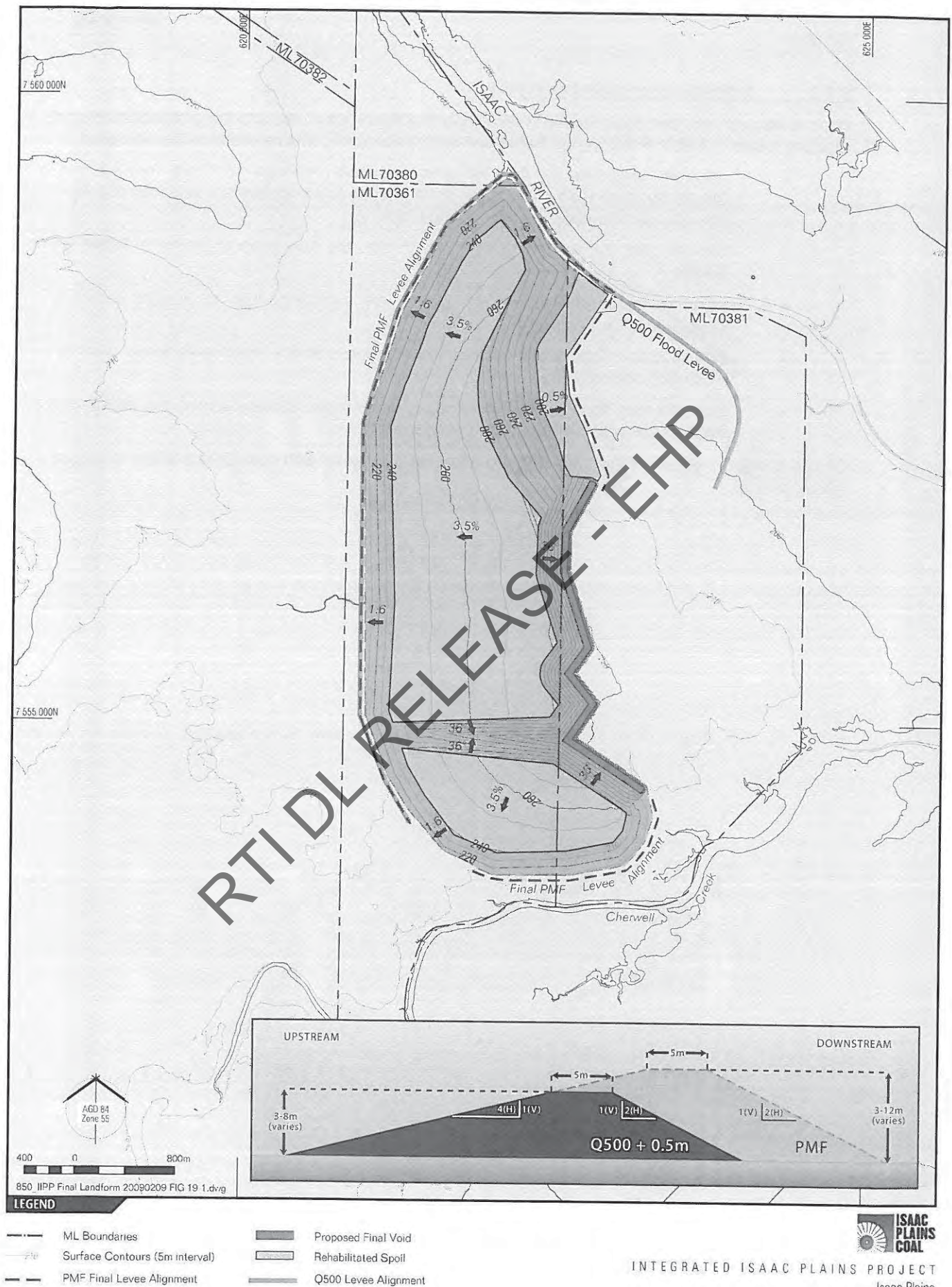
Hydrology

filling or providing a levee for the ROM stockpile area will be controlled by building a levee to protect the spoil dump and building the proposed MIA and ROM stockpiles on a raised pad above the Isaac River 500 year ARI design flood level to reduce the risk of inundation. Flood levels and velocities along the Isaac River for existing and developed conditions, which includes the mitigation measures proposed for the MIA, ROM stockpile and open cut pit, are illustrated in and . The proposed levee, Conrock Gully diversion and MIA and ROM stockpile raised pad increase the extent of flooding both on the Expansion Area MLAs and on adjacent grazing land upstream of the site. The additional inundation extent upstream of the site is unlikely to affect the present upstream land use of grazing.

Table 6 — Conrock Gully Diversion HEC-RAS Results — 1% AEP Results

15	207.82	0.02
14.5	207.78	1.36
14	207.44	1.85
13	207.1	1.29
12	206.67	2.86
11	206.2	2.67
10	204.72	1.56
9	204.59	0.9
8	204.49	0.39
7	204.48	0.37
6	204.46	0.39
5	204.43	0.63
4	204.11	2.6
3	203.16	3.16
2	202.62	0.62
1	202.62	0.17

Smoky Creek Diversion





6.8.2 Existing Isaac Plains Coal Mine

Flood levels and velocities along Smoky Creek supporting the existing case and the proposed diversion case are shown in **Table 6-26-18** and **Table 6-27-19** respectively. The results show the following:

- velocities predicted for the permanent diversion through spoil are, on average, marginally lower than the existing Smoky Creek and therefore the velocities will have less erosion potential than the existing creek;
- the velocities are limited to 1.74 m/s in the low flow channel (refer to **Table 6-27-19**);
- velocities in the diversion (1.4 - 2 m/s) are sufficiently high to prevent sediment deposition in the diversion;
- post diversion flood levels upstream of the diversion are significantly lower than for existing conditions; and
- post diversion flood levels and velocities downstream of the diversion are unchanged because the catchment flows are unchanged.

On this basis, the impact of the proposed diversion both upstream and downstream of the diversion will be minimal.

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Table 6-181827 Smoky Creek Existing HEC-RAS Results – 1% AEP Results

River Station	Drainage	Flood Level (m AHD)	Velocity (m/s)
10	2,000	223.64	2.74
9.9		223.57	2.84
9.8		223.5	2.98
9.7		223.4	2.87
9.6		223.33	2.7
9.5		223.24	2.67
9.4		223.15	2.52
9.35	1,500	223.07	2.41
9.3		222.99	2.24
9.2		222.95	2.1
9.1		222.87	2.15
9		222.69	2.43
8.5		222.59	2.37
8.4		222.42	2.3
8.35	1,000	222.37	2.2
8.3		222.32	2.14
8.2		222.19	2.12
8.1		222.07	2.16
8		221.91	2.38
7.7		221.79	2.36
7.6		221.57	2.45
7.5	500	221.41	2.32
7.5		221.4	2.32
7.4		221.19	2.42
7.3		221.09	2.37
7.2		220.61	2.66
7.1		220.43	2.5
7		220.3	2.7
6.9		220.28	2.64
6.8	0	220.27	2.57

Table 6-191928 Smoky Creek Diversion HEC-RAS Results – 1% AEP Results

River Station	Chainage	Flood Level (m AHD)	Velocity (m/s)
10	2,000	223.1	2.93
9.8		222.85	3.38
9.7		222.64	3.47
9.6		222.5	3.38
9.5		222.24	3.58
9.4		221.84	3.83

Hydrology

River Station	Chainage	Flood Level (m AHD)	Velocity (m/s)
9.3	1,500	221.88	1.95
9.2		221.84	1.82
9.1		221.81	1.76
9		221.75	1.74
8.5	1,000	221.7	1.74
8.4		221.64	1.71
8.3		221.59	1.69
8.2		221.54	1.67
8.1		221.51	1.67
8		221.48	1.61
7.7	500	221.45	1.57
7.6		221.39	1.59
7.5		221.35	1.52
7.4		221.31	1.48
7.3		221.04	2.39
7.2		220.55	2.69
7.1		220.35	2.56
7		220.22	2.75
6.8	0	220.19	2.60

6.9 WATER BALANCE MODEL

6.9.1 General

A daily water balance model was developed for operational areas within the Expansion Area to:

- size Release Dam 3 and the MIA Retention Pond;
- determine mine water surpluses and deficits for a range of climatic conditions;
- optimise the controlled release rules to maximise water surpluses and minimise uncontrolled spills from Release Dam 3;
- establish the level of risk that the open cut pit cannot be dewatered; and
- determine the impact of Conrock Gully dam and the water management system on Isaac River flows.

The AWBM (Boughton, 2003) rainfall runoff model parameters, described in **Section 6.5**, were used to determine the runoff volume draining the various catchments on the Project Site. The IQQM (NSW DWE, 2007) water balance model was then used to determine the behaviour of the various storages, sediment dams and the open cut pit. The model was run over a 108 year period of daily rainfall and simulated streamflow data from 1 January 1900 to 26 March 2008 (inclusive) using data drill daily rainfall and Morton's potential evapotranspiration (DNRW, 2008). The use of such a long period of continual data provides a good indication of the behaviour of the various storages over extended dry and wet periods.

6.9.2 Water Demands

The major water demands are for:

- coal processing;
- infrastructure requirements;

- dust suppression on haul roads and coal stockpiles; and
- infrastructure such as vehicle wash-down.

Water demands were calculated based on ROM production rates, haul road length and CHPP throughput. The calculated annual water demands for the existing Isaac Plains Coal Mine and Expansion Area, and IIPP, are shown in **Table 6-2820**.

Table 6-2920 Annual Water Demands IIPP (ML/year)

	Existing Isaac Plains Coal Mine (ML)	Expansion Area (ML)	Total (IIPP) (ML)
Mining haul roads – dust suppression	245	291	536
Infrastructure requirements (office, wash-down)	5	2	7
Coal preparation and handling	200	240 (to be used in the existing CHPP)	440
Miscellaneous	50	20	70
Total Water usage	500	553	1,053

For the Expansion Area water balance model, a daily demand of 1.51 ML/d was adopted, which is equivalent to 553 ML/yr divided by 365.25 days.

6.9.3 Catchment Runoff

The operational areas of the Expansion Area have been delineated into catchment types based on their expected runoff characteristics. A summary of the various catchment areas in Year 1, Year 5 and Year 10 of the mine expansion and the estimated runoff coefficients for each catchment type are shown in **Table 6-2921**. The following is of note:

- Phillips Creek at Tayglen AWBM parameters (refer to **Table 6-78**) were used to derive the daily flows and runoff coefficient for Conrock Gully, the natural catchments in the operational areas and the out of pit spoil dumps;
- Isaac River at Deverill AWBM parameters (refer to **Table 6-78**) were used to derive daily flows and the runoff coefficient for the Isaac River; and
- the open pit and mine infrastructure area daily flows were derived using Phillips Creek AWBM parameters with the base flows removed and the average soil moisture depth reduced to 20mm (compared to 197mm for Phillips Creek).

Table 6-3021 Catchment Areas and Estimated Runoff Coefficients

Catchment Type	Catchment Areas (km ²)			Runoff Coefficient
	Year 1	Year 5	Year 10	
Mine Open Pit	1.72	1.65	1.32	0.26
Out-of-Pit Spoil Dump/Rehabilitated Spoil	2.94	5.71	7.50	0.063
Natural (downstream of Open Pit)	5.27	3.01	2.10	0.063
ROM Stockpile/Mine Infrastructure	0.44	0.44	0.44	0.26
Isaac River to Cherwell Creek	3,474	3,474	3,474	0.048
Conrock Gully	44.5	44.5	44.5	0.063

Note that the total area of Mine open pit, out of pit spoil dump and natural catchment within the operational area increases as the mine progresses into the Cherwell Creek catchment.

6.9.4 Water Balance Model Configuration

Table 6-30-22 shows the inflows and outflows from each storage in the water balance model. The following is of note with regards to the configuration of the water balance model:

- the mine site water management system configuration, detailed in Section 6.7, was adopted;
- it was assumed that the quality of water collected in the spoil dump sediment dams and the MIA Retention Pond would not meet the water quality compliance criteria and would require pumping to Release Dam 3;
- long term groundwater inflows to the mine pit void of 1.4 L/s (0.12 ML/d) was adopted based on the Base-Case groundwater model scenario (Matrix+, 2007);
- spoil catchment sediment dams were modelled as a single lumped storage with a total storage capacity of 100 ML with a single 10 ML/day pump;
- the mine open cut pit was assumed to be kept dry at all times, except when the stored capacity in Release Dam 3 exceeds the target threshold level of 198 m AHD. The water will remain in the void until sufficient capacity is available in Release Dam 3; and
- Release Dam 3 will release the stored water to the Isaac River using the release rules given in Section 6.7.3.1.

Table 6-31-22 Water Balance Storage Inflows and Outflows

Storage	Inflows	Outflows
Release Dam 3	Direct rainfall	Evaporation
	Pumped inflows from pit	Mine water demand
	Pumped inflows from MIA Retention Pond	Controlled and uncontrolled releases to Isaac River
Pit	Direct rainfall	Evaporation
	Pit catchment runoff	Pump to Release Dam 3
	Overflows from spoil sediment dams	-
	Groundwater inflows	-
Spoil Sediment Dams	Direct rainfall	Evaporation
	Spoil catchment runoff	Pump to Cherwell Creek
	-	Overflow to pit
MIA Retention Pond	Direct rainfall	Evaporation
	ROM and MIA catchment	Spills to Isaac River
	-	Pump to Release Dam 3 (when water does not meet quality criteria)

6.9.5 Water Balance Results

6.9.5.1 Mine site Water Supply Deficits

Table 6-31-23 shows the expected annual volume of water that can be sourced from the proposed mine site water management system (Release Dam 3) to meet the annual mine site water demand for production year 1, year 5 and year 10. Results are provided for a median year and a representative wet and dry year together with the driest runoff year on record. The following is of note with respect to the water balance results:

- of the 107 years modelled (July 1900 to June 2007), the volume of mine water captured in Release Dam 3 can supply the entire mine site water requirements in only about 13 to 15 years for each production year scenario;
- Release Dam 3 can supply the mine water demand on 59% to 61% of days. The Sunwater allocation will be required on the remaining days;

Hydrology

- for a median year, Release Dam 3 can supply about 59 to 62% of the annual mine site water requirements; and
- for the driest runoff year over the simulation period, Release Dam 3 can supply only about 10% of the total mine site water demand. That is, the Sunwater allocation will be required to meet the majority of the water demand in that year or production may be affected.

Table 6-3223 Water Balance Results, Release Dam 3 Supply Capability, July 1900 – June 2007

Water Supply	Production Year 1 (ML/y)	Production Year 5 (ML/y)	Production Year 10 (ML/y)
Water Supply (Median Year)			
Release Dam 3	343	342	330
Sunwater allocation	210	211	223
Total	553	553	553
Water Supply (20%ile –wet year)			
Release Dam 3	496	503	503
Sunwater allocation	57	50	50
Total	553	553	553
Water Supply (80%ile –dry year)			
Release Dam 3	231	217	202
Sunwater allocation	322	336	351
Total	553	553	553
Water Supply (99%ile –driest year on record)			
Release Dam 3	64	59	52
Sunwater allocation	489	494	501
Total	553	553	553

6.9.5.2 *Release Dam 3 and MIA Retention Pond Uncontrolled Spills and Controlled Releases*

Table 6-32-24 shows the expected uncontrolled spills and controlled releases from the Release Dam 3 and the uncontrolled spills from the MIA Retention Pond for production year 1, year 5 and year 10. The following is of note with respect to the water balance results:

- Release Dam 3 does not spill throughout the simulation period for any of the production year scenarios;
- controlled releases are made from Release Dam 3 on 23 to 24 years or approximately 1 year in 5; and
- the MIA Retention Pond spills on 14 years over the simulation period.

Table 6-3324 Release Dam 3 and MIA Retention Pond Controlled and Uncontrolled Spills, July 1900 – June 2007

Water Storage	Production Year 1 (ML/y)	Production Year 5 (ML/y)	Production Year 10 (ML/y)
Release Dam 3			
No years uncontrolled spills	0	0	0
Median volume of spill/spill year	0	0	0
No years controlled release	23	24	24
Median volume of release/release year	298	278	247
MIA Retention Pond			
No years uncontrolled spills	14	14	14
Median volume of spill/spill year	19.5	19.5	19.5
No years controlled release	0	0	0
Median volume of release/release year	0	0	0

6.9.5.3 Open Cut Pit Dewatering

An analysis of the water balance results for the three production year scenarios show that there are only two periods over the simulation where the Release Dam 3 is too full to accept pumped inflows from the pit. On both of these occasions, the stored volume in the pit exceeds 100 ML for about 23 days. The remainder of the times, the pit is able to be pumped dry within 6 days. That is, dewatering the open cut pit should not of concern to the operation of the mine.

6.9.5.4 Conrock Gully Dam

The water balance model was used to determine the impact of the Conrock Gully dam and the proposed water management system on Isaac River flows. The configuration of Conrock Gully dam is given in **Table 6-1617**. The results of the modelling are summarised below:

- the Conrock Gully dam reduces the Conrock Gully catchment flows by 26%. The remaining 74% overflows and drains along the diversion channel to the Isaac River;
- under current conditions, the gully would flow on 3.4% of days. Under proposed conditions, the diversion would flow on 3.7% of days; the increase being due to the attenuation of the flood peak caused by the dam;
- the Conrock Gully dam remains full or within a metre of FSL for 90% of the time;
- the Conrock Gully dam reduces Isaac River flows by about 0.4%. The impact on Isaac River flows is confined to low flows below 100 ML/d. Flows greater than 100 ML/d are not affected by the Conrock Gully Dam.

On this basis, the proposed water management system and Conrock Gully diversion will not have a significant impact on Isaac River flows. **Section 6.7.5.1** provides further information on the options considered for the Conrock Gully Diversion Dam and the rationale for the chosen option.

6.9.6 Impacts on Water Quality

Table 6-33-25 shows the impacts on Isaac River conductivity (salinity) concentrations resulting from the proposed controlled releases from Release Dam 3 over the simulation period for the three production years. For the analyses, the median conductivity concentrations of 180 $\mu\text{S}/\text{cm}$, provided in **Table 6-1213**, was adopted for the Isaac River and a conductivity of 5,700 $\mu\text{S}/\text{cm}$ was adopted for Release Dam 3 releases. The following is of note with respect to the results:

- the proposed releases from Release Dam 3 do not alter median conductivity concentrations in the Isaac River, given that releases occur so infrequently; and
- on days when water is released from Release Dam 3, the median concentration is increased to 216 $\mu\text{S}/\text{cm}$ and the 80th percentile concentration increased to about 245 $\mu\text{S}/\text{cm}$ for the three production year scenarios. This is within the adopted water quality compliance criteria outlined in **Table 6-1213**.

Table 6-3425 Isaac River Conductivity with Controlled Releases from Release Dam 3, July 1900 – June 2007

	Production Year 1 ($\mu\text{S}/\text{cm}$)	Production Year 5 ($\mu\text{S}/\text{cm}$)	Production Year 10 ($\mu\text{S}/\text{cm}$)
Maximum Conductivity	283	283	283
Median Conductivity on a Release Day	216	216	215
20 th Percentile Conductivity on a Release Day	197	199	197
80 th Percentile Conductivity on a release Day	240	247	246
Median Conductivity on a Flow Day	180	180	180

6.10 SURFACE WATER QUALITY MONITORING

Key to evaluating the successful implementation of the surface water mitigation measures is an effective monitoring program. Monitoring requires regular and event based water quality sampling, along with engineering inspections and assessments of the performance of diversions. This section outlines a monitoring strategy devised to evaluate the specific surface water mitigation measures and mining operations for the Expansion Area. In addition, IPCM will continue to use the monitoring system under the existing approvals for the existing Isaac Plains Coal Mine.

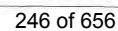
The continuous sampling and event-based sampling enables any pollutant loads from the site to be quantified along with their impact on overall water quality within Isaac River. On-site monthly sampling allows for any problem areas of pollutant generation to be identified and remediated.

6.10.1 Surface Water Quality Monitoring Locations

Figure 6-14 illustrates the proposed surface water sampling locations. The surface water monitoring program has been designed to provide upstream, source and downstream monitoring. Four release points have been established for the Expansion Area at:

- Release Dam 3;
- MIA Retention Pond;
- spoil dump Sediment Dam 1 to Isaac River (when water quality meets limits); and
- spoil dump Sediment Dam 2 to Cherwell Creek.

As shown in **Section 6.9**, Release Dam 3 and the MIA Retention Pond are expected to release water on average of 1 year in 5 and 1 year in 8 respectively. The sediment dams will be pumped to Release Dam 3 or overflow to the pit until sufficient data is collected to demonstrate that spoil dumps are sufficiently rehabilitated and runoff meets water quality compliance criteria. When water quality data demonstrates that compliance criteria can be met, the stored water in the sediment dams will be directed to the Isaac River or Cherwell Creek by overland flow or siphoned where the topography does not allow gravity flow.



6.10.2 Water Quality Monitoring Schedule

Table 6-34-26 defines the parameters to be sampled and the sampling frequency for each sampling location. The proposed water quality monitoring program provides for the assessment of flow events in both the Isaac River and in Cherwell Creek, continuous flow and EC measurements in the Isaac River, a gauge board in the Isaac River (to be used in conjunction with Near Field Bore 1 (refer to **Section 7.4.1**), as well as monthly grab samples from the mine water storages on-site.

Table 6-3526 Water Quality Monitoring Schedule

Location	Parameters	Frequency
Upstream of the Expansion Area (ES1)	Flow Rate and EC	Continuous
Upstream and Downstream of the Expansion Area on both Isaac River and Cherwell Creek (WQ5, WQ6, WQ7 and WQ8)	pH, EC and/or Total Dissolved Solids, Turbidity, Total Suspended Solids, Metals, Anions and Cations	Event-Based (grab samples)
On-site Water Storages (MS1, MS2, MS3 and MS4)	Water levels, pH, EC and/or Total Dissolved Solids, Turbidity, Total Suspended Solids, Metals, Anions and Cations	Monthly until baseline is established and then quarterly and during releases
MS 1 only	As, Co, Fe, Se, Sb and Zn	Monthly
	Water levels, pH, EC and/or Total Dissolved Solids, Turbidity, Total Suspended Solids, Metals, Anions and Cations	Monthly until baseline is established and then quarterly and during releases
In pit	pH	Monthly

The continuous and event-based sampling enables quantification of any pollutant loads from the site and their corresponding impact on the Isaac River water quality. The continuous station on the Isaac River will be used to determine when and how much water can be released from Release Dam 3. It is expected that the continuous station will send an email or a text message to mine staff when the Isaac River is flowing sufficiently for releases to occur.

On-site monthly sampling allows for any potential problem areas with respect to pollutant generation on-site to be identified in advance ensuring appropriate remedial action can be taken. It also will determine whether water is required to be pumped to Release Dam 3 or can be directly released to the receiving waters.

The frequency of monitoring and range of parameters analysed during flow and routine monitoring will be reviewed after the first two years of operations.

6.10.3 Engineering Inspections

Annual inspections will be undertaken to assess the integrity of:

- the Isaac River flood levee;
- Release Dam 3 and release structures;
- low level crossing of the Isaac River;
- Conrock Gully diversion and dam (haul road); and
- Smoky Creek diversion.

Annual inspection will be undertaken by an appropriately qualified engineer. Additionally, inspections will also be undertaken by IPCM personnel following each significant rainfall event and when any required ameliorative works are undertaken.

6.10.4 Diversion Channels

The stability of diversion channels will be monitored in annual inspections by a appropriately qualified engineer. Inspections will examine the stream bed and bank integrity. Additionally, cross-sectional surveys of the diversion channels will be undertaken on a two yearly basis to monitor stability of the bed and banks.

As with the surface water quality monitoring, the frequency of diversion channel monitoring will be reviewed after the first two years of operations.

RTI DL RELEASE - EHP

RTI DL RELEASE - EHP

7

HYDROGEOLOGY

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

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7 HYDROGEOLOGY

This hydrogeological assessment of the Expansion Area of the IIPP aims to characterise the existing groundwater environment and to provide an estimate of the groundwater inflow rate into the proposed mine pit and of groundwater drawdown at end-of-mining. The hydrogeological assessment includes new data collected during field investigations and public data collected at a single DNRW bore located within a 10 km radius of the Expansion Area. Supporting literature includes reports for geology, hydrogeology, geophysics and lithology for the Expansion Area and immediate surrounds. This section of the EIS is summarised from a hydrogeological assessment report completed by Matrix+ Consulting (Matrix+, 2007).

The existing Isaac Plains Coal Mine has already been assessed through the approvals process, consequently the hydrogeology of ML70342 and associated open cut pits are not directly relevant to this assessment. Furthermore, the existing Isaac Plains Coal Mine and the proposed Expansion Area are separated by sufficient distance that groundwater impacts at these two locations are not likely to be inter-related.

7.1 EXISTING GROUNDWATER ENVIRONMENT

7.1.1 Geology

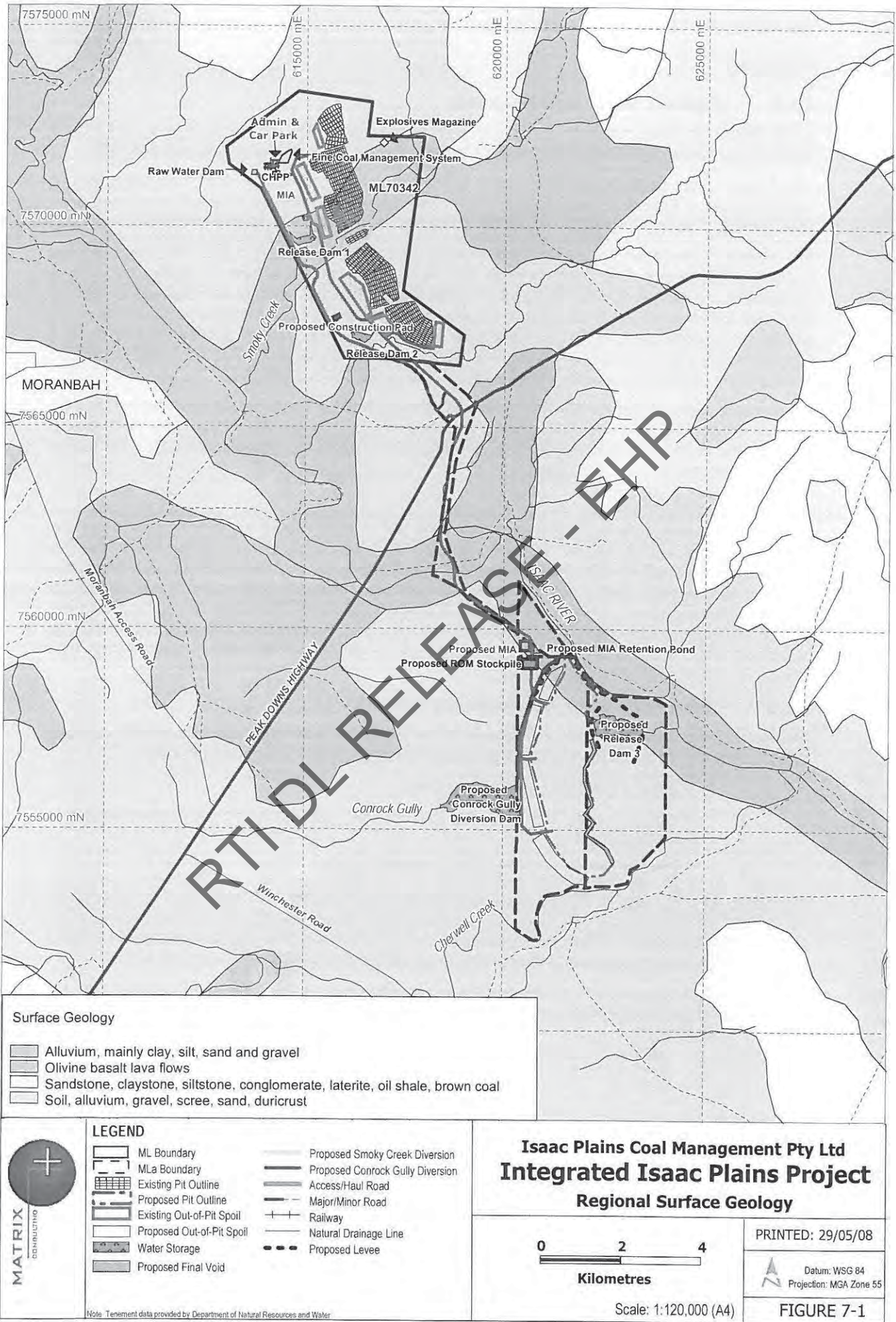
The Expansion Area lies within the Central Queensland coalfields. A subartesian aquifer system occurs within the Permian Rangal Coal Measures and provides modest water supplies for agriculture and livestock. Regionally, the Permian subartesian aquifer has poor or patchy water-bearing characteristics. Within the Expansion Area, a general 'dryness', i.e. a poor supply, is present similar to that experienced in the existing Isaac Plains Coal Mine. The major geological units in the Expansion Area have been delineated by resource drilling. These are, from shallowest to deepest:

- Tertiary sediment (1-20 m thick) and river alluvium (10-23 m thick);
- Permian Rangal Coal Measures, including:
 - sandstone, siltstone, mudstone, tuff, conglomerate;
 - Leichhardt (LHD) coal seam (~2.3 m thick); and
 - Vermont (VER) coal seam (5-7 m thick).

Tertiary basalt (associated with olivine lava flows) does not occur within the Expansion Area although basalt is found further west of the Expansion Area. Each of the major geological units is described in the following sections.

7.1.2 Quaternary Alluvium and Tertiary Sediments

The Tertiary sediments are 1-20 m thick (averaging 8 m) and are mostly unsaturated (i.e. 'dry'). They occur in the hills of the Expansion Area where the terrain is higher. Alluvium occurs along the Isaac River and to a lesser degree along Cherwell Creek (refer to **Figure 7-1**). These alluvial sediments comprise a fining-upward sequence of unconsolidated sand, silt, clay, gravel and lithic fragments. The alluvium may extend to a distance up to 750 m from water courses, however, the lateral extent may be highly variable. The river alluvium is likely to have a relatively high permeability and relatively high specific groundwater yield. The particle size of the river alluvium ranges from fine sand to gravel.



7.1.3 Permian Rangal Coal Measures

In the Expansion Area, the Permian-age sedimentary rocks dip to the east (2-6 degrees) and include inter-bedded sandstone, siltstone and lesser amounts of carbonaceous mudstones, coal and tuff.

The Rangal Coal Measures typically have a relatively low permeability and poor water-holding properties (i.e. a relatively low specific yield). A weathered zone extends to 15-30 m below ground level (mBGL). The weathered zone is also considered to have poor water-holding properties.

The Permian Coal Measures contain groundwater within two coal seams: the LHD seam and the underlying VER seam. The seams dip to the north-east across the site. Typically, the VER is stratigraphically located approximately 25 m below the LHD. In the north of the Expansion Area, the LHD and VER seams 'coalesce' into a single, thicker seam (5-6 m thick). The coal seams are shallowest (approximately 150-175 mAH) on the western side of Expansion Area and deepest (approximately 45-95 mAH) at the north-eastern side of the Expansion Area. The Fort Cooper Coal Measures are located immediately beneath the first ply of the VER coal seam.

Sedimentary rocks of the Rangal Coal Measures typically have a low average hydraulic conductivity because of inter-bedding with fine-grained siltstones and mudstones which have very low hydraulic conductivity. Higher hydraulic conductivity sedimentary rock may be encountered within the faulted and fractured zones.

7.1.4 Fault Zones

Faulting is extensive throughout the Expansion Area and is most clearly denoted by changes in coal seam thicknesses and elevations. The regional Isaac Thrust Fault system is a major thrust fault that trends along the Isaac River to the north-east of the proposed pit area near Conrock Gully (JB Mining Services and Hewitt, 2005). Numerous north-north-west trending thrust faults and orthogonal transverse faults occur throughout the Expansion Area. Thrust faults located in the middle to northern section of the Expansion Area have caused throws of up to 25 m. Deeper weathering profiles may be associated with faulted zones within the Permian coal measures. Groundwater yields from the coal measures may also be affected by faulting.

7.1.5 Existing Groundwater Monitoring Network

The existing groundwater monitoring network at the Expansion Area consists of 13 monitoring bores at six nested sites. The monitoring bores are screened within the following geologic units:

- Quaternary alluvium along Isaac River;
- Permian Rangal Coal Measures, including the coal seams and the sandstone/siltstone sediments; and
- faulted areas within the proposed mine pit area.

The construction details of the 13 monitoring bores are presented in **Table 7-1**. In general, the nested site locations consist of two bores screened in alluvial sediments, nine bores screened in the Permian coal measures and two bores screened in the faulted sandstone located between individual coal seams. Bentonite seals isolate the screened interval from underlying and overlying units.

A summary of the groundwater monitoring history, for each bore, is also presented in **Table 7-1**. The locations of existing monitoring bores are shown in **Figure 7-2**.

**Table 7-1 Groundwater Monitoring Bores and Water Level Measurements**

Nested Site	Bore Short ID	Coordinates (GPS) UTM WGS 1984		Elevation of Standpipe (mAHD)	Water Level (m AHD)			Lithology Screened
		Easting (m)	Northing (m)		Feb 2006	May 2006	Jun 2006	
Site 1	584s*	622,696	7,556,692	218.6	187.08	191.59	191.63	LHD coal seam
	584d**	622,696	7,556,692	218.6	190.96	191.50	191.53	VER coal seam
Site 2	204	621,796	7,558,955	203.2	188.77	188.75	188.74	Alluvial sediments
	203	621,797	7,558,960	204.6	190.50	190.49	190.49	Coalesced coal seams
Site 3	585	622,280	7,558,544	203.9	190.47	190.47	190.44	Alluvial sediments
	592s	622,276	7,558,545	204.4	190.33	190.49	190.51	LHD coal seam
	592d	622,276	7,558,545	204.4	190.64	190.88	190.88	VER coal seam
Site 4	593	622,612	7,555,053	213.3	185.87	185.93	186.10	VER coal seam
	594	622,612	7,555,052	214.0	180.44	185.62	185.64	LHD coal seam
Site 5	205s	621,616	7,557,019	209.7	192.67	192.76	192.80	Faulted sandstone above coal seams
	205d	621,616	7,557,019	209.7	194.59	195.17	195.21	Sandstone between coal seams
Site 6	206s	621,990	7,557,687	203.0	188.51	188.60	188.69	Faulted sandstone above coal seams
	206d	621,990	7,557,687	203.0	188.32	189.01	189.07	Sandstone between coal seams

Notes:

1. A hand-held GPS was used to obtain standpipe elevations and errors could exceed +/- 5 m (pending survey).

2. Bore IDs are abbreviated (last three digits).

* Shallow.

** Deep.

7.1.6 Groundwater Occurrence

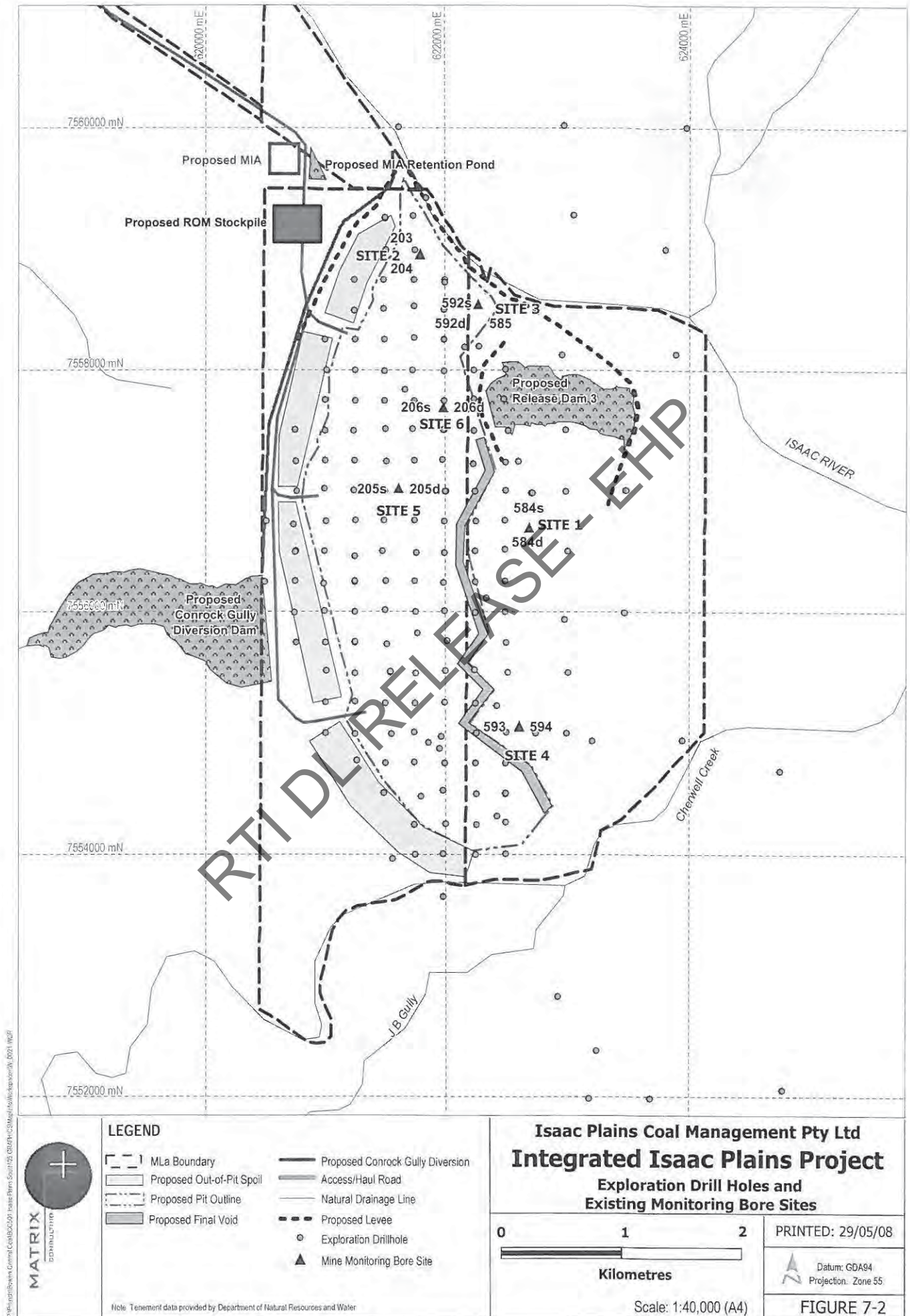
Groundwater occurs within the Quaternary alluvium, primarily within prior channels of the Isaac River, and within the Permian coal seams, which are expected to act as the primary conduit of groundwater within the Rangal Coal Measures.

7.1.6.1 Alluvium

The spatial distribution and thickness of the alluvial sediment is presented in **Figure 7-3**. An area towards the north of the Expansion Area contains the thickest section of alluvial sediment. This feature corresponds to the interpreted location of prior river channel systems. The thickness of alluvium in this area generally ranges between 12 to 20 m. The base of the alluvium in this area generally ranges between 185 to 190 mAHD (although there may be deeper paleo-channels that are not indicated by the available drilling data) (refer to **Figure 7-4**).

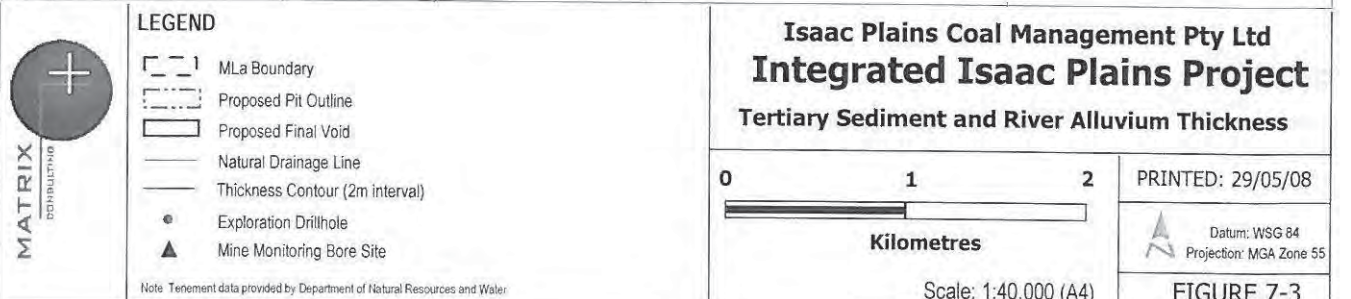
There are limited groundwater level data for the alluvium unit of the Expansion Area. However, existing monitoring bores indicate an average groundwater level, within the alluvial aquifer, of approximately 188 mAHD. In this case, the saturated thickness tends to be very shallow averaging 3 m. It is considered that areas of deeper paleo-channel alluvial sediment may contain a more significant saturated thickness. In this sense, where paleo-channels exist with a base elevation of approximately 180 mAHD a saturated thickness of approximately 10 m may develop. However, there are no recorded data at this time to support this hypothesis.

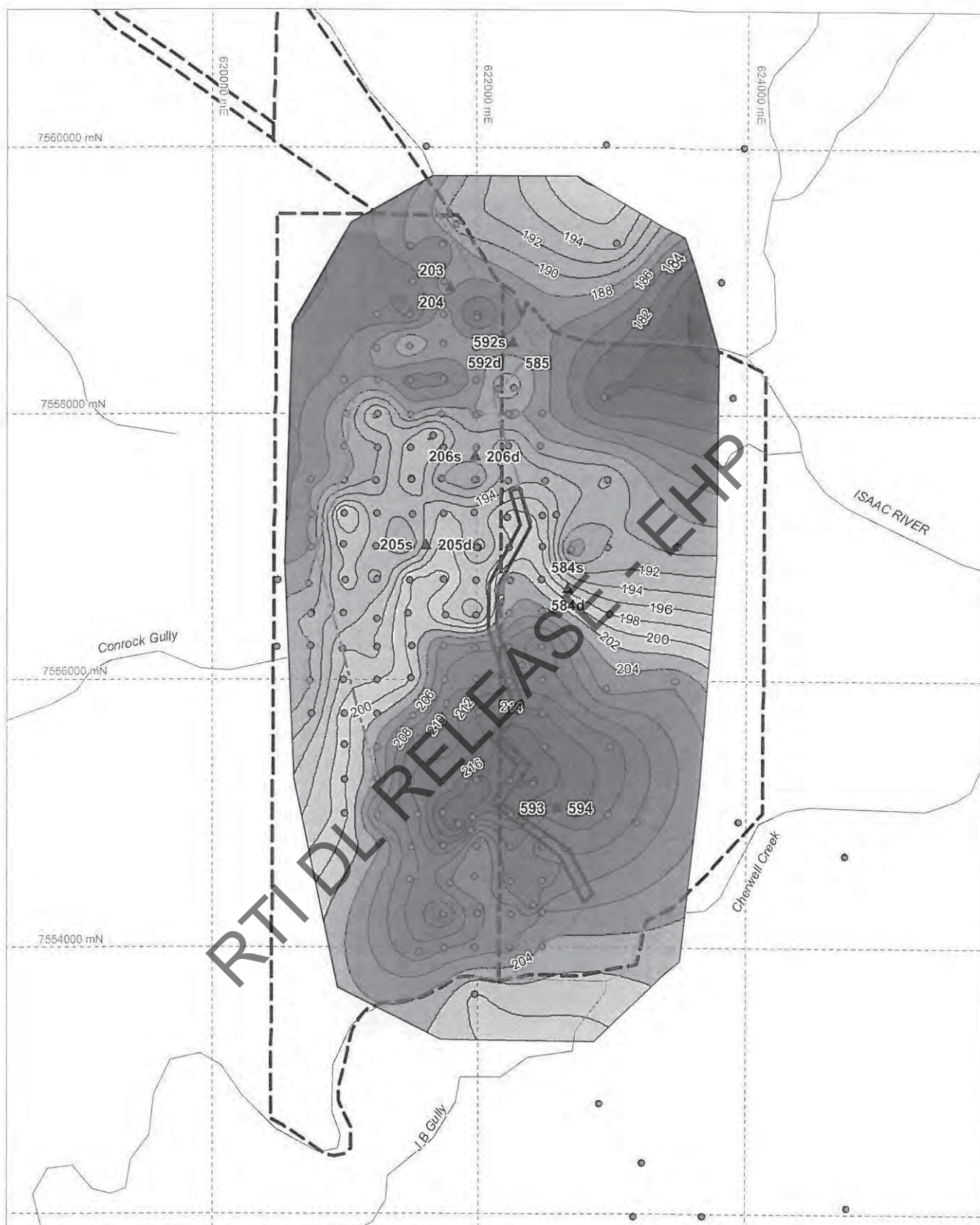
Owing to the heterogeneous nature of the alluvial aquifers, groundwater level fluctuations will not be uniform or systematic across the aquifer.





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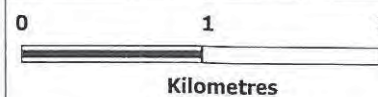


LEGEND

- MLa Boundary
- Proposed Pit Outline
- Proposed Final Void
- Natural Drainage Line
- Elevation Contour (2m interval)
- Exploration Drillhole
- Mine Monitoring Bore Site

Note: Tenement data provided by Department of Natural Resources and Water

Isaac Plains Coal Management Pty Ltd Integrated Isaac Plains Project Tertiary Sediment and River Alluvium Base Elevation



Scale: 1:40,000 (A4)

PRINTED: 29/05/08

Datum: WGS 84
Projection: MGA Zone 55

FIGURE 7-4

Hydrogeology

Exploration drilling into the alluvial sediments adjacent to the Isaac River (refer to **Figure 7-2**) did not generally intercept significant groundwater supplies. However, notwithstanding this, a small number of exploration holes have intercepted groundwater yields of up to 1 L/s. These groundwater yields suggest that the alluvial sediment at some locations is likely to function as a moderately productive unconfined aquifer. These drilling results confirm the sporadic occurrence of groundwater within the alluvium unit.

The Isaac River is an incised well defined river system. Historically, the Isaac River has been part of a meandering system whose channel has moved across the flood plain over time. During these processes, coarse sediment is deposited as part of a point bar/channel gravel system and finer sediment is deposited above this as part of the flood plain system. Paleo-river channels exist in the subsurface and are covered by sediments. The paleo-channels occur as depressions in the surface of the rocks underlying the recent sediments. These Paleo-channels are filled with coarse sediments (i.e. sand and gravel). River flow will be established in one or more channels until an event such as a flood re-establishes the channel(s) in another location. A conceptual cross section through the Isaac River flood plain is shown in **Figure 7-5**.

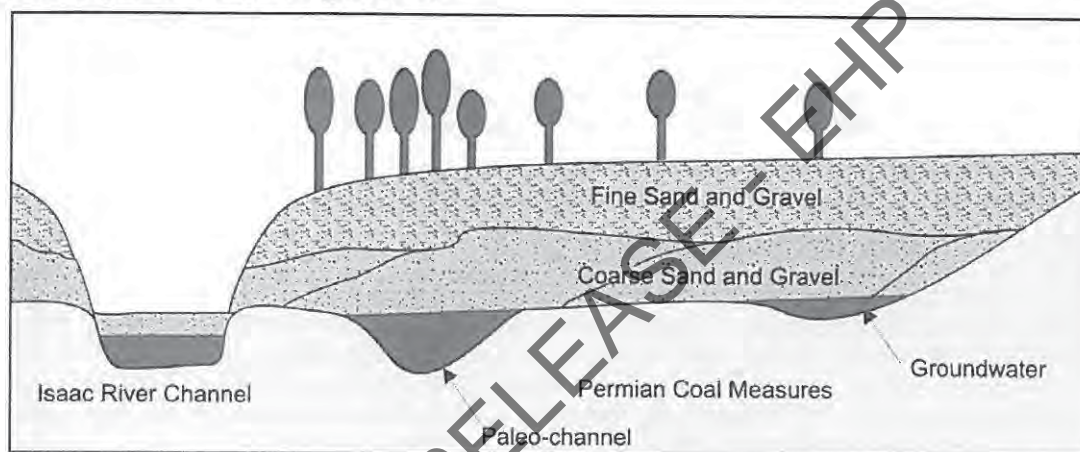


Figure 7-5 Conceptual Cross-section through Isaac River and River Alluvium

Groundwater accumulates in the sediment from direct infiltration of rainfall (possibly through sandy 'windows' in the shallow floodplain sediment) and possibly also due to infiltration from the river during flooding events. Coarse sediments have a high hydraulic conductivity and groundwater is likely to migrate rapidly to the lowest elevation. In this case, the lowest elevation occurs within the paleo-channels. The coarse sediment contained within the paleo-channels is likely to act as an effective underdrain to the system and groundwater levels remain low, even potentially drying out in some locations. Groundwater levels within the alluvial aquifer are expected to fluctuate in response to seasonal recharge variability. However, owing to the effectiveness of the coarse paleo-channel sediment as an underdrain, thick saturated intervals are unlikely to develop, except perhaps in the short-term following major recharge events.

The surveyed sections of the Isaac River show that the bottom of the channel is between 10 and 15 m below the surrounding topography. This incision by the Isaac River channel has eroded through the alluvial sediments to the top of the Rangal Coal Measures in some parts of the system.

The Isaac River can be categorised conceptually as an ephemeral river as illustrated in **Figure 7-6 (a)**. Rivers in arid areas are typically fed by overland flow. If the flood crest depth in the river channel is greater than the local groundwater table elevation, the hydraulic gradient will be towards the adjacent aquifer as shown in **Figure 7-6 (b)**. Water that flows from the river into the adjacent aquifer causes a temporary storage of flood water in the aquifer (i.e. bank storage). When the flood crest passes, the hydraulic gradient will likely reverse and the river will gain water from the aquifer as base flow as shown **Figure 7-6 (c)**. Base flow may only be temporary as the system returns to a dry state.

Owing to the heterogeneous nature of the alluvial aquifer, groundwater level rises and falls will not be uniform or systematic across the aquifer.

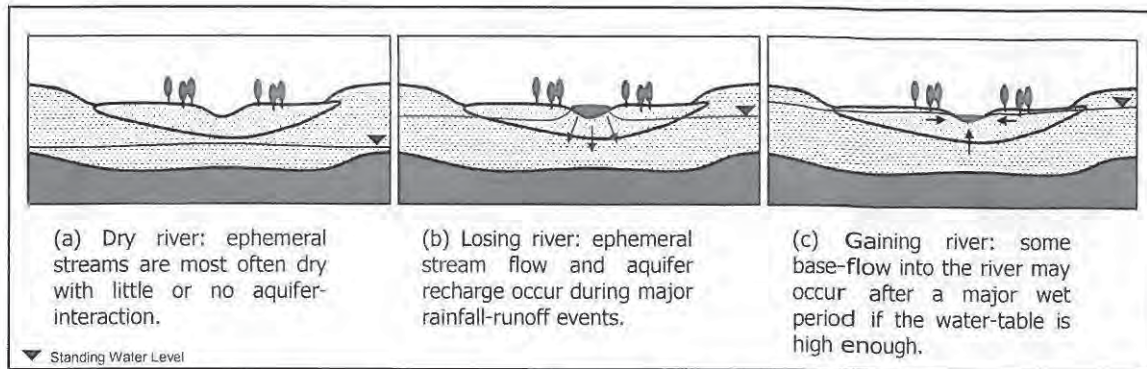


Figure 7-6 Conceptual Models for River-Aquifer Interaction

The occurrence of water in the alluvium is thus tenuous, and is a difficult resource to locate owing to the shallow saturated interval. The most likely sources of groundwater would be located in the deeper paleo-channel areas. These paleo-channels may not be continuous in nature so a sustainable water supply would not be likely. There are currently insufficient data to indicate the degree of connection between the Isaac River and the alluvial sediment. Any rise in groundwater level may be interpreted as being due to diffuse recharge and perhaps river losses.

The conceptual model for the alluvial aquifer describes a groundwater system that has the potential for moderate flow rates, but owing to the shallow saturated interval, the aquifer has low storage.

7.1.6.2 Rangal Coal Measures

Based on exploration drilling results, the Rangal Coal Measures located in the Expansion Area contain little or no groundwater similar of nearby mines (the existing Isaac Plains Coal Mine (north) and Poitrel Coal Mine (east)). Groundwater is absent in most exploration holes located within the Permian coal measures south of Conrock Gully (refer to **Figure 7-2**). Where groundwater was encountered, yields were low. Hence, it is unlikely that coal units within the area south of Conrock Gully will yield significant groundwater during pit excavation.

Drill holes located north of Conrock Gully were also found to be generally dry. An exception to these findings occurred in association with the Isaac Thrust Fault within the coal measures to the north-east of the proposed pit area. As such, it is possible that any faulted-fractured zones intersected by mining operations could potentially yield a greater volume of groundwater. The groundwater modelling of this assessment considers this effect in a 'wet-case scenario' (refer to **Section 7.2.2**).

The hydraulic conductivity of the coal seams is generally lower than the overlying units. Lateral drainage through the alluvium will occur in preference to vertical drainage to the coal seam. The coal measures are fully saturated (i.e. in a confined state). During mining, this confined groundwater is expected to drain into the pits as seepage.

7.1.7 Groundwater Use

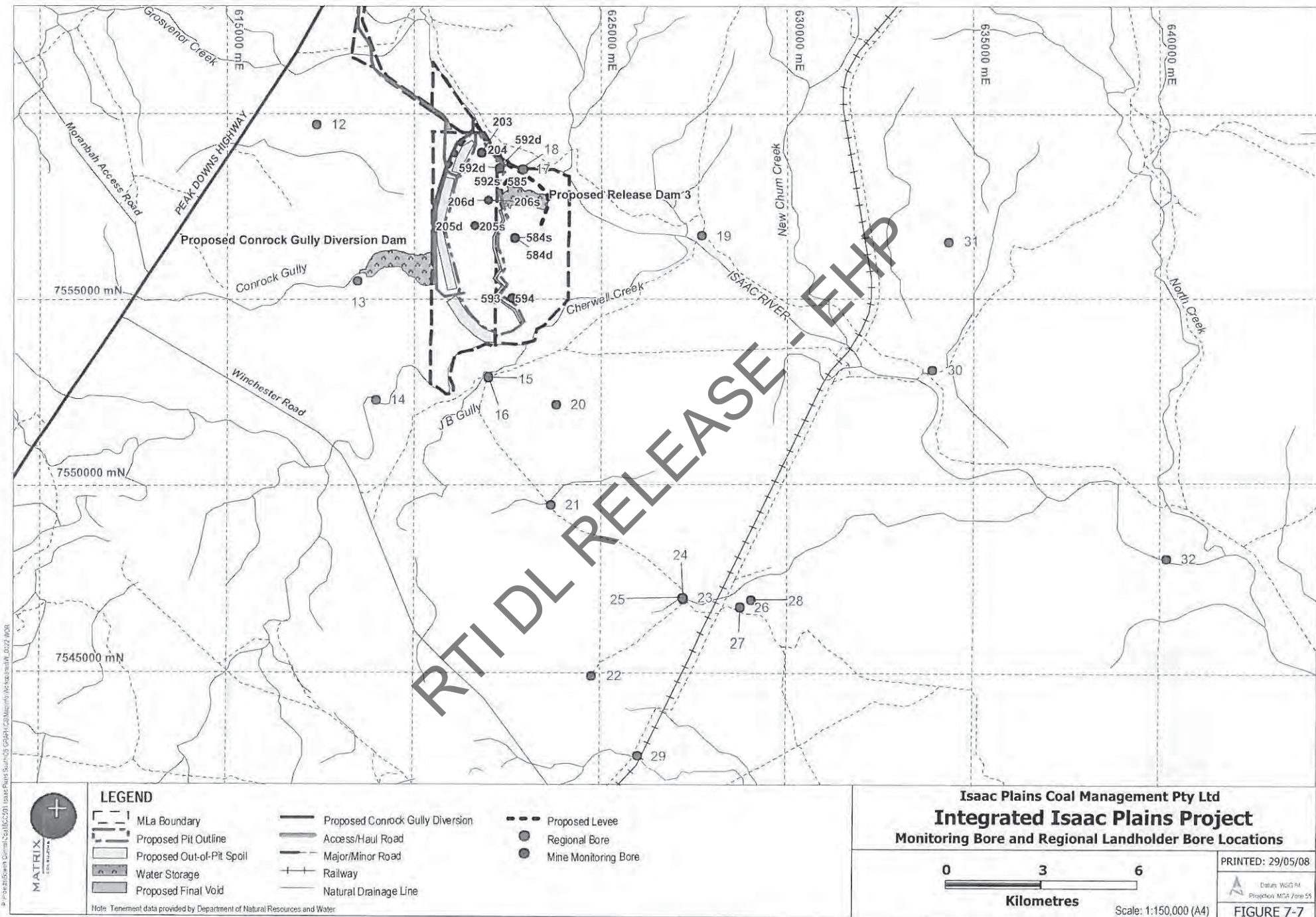
A field survey shows that regional landholder bores are predominantly utilised for stock watering with most of these bores located on the property to refer to **Table 7-2**. Seven landholder (stock water) bores, of which only three are currently in use, occur within 2 km of the Expansion Area as shown in **Figure 7-7**. Two of these active bores (No. 17 and No. 18) are located approximately 340 m east of the proposed pit. It is not known why most of the bores are inactive or abandoned. However, it is apparent that groundwater use immediately surrounding the Expansion Area is traditionally modest. During recent field investigations, an anecdotal maximum yield of 18.9 L/s was noted for bore No. 20 located on the property to refer to **Table 7-2**. The data that was collected during the field survey of landholder bores are provided in **Table E-1** and **Table E-2** of **Appendix E**.

Table 7-2 Regional Landholder Bore Details

Bore No.	Property Name	Location (Easting/Northing)	Elevation ² Top of Collar (TOC) (mAHD)	Yield (L/s)	Condition ³	Water Level (mBGL)	Distance to Pit (km)
12	[REDACTED]	617,377 / 7,559,710	215.0	0.6	Active	21.31	4
13		618,483 / 7,555,539	215.0	--	Not active	12.50	2.6
14		618,975 / 7,552,309	218.1	--	Not active	6.37	3.4
15		621,972 / 7,552,893	212.3	--	Not active	11.13	1.3
16		621,972 / 7,552,911	213.3	--	Not active	11.35 ⁶	1.3
17		622,899 / 7,558,531	206.1	7.6	Active	12.84	0.34
18 ⁵		622,909 / 7,558,529	207.8	--	Active	13.00	0.34
19		627,698 / 7,556,755	200.6	--	Not active	14.93	5.1
20		623,797 / 7,552,173	222.9	18.9	Active	~22 ⁴	2.4
21		623,631 / 7,549,482	213.5	--	Not active	15.24	4.8
22	[REDACTED]	624,783 / 7,544,917	225.1	--	Not active	--	9.5
23		627,205 / 7,546,949	241.7	--	Not active	DRY	8.7
24		627,190 / 7,546,933	--	--	Active	--	
25		627,200 / 7,546,952	217.9	1.0	Active	14.34	8.7
26		628,737 / 7,546,686	205.6	--	Not active	8.32	9.8
27		628,742 / 7,546,693	209.7	--	Not active	--	9.8
28		629,039 / 7,546,875	197.9	--	Not active	DRY	9.9
29 ¹		626,023 / 7,542,786	227.2	--	Not active	16.72	12
30		633,888 / 7,553,065	192.1	1.5	Active	--	11.5
31		634,283 / 7,556,586	204.6	0.5	Active	--	11.8
32	[REDACTED]	640,184 / 7,547,982	190.0	1.2	Active	21.54	18.8

Notes:

1. Bore 29 = Queensland Department of Natural Resources and Water registered bore RN100291.
2. A hand-held GPS was used to obtain standpipe elevations and errors could exceed +/- 5 m.
3. Bores may become inactive due to damage (e.g. rust, old casings, broken windmill etc) or abandonment (e.g. depleted).
4. Landholder's estimate (this bore has active headworks that prevent field measurements).
5. Operated via windmill.
6. Water level in metres below top of casing.



7.1.8 Groundwater Levels

The groundwater potentiometric surface (i.e. groundwater pressure head or groundwater water level) for the Rangal Coal Measures, recorded in regional landholder bores (refer to **Table 7-2**) and in groundwater monitoring bores, is illustrated in **Figure 7-8**. Horizontal groundwater flow is predominately from the south-west to the north-east following local topography (i.e. towards the Isaac River).

South of Conrock Gully, the depth to groundwater measured within groundwater monitoring bores varied between 27m and 34 mBGL. The depths to groundwater within monitoring bores located north of Conrock Gully, in coal seams and in the faulted sandstone, were approximately 13 mBGL and 14 to 16 mBGL, respectively. Depth to groundwater within groundwater monitoring bores located within alluvial sediments was also in the range 13 to 14 mBGL.

The main factors influencing natural groundwater levels are groundwater recharge, evapotranspiration, and regional flow patterns. A paucity of stockwater bores indicates that groundwater extraction is unlikely to have had a significant impact on historical regional groundwater levels. On a time-frame of years and decades, land-use and land-cover changes may have significantly altered the natural water-balance and groundwater levels. The typical impact in Australia has been a tendency towards deforestation and greater net recharge and therefore higher water-tables.

Groundwater recharge in the Expansion Area occurs by two mechanisms:

1. diffuse rainfall recharge that replenishes the entire aquifer system; and
2. concentrated river recharge that replenishes the river alluvium. While indications of groundwater recharge can be obtained from analysis of water level hydrographs, detailed measurements of groundwater recharge (via field experiments) are inherently problematic because of temporal and spatial variability and, as a result, are rarely undertaken. An initial estimate for groundwater recharge of 0-50 mm per year may be adopted, based on global studies by Döll *et al* (2002).

On a time-frame of years and decades, climatic variability also impacts on rainfall, stream flow, groundwater recharge and groundwater levels. Climatic variability will therefore influence future groundwater conditions, but this will occur independently of the proposed mining activities.

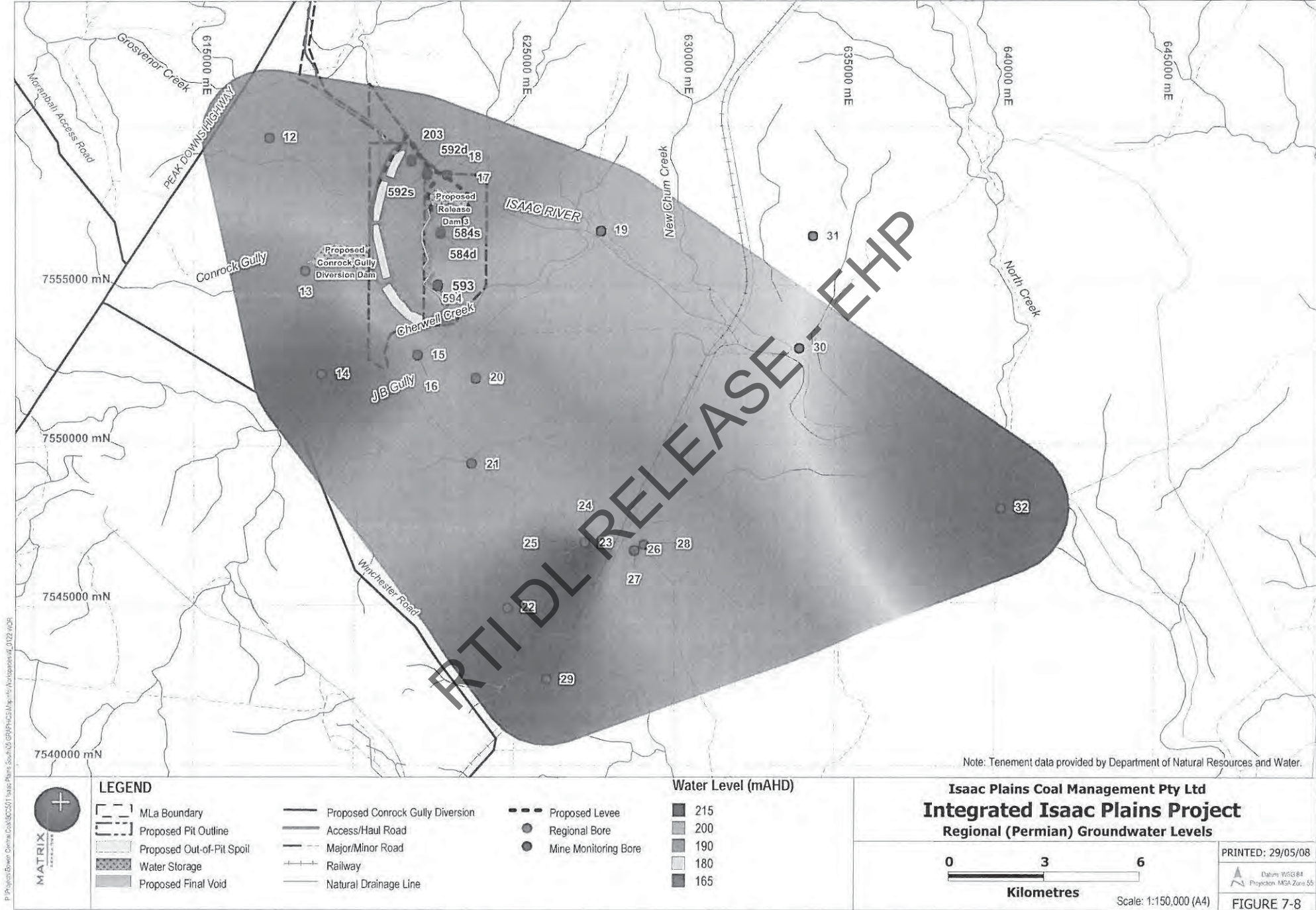
7.1.9 Groundwater Quality

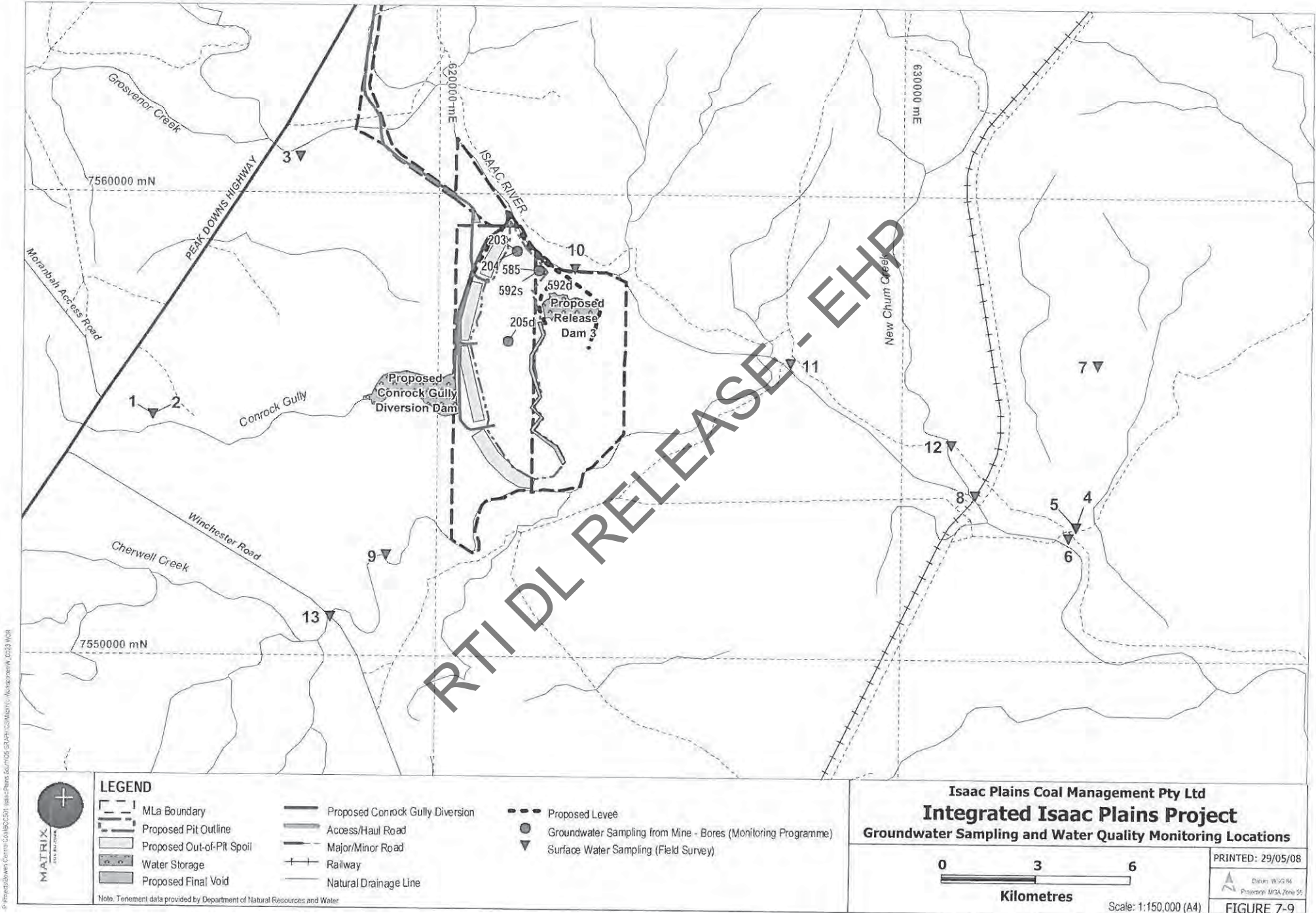
Surface water within the region was found to be fresh (TDS approximately 180 ppm).

Groundwater in the Rangal Coal Measures is of poor quality with Na, Mg and Cl dominating the chemical signature. Levels of total dissolved solids (TDS), electrical conductivity (EC), chloride, sulphate and a number of dissolved metals exceed the ANZECC guidelines for aquatic ecosystems, livestock, irrigation and drinking. Ambient groundwater is brackish, with an average EC of 21,000 $\mu\text{S}/\text{cm}$ (ranging from 11,000 to 41,000 $\mu\text{S}/\text{cm}$ for 12 samples) and an average TDS of 14,000 ppm (ranging from 6,000 to 29,000 ppm for 17 samples).

A water sample taken from groundwater monitoring bore 585 (refer to **Figure 7-9**) indicates that alluvial groundwater is almost saline in places (TDS approximately 27,000 ppm). However, a high salinity such as that sampled from bore 585 should not be considered unusual for the Bowen Basin, and may be attributable to mixing with highly saline groundwater contained in surrounding rock formations. This explanation appears likely considering that drilling investigations undertaken by the Queensland Government (SA02 Project) have also encountered saline groundwater in Middle Bowen Basin sediments at various sites, including along the Isaac, Mackenzie, Nogoia, Comet, Belyando and Suttor Rivers (pers comm., Bruce Pearce, DNRW, 2007).

Groundwater quality in the existing Isaac Plains Coal Mine to the north differs somewhat from that found in the Expansion Area. The chemical signature in the northern mine is Na-Cl dominant and on average the ionic concentrations are also lower.





7.1.10 Legislation Relevant to Groundwater

The Expansion Area is situated within the Highlands Subartesian Declared Area as defined by the DNRW. The Expansion Area is located within the Isaac River sub-catchment of the Fitzroy Basin (refer to **Figure 6-1**).

Under the Water Act, the DNRW is planning to advance the sustainable management and allocation of groundwater within the Isaac-Connors sub-catchment to provide secure supplies for both water users and the environment. When the Fitzroy Basin Water Resources Plan (WRP) was finalised in 1999, no provision was made for management of the basin's groundwater resources.

However, the demand for groundwater, driven mainly by mining and agriculture, in the Isaac-Connors catchment has increased significantly. The prolonged drought and record low water levels in some aquifers have raised concerns that the groundwater resource may be at risk of being overcommitted.

Under provisions of the Water Act, WRP's at risk in these circumstances must be amended to regulate groundwater. Amending the Fitzroy WRP to include the groundwater resources in the Isaac-Connors catchment will enable the integrated management of the surface water and groundwater resources. The amendment will provide for the sustainable use of the groundwater resource, effective water sharing arrangements, improved definition and security of water entitlements, a framework for tradable water entitlements, water for the environment, salinity management and monitoring and reporting.

7.1.10.1 *Moratorium*

In November 2006 the minister for Natural Resources and Water announced a moratorium on the use of subartesian water contained in the alluvial aquifers of the Isaac-Connors catchment. The intent of the moratorium is to ensure the water entitlement status quo remains while the draft amendment is being developed. In the Expansion Area, the moratorium applies to:

- subartesian water in the alluvial aquifers in the unconsolidated Quaternary deposits in the area associated with the Isaac River, the Connors River and all tributaries of those rivers;
- for that part of the area that is declared as the Highlands Subartesian Area, to all applications for or about water licences to take the subartesian water mentioned above, whether made before or after the moratorium notice date; and
- for that part of the area that is undeclared (i.e. outside the Highlands Subartesian Area), works to take the subartesian water mentioned in the first dot point.

However, Clause 8 of the moratorium notes that the following works are exempt:

- to take water for:
 - town water supply;
 - stock purposes;
 - domestic purposes;
 - the construction, operation or maintenance of public assets and utilities;
 - mining purposes, to the extent that the water is to be taken for dewatering purposes; or
 - a significant project declared under Section 26 of the *State Development and Public Works Organisation Act 1979*.

The moratorium is expected to apply until the draft amendment has been finalised. In effect, the moratorium does not restrict the development of dewatering activities for the Expansion Area.

In Queensland the taking of water from an aquifer under land within the Highlands Subartesian Declared Area is regulated by the Water Act and *Water Regulation 2002*. Where operations such as coal mining activities intersect aquifers, the DNRW assess (case by case) the need for water licensing of groundwater inflow to coal mine pit voids. In cases where groundwater inflow to a mine pit void is sourced from an identified aquifer, and/or where this resource is utilised by others, a licence to take water is required. In the case of the proposed Expansion Area, the potential use of the alluvial aquifer and the Rangal Coal Measures by surrounding landholders necessitates the IPCM to hold a Licence to Take Water to account for the groundwater inflow to the mine pit void.

The Water Licence is required to facilitate the management of the resource in terms of monitoring and mitigation requirements. As such, the Licence to Take Water covering pit void inflow will not likely limit the volume of groundwater the Expansion Area can remove from the aquifer via pit void inflow. In this sense, the Water Licence will legally authorise the Expansion Area to take water from the aquifer for which the Licence specifies. In addition, the Water Licence will also provide security (via 'Make Good' clauses) to other parties potentially affected by the removal of groundwater from the specified aquifers by mining activities.

7.2 POTENTIAL IMPACTS ON GROUNDWATER – DURING MINING OPERATION

The Expansion Area will become an open pit mine excavated using dragline and truck-and-shovel to remove the LHD, the underlying VER and their sub-plies. This will result in the removal of the overlying strata and the localised dewatering of aquifers as mining progresses. The depth of the pit will therefore extend to the base of the deepest VER seam mined which is located approximately 80 m below ground. Groundwater inflow to the pit void will be collected in sumps constructed on the floor of the pit. The disturbed fill is 'uncompacted' and fractured, resulting in changes in hydraulic conductivity, specific yield and bulk volume.

Potential impacts on groundwater by open cut mining include changes to:

3. water-table levels/potentiometric surface levels;
4. groundwater flow patterns; and
5. bore water-levels and yields.

Groundwater bores within the footprint of the pit will no longer exist.

Additionally, mining activities may also inadvertently change the chemistry of groundwater via induced groundwater mixing and/or surface water mixing. To estimate mine-induced groundwater flow and drawdown patterns, a numerical model was developed. Impacts on groundwater quality were interpreted qualitatively.

7.2.1 Impact Assessment Methodology

7.2.1.1 Hydrogeological Field Program

A field program was undertaken to obtain information on the occurrence, quality and movement of groundwater in the Expansion Area. The field program included:

- drilling and construction of 13 monitoring bores at six sites (refer to **Figure 7-2**);
- recording groundwater levels within bores to determine pre-mining water levels;
- sampling groundwater from selected bores to determine pre-mining groundwater quality;
- hydraulic (slug) testing of selected bores to estimate aquifer hydraulic conductivity; and
- a regional landholder bore survey within a 10 km radius of the Expansion Area.

Drilling in the Expansion Area commenced in February 2006 and 13 groundwater monitoring bores were constructed in accordance with the Minimum Construction Requirements for Water Bores in Australia (DNRW, 2003). Clustered monitoring bores, with up to three bores per site, were installed at six of the sites. Monitoring bores at Site 1 and Site 4 were located outside of the pit limits to enable ongoing monitoring of background conditions. The other bores were positioned within the footprint of the open cut and will eventually be destroyed. The monitoring bores were drilled and screened within target geologic units that were expected to yield groundwater, including the alluvium along the Isaac River, coal seams, Permian sandstone/siltstone rock and faulted zones within the proposed mine pit area. The monitoring bore locations are shown in **Figure 7-2** and water level recordings are presented in **Table 7-1**.

A bore survey was conducted in February 2006 within a 10 km radius of the Expansion Area to obtain the status of water supply bores and information on groundwater use (refer to **Table E-1** and **Table E-2** of **Appendix E** for the raw data). The bore survey began with a search of the DNRW registered bore database which revealed three registered bores and associated landholders. The field survey located only one of these bores, bore No. 100291 (refer to **Table 7-2**). The regional landholder bore survey located a further 19 bores plus one abandoned well within the 10 km radius (refer to **Table 7-2**). The survey recorded the use and yield of existing bores, location, approximate elevation, standing water levels, and physicochemical parameters of water samples where possible. Within 2 km of the Expansion Area seven stock watering bores exist, of which three are currently in use. Stock watering bores No. 17 and No. 18 are located within the MLa and are approximately 340 m from the proposed pit. Bore construction details are not available for the majority of the unregistered bores and so it is not known which aquifers are being intersected by these bores. In February 2006, physiochemical parameters of water samples were recorded in situ at locations where surface water was available (refer to **Figure 7-9**). In early June 2006, groundwater quality sampling conducted at five monitoring bores in the Expansion Area included:

- one sample from alluvial sediments;
- three samples from within the coal seams; and
- one sample from within the faulted sandstone above the coal seams.

7.2.1.2 *Aquifer Testing Program*

Hydraulic tests were carried out on six monitoring bores located within the Expansion Area. Analysis of the falling head and rising head test data was undertaken using the method of Bouwer and Rice (1976).

The unconsolidated, alluvial sediments located near the Isaac River range in grain size from fine sand to gravel (<50 mm diameter). Results from hydraulic testing within the alluvial sediments provide a hydraulic conductivity range of 2.3 m/day to 3.6 m/day.

Within the Expansion Area, coal seams are separated by units of low permeability carbonaceous mudstone units. The LHD coal seam is typically 2.3 m thick and has an hydraulic conductivity of the order of 0.0005 m/day. The thicker VER seam (5-7 m) has a higher hydraulic conductivity of ranging from 0.022 to 0.024 m/day while the coalesced coal seam (adjacent to the Isaac River), is approximately 8.5 m thick and has an hydraulic conductivity ranging from 1.5 to 1.8 m/day.

Hydraulic tests carried out in the Permian sandstone/siltstone gave a hydraulic conductivity of 0.0001 m/day which increases to about 0.05 m/day within the Isaac Thrust Fault material. The relatively low hydraulic conductivities in these units are probably a result of the interbedding of sandstone with finer grained siltstone. The higher hydraulic conductivity range appears to be in response to faulting and fracturing of the sandstone/siltstone unit.

7.2.1.3 *Rate of Groundwater Inflow to Pit Voids*

The estimation of pit inflow rates and groundwater drawdown is based on 3-D numerical groundwater modelling, experience and qualitative assessment. In terms of numerical modelling, the mine plan was notionally defined as a progressive excavation from west-to-east with seven evenly-paced stages over 10 years (refer to **Figure 7-10** and **Figure 7-11**). The groundwater model is termed a 'basic model' and is suitable for preliminary assessment as defined by the Groundwater Flow Modelling Guideline (MDBC, 2000). The groundwater model was developed using MODHMS which is a highly advanced version of the commonly used MODFLOW code.

The numerical groundwater model was developed to simulate the impact on regional groundwater flow patterns and groundwater drawdown caused by groundwater discharge/inflow into the proposed mine pit void to predict:

- the average rate of groundwater flow into the pit during year 10 of mining; and
- the drawdown impact on the aquifer at the length year of mining.

In the absence of highly-detailed spatial data describing groundwater occurrence, there remains some uncertainty in the expected pit dewatering rates. To help bound the estimate of pit dewatering rates; two scenarios were simulated by the model. They are:

1. a Base-Case Scenario that assumed a very low release of water from excavated rock; and
2. a Wet-Case Scenario that assumed significant water release by the excavated rock.

The Wet-Case Scenario is for a hypothetical situation in which the aquifer is fully saturated and there is extensive faulting and a weathered zone both of which tend to yield significant water. The Wet-Case scenario provides an upper bound for pit dewatering requirements.

The northern edge of the mined area will be located approximately 250 m from the Isaac River. The conceptual mine plan shown in the draft EIS had a final void running parallel with the Isaac River. In response to feedback received on the draft EIS from stakeholders raising concerns about stability, IPCM have redesigned this section of the mine. It is now proposed that the final void will be progressively backfilled in a southerly direction for a distance of 1.2 km. Further information is provided in **Section 6.7.6**, **Section 19.1.3** and **Section 19.1.6**.

Such backfilling will stabilise the alluvium after mining has occurred. At any one time there will be a maximum 70 m pit face open to the alluvium. The alluvial aquifer associated with the Isaac River is likely to have a relatively high hydraulic conductivity (slug test results indicate 2.5 m/day) and it may provide a pathway for groundwater flow to the pit during the wet season but is unlikely to provide any significant inflow to the pit. Calculations below support this.

The basic model includes a deepening of the alluvial aquifer around the Isaac River along the northern edge of the site. For simplicity, river flows were not simulated: the Isaac River and other streams in the local area are ephemeral, and hydrological data suggests that the Isaac River flows approximately 3 % of the time and seldom for periods exceeding one week.

An adequate approach to calculate groundwater flow from the Isaac River through the alluvium is to base the calculations on simple D'arcy flow through the 250 m stretch of alluvium 10 m deep with the 10 m river height as a control on one end and the base of the alluvium as the outlet control on the other end.

Since the river is a source boundary, at one end the flow can be assumed to be in equilibrium for its duration. The flow into the northern end of the pit is assumed to be zero. The base of the alluvium is assumed to be horizontal.

To assess the maximum possible flow that has the potential to occur it has been assumed that the depth of flow is 10 m throughout the entire length of the interface between the Isaac River and the mine pit. In fact, the average depth of flow will be less than this as (1) a seepage face would be required at the discharge end and (2) a slope is required to activate the flow; hence the depth of water in an unconfined aquifer such as this requires that the depth decreases with distance travelled. In addition the equations below are based on continuous flow 24 hours per day 365 days per year. The Isaac River flows intermittently and for durations seldom exceeding 1 week.

Such a conceptual model is based on the following equation:

$$Q = K I A$$

Where

Q = flow rate in m³/day

K = hydraulic conductivity in m/day

I = the gradient (the head loss/distance travelled)

A = the cross sectional area through which the water travels

In this model:

$$K = 2.5 \text{ m/day}$$

$$I = 10 \text{ m}/250 \text{ m} = 0.04$$

$$A = 10 \text{ m} \times \text{width of flow in metres}$$

If the exposed section is the only avenue of ingress of water from the alluvium into the pit and the water flow occurs for long enough to reach the pit, then the flow into the pit is 70 m³/day or 1 m³/day/m length of the exposed pit.

This will also be the maximum value of flow from the pit to the Isaac River should the pit water level ever be high enough to cause a reverse flow. Such a maximum value of reverse flow is also dependent on the water level in the Isaac River being 10 m lower than the pit water level. Neither of these conditions are plausible.

However, it is quite likely that the hydraulic conductivity of the backfill material will be higher than that of the alluvial material. If this is the case then, even though backfilling has occurred, the pit could still be exposed to the groundwater flow through the alluvium with the backfill material acting as a sink.

In this eventuality the flow into the pit through the alluvium could increase from a minimum value of 70 m³/day for the 70 m exposed length to a maximum of 1,300 m³/day if access is provided along the entire 1,300 m of mined area parallel to the Isaac River and if continuous flow is achieved.

However, with a hydraulic conductivity of 2.5 m/day and a gradient of 0.04 and a porosity of 0.25, the particle velocity of the water is 0.4 m/day. This means that a particle of water will take 625 days to travel from the Isaac River to the pit. In reality, any recharge from the Isaac River during a flood event will be stored as bank storage and will drain back to the Isaac River when the river level recedes. It is most unlikely that the water from the Isaac River will ever reach the pit and if it does it will be in negligible quantities.

Most pore water contained in excavated rock will evaporate as a result of blasting and atmospheric exposure during mining, and residual pore water remaining in the rock will be transported with the rock to the spoil dump. The pit void on the eastern side of the mine pit, that runs perpendicular with the Isaac River, will collect water from groundwater inflow and rainfall, and this water will be removed by sump pumps.

7.2.1.4 *Limitations of the Groundwater Flow Model*

Whilst groundwater levels are naturally uneven, the water-table and groundwater heads everywhere in the model were assumed to be 188 mAHD (uniformly) which is the spatially-averaged water-level in the mine area based on the results of resource drilling and groundwater monitoring (refer to **Table 7-1**). Under ambient conditions, there exists a mild head gradient with groundwater moving towards the topographic low associated with the Isaac River. However, for simplicity, the regional groundwater flow was ignored on the basis that the ambient regional flow is relatively slow compared with mine-induced flow. Hence, the model only considers groundwater flow induced by pit dewatering and natural 'flow-through' is ignored. The extensive faulting across the mine site and the proximity of the river alluvium to the pit represent potential zones of enhanced lateral and vertical groundwater connectivity. The faulting zones were ignored because of a lack of fault-specific data. Some account of a (possible) alluvial channel was taken into consideration by assuming a 9-14 m deepening of the alluvial layer in the vicinity of the Isaac River (Layer 1).

Model calibration was not attempted. Aquifer parameters are based on field tests, literature values and experience. Slug tests were used to provide an initial estimate of aquifer hydraulic conductivity (K) but these tests can only sample a small-to-intermediate volume around a bore and so may not be representative of the large-scale aquifer.

A uniform groundwater recharge rate of only 0.5 mm per year was assumed in the basic model leading to conservative assessment of drawdown. The aquifer parameters, including hydraulic conductivity and storativity, are presented in **Table E-3** of **Appendix E**. This table also provides approximate uncertainty bounds based on the data, literature and experience.

The complete water-balance of the pit (i.e. evaporation, runoff, rainfall, and surface water flow) was not assessed within the numerical model, and only induced groundwater flow towards the pit and standing groundwater volume (i.e. groundwater contained in the pore spaces of rock) are accounted for by the model. A complete description of the model's limitations were developed as part of the hydrogeological assessment completed by Matrix+ (2007).

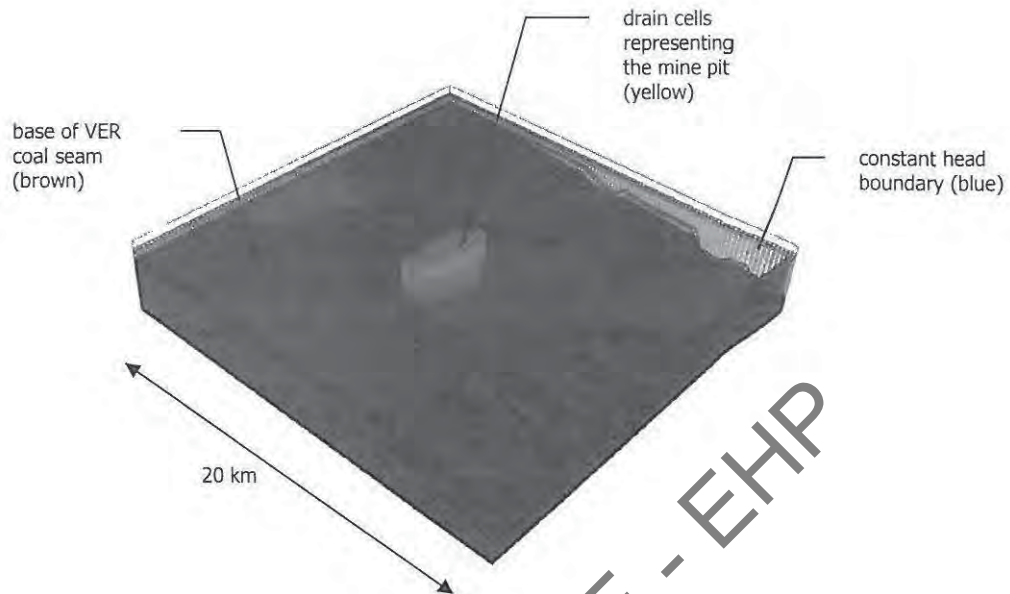


Figure 7-10 Perspective View Showing Boundaries of the Groundwater Model

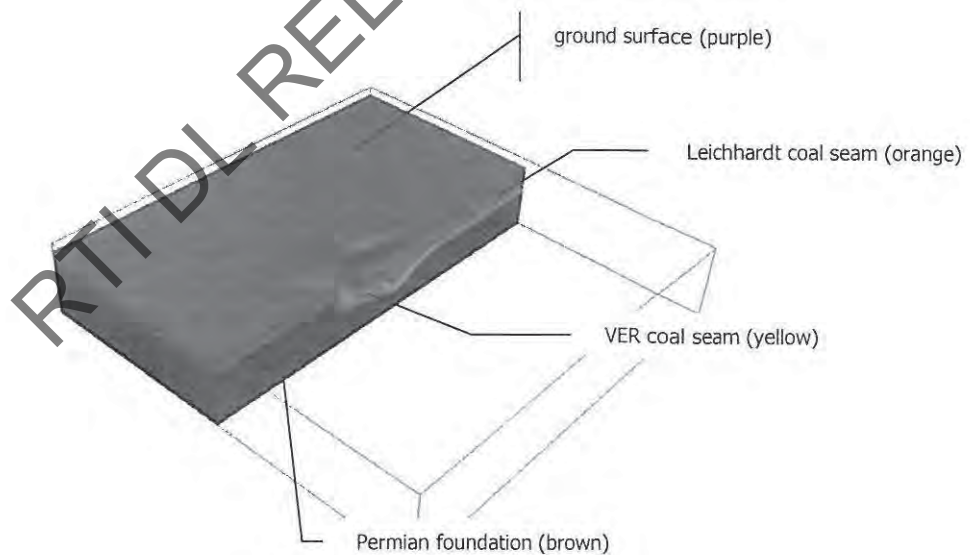


Figure 7-11 Perspective Slice-View Showing Layers of the Groundwater Model

7.2.1.5 Calculation of Groundwater Drawdown Impact

Both numerical groundwater flow modelling and analytical modelling were used to predict the groundwater drawdown caused by the mining operations and the final void. The numerical groundwater flow model was utilised to illustrate the potential drawdown impact on the alluvial aquifer and the coal seam at the cessation of mining.

The drawdown predictions made with the analytical model, using the equation provided below, are for 100 years into the future when, according to the pit void modelling, the hydrogeological system will approached a new equilibrium.

The radius of influence was determined using non-steady state flow (analytical) equations for radial flow at a particular time (i.e. the Theis equation). The input parameters required in the assessment are aquifer transmissivity (T), aquifer storage coefficient (S), saturated aquifer thickness and the time at which the 'snap-shot' is taken (t).

The assessment of drawdown was conducted separately for those aquifers currently being utilised by surrounding groundwater users, that is, the Quaternary alluvium and Permian coal measures. The radius of groundwater drawdown influence can be determined based on the following equation:

$$r = \sqrt{\frac{2.25 T t}{S}}$$

Where:

r = radius of influence (m)

T = aquifer transmissivity (m²/day)

t = time (days)

S = aquifer storage coefficient or specific yield (dimensionless)

On the basis that the maximum drawdown of any aquifer is to the base of that aquifer and using the radius of influence determined during pit void groundwater inflow calculations, distance drawdown curves were constructed for a period 100 years after the cessation of mining.

The drawdown predictions were made for:

- the Tertiary sediment (1-20 m thick) and Quaternary alluvium (10-23 m thick); and
- the Permian Rangal Coal Measures.

For the alluvial aquifer units, the average total transmissivity was estimated to be 32.5 m²/d (based on a K of ~2.5 m/d) and the specific yield was estimated to be 0.15. For the Rangal Coal Measures, the average total transmissivity was estimated to be 0.1 m²/d (based on a K of ~0.015 m/d) and the storage coefficient was estimated to be 8×10⁻⁵.

The analytical approach employed to evaluate the groundwater inflow rate to the mining pit void and the subsequent groundwater level drawdown impact is simplified and entails a number of important assumptions, these being:

- the aquifers are homogenous and remain so over the duration of mine operation;
- the water table/potentiometric head is lowered to the base of the aquifer as in the case of the alluvial aquifer and the to the base of the pit void in the case of the Rangal Coal Measures; and
- the open void area constitutes one continuous excavation pit.

In summary, the analytical approach employed is simplified and involves a range of assumptions.

7.2.2 Groundwater Inflow and Dewatering Requirements

In a Base-Case scenario, the Rangal Coal Measures (i.e. sedimentary rock and coal seams) and alluvial sediments have poor water-yielding characteristics, hence groundwater flow into the mine pit void is expected to be low. The Base-Case Scenario of the groundwater model produced a groundwater inflow rate to the mine pit void of approximately 1.4 L/s averaged over 15 years. Groundwater discharge rates are expected to rise, as the pit void increases in depth and area.

The sedimentary rock and coal seams also contain extensive faulted/fractured zones that may contribute to wetter conditions (i.e. a Wet-Case Scenario) and a moderate flow of groundwater to the mine pit void. The Wet-Case Scenario of the groundwater model produced a groundwater inflow rate to the mine pit void of approximately 6 L/s averaged over 15 years.

The annualised groundwater inflow rates into the mine pit void for the two scenarios are shown in **Table 7-3**. Pit sumps should be sufficient to satisfy pit dewatering requirements and advanced pit dewatering appears unnecessary to achieve a dry pit during mining.

Groundwater flow into the mine pit void will be consistently brackish (approximately 14,000 ppm average TDS) and pockets of saline groundwater may also be encountered in the alluvium which would give rise to higher overall pit water salinities.

Table 7-3 Model Estimate of Groundwater Inflow into the Expansion Area Mine Pit

Base-Case Scenario				
Start (year)	End (year)	Duration (year)	Volume (GL)	Average Groundwater Inflow to Mine Pit Void (L/s)
0	1	1	0.01	0.5
1	3	2	0.05	0.7
3	5	2	0.04	0.7
5	7	2	0.11	1.7
7	10	3	0.07	0.7
10	13	3	0.26	2.8
13	15	2	0.12	2.0
0	15	15	0.7	1.4
Wet-Case Scenario				
Start (year)	End (year)	Duration (year)	Volume (GL)	Average Groundwater Inflow to Mine Pit Void (L/s)
0	1	1	0.12	3.7
1	3	2	0.36	5.6
3	5	2	0.22	3.5
5	7	2	0.33	5.2
7	10	3	0.49	5.2
10	13	3	0.90	9.5
13	15	2	0.39	6.2
0	15	15	2.8	5.9

The conceptual model utilised within the numerical groundwater flow model describes an alluvial groundwater system that has the potential for high flow rates, but owing to the shallow saturated interval, the aquifer has low storage capability. Under currently prevailing conditions it is likely that groundwater inflow will occur as mining operations strip through the alluvial aquifer. This will expose paleo-channel systems that will be serving as conduits for groundwater flow. Assuming there is limited hydraulic connection to the Isaac River, which appears to be supported by the data to date, inflows should be of relatively short duration. As such, calculation of long-term pit inflows has not been attempted because the results are likely to be misleading.

The results shown in **Table 7-3** represent groundwater inflow to the mining pit sourced solely from the Rangal Coal Measures.

7.2.3 Potential Impacts on Regional Groundwater Levels During Mining Operations

During the mine life, the rate of groundwater discharge to the pit void will exceed the rate that these aquifers can be recharged. This will lead to a depression or 'drawdown' of the potentiometric surface in the vicinity of the mine when compared to pre-mining levels.

The influence of mining related groundwater extraction on surrounding aquifers has been simulated within a computer based numerical groundwater modelling package. The impact is illustrated via groundwater drawdown contours. The drawdown contours represent the vertical distance in metres that the potentiometric surface has been lowered from its initial level. The initial potentiometric surface is taken as average pre-mining water levels within bores in the region based on groundwater level monitoring. Hence, the 2 m drawdown contour represents the location where a 2 m drop in water level (compared to pre-mining levels) is predicted for bores installed within the modelled aquifer. In consideration of the impact, groundwater level drawdown of less than 2 m were not considered significant as such drawdowns are expected to be within the natural fluctuation of water levels within the alluvial aquifers and Rangal Coal Measures of this region.

The groundwater flow model base-case scenario drawdown predictions at the cessation of mining (i.e. 10 years) are presented for the unconfined water-table (refer to **Figure 7-12**) and for the groundwater potentials in the confined VER coal seam (refer to **Figure 7-13**).

7.2.3.1 Potential Impact on Alluvial Aquifers

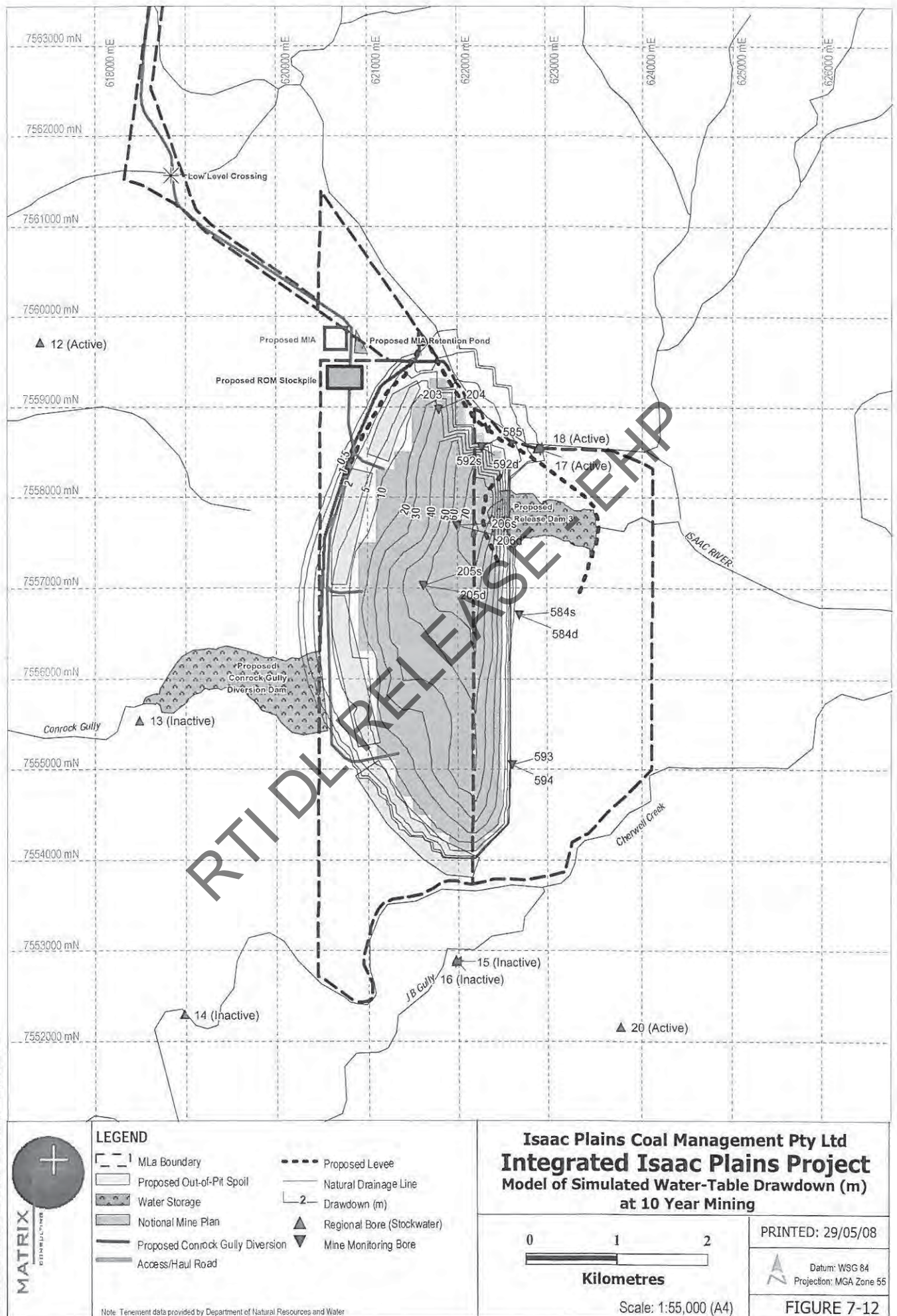
Groundwater drawdown in the alluvial unconfined aquifers is less reliably predicted owing to the irregular groundwater distribution. However, based on the conservative assumptions made regarding the alluvial aquifer, a 2 m drawdown influence is predicted to occur at less than 1 km from the mine pit at the cessation of mining operations (refer to **Figure 7-12**).

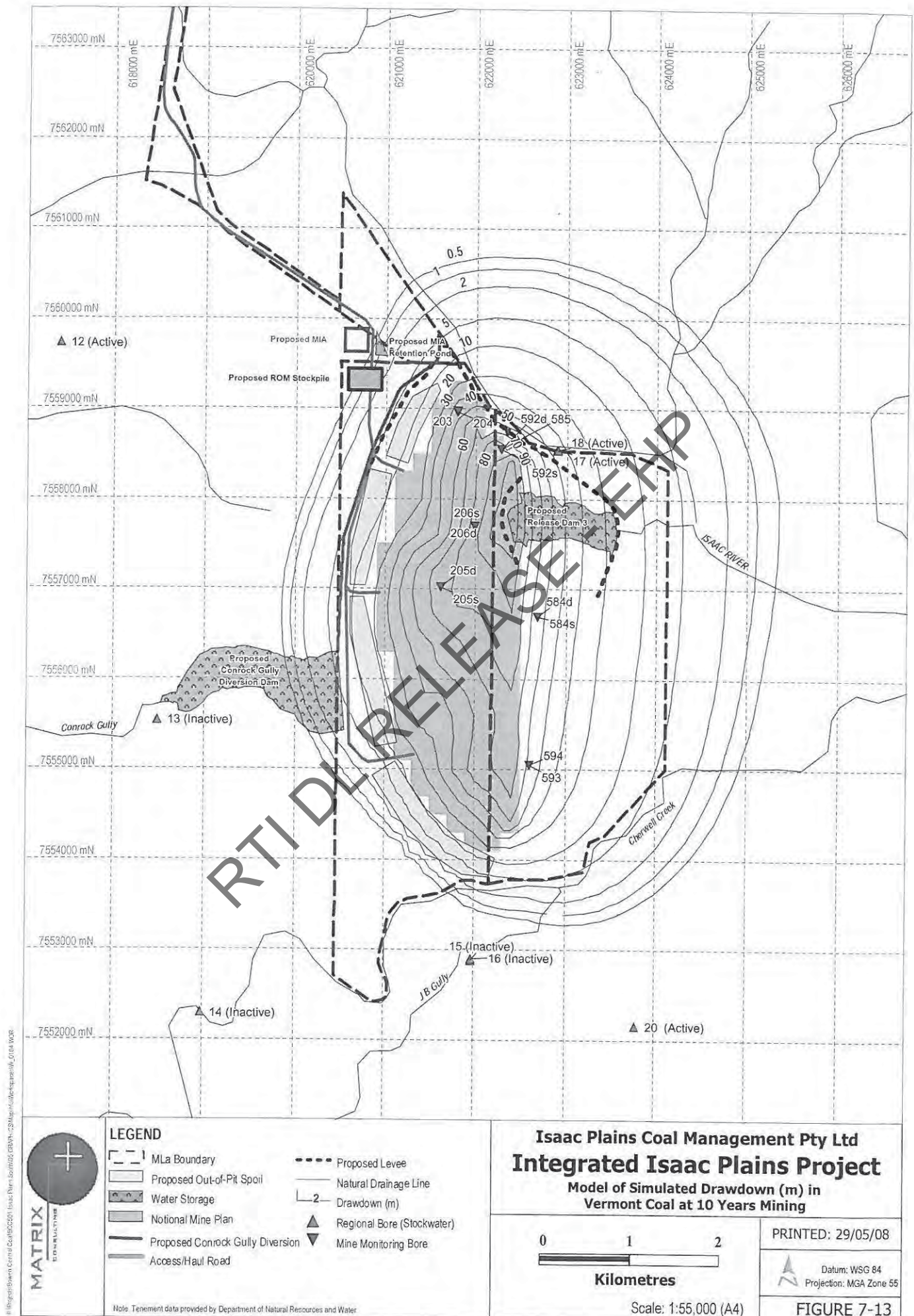
The Isaac River is located approximately 250 m north of the most northern parts of the mine. The groundwater level drawdown at this location may range up to 2.5 m as a consequence of the mine pit and dewatering of the alluvium deposits during mining operations. However, as discussed in **Section 7.1.6.1**, the occurrence of water in the alluvium is tenuous and most likely located in paleo-channels.

7.2.3.2 Potential Impact on Permian Coal Measures

The groundwater flow model predicts the 2 m groundwater drawdown contour of the confined Rangal Coal Measures will be limited to approximately 1-3 km from the pit at the cessation of mining (refer to **Figure 7-13**).

In general, the groundwater level drawdown in the coal measures is anticipated to expand with progression of the mine as a consequence of the progressive deepening and increased area of the pit.





7.2.4 Potential Impacts on Groundwater Quality During Mining Operations

The groundwater quality data for the Expansion Area show that the groundwater is mostly unsuitable for domestic supply, agriculture or stock watering (according to Australian Drinking Water Guidelines and Australian and New Zealand Guidelines for Fresh and Marine Water Quality for aquatic ecosystems, stock water and irrigation, ANZECC 2000).

During mining operations, water quality within aquifers surrounding the Expansion Area is expected to remain the same as pre-mining water quality for these aquifers. No change in water quality during mining operations (as compared to pre-mining) is expected for the following reasons:

- during mining operations, groundwater will be continually extracted from the pit to ensure a safe working environment within the pit. Extraction of groundwater from the pit will create a depression in the potentiometric surface at this location, and groundwater surrounding the mine pit will travel towards this depression. The net movement of groundwater towards the pit during mine operation will prevent the movement of potentially poorer quality water (that may have been impacted by mining) from moving away from the mine operation area and into the surrounding aquifers; and
- aquifers outside of the mine pit area will continue to receive recharge via the same processes that occurred pre-mining.

Groundwater quality data also suggests that groundwater in the alluvial aquifer and the Rangal Coal Measures are of similar quality with respect to pH, TDS, major ions and metals. Hence any inadvertent mixing of groundwater (during mining) is unlikely to result in a deterioration of water quality in either aquifer.

During mine operation, water quality within aquifers surrounding the mine pit will continue to be suitable for the same purposes applicable during the pre-mining period.

The migration of pit water into the Isaac River is considered unlikely due to the base of the River being much higher than the standing water level in the void.

7.2.5 Potential Impacts on Groundwater Users During Mining Operations

The groundwater drawdown impact of 2 m will progressively expand from the mine pit to cover parts of neighbouring properties. At the cessation of mining, two neighbouring landholder bores (stock bores No. 17 and No. 18) are likely to be impacted as illustrated in **Figure 7-12** and **Figure 7-13**.

The potential impact on groundwater users as a consequence of the anticipated drawdown is discussed below:

- the potentiometric surface within aquifers surrounding the mining activities will decline, which will result in an increased depth to water surface within bores located within the area of impact;
- the lower potentiometric surface within aquifers will potentially reduce the rate at which groundwater can be extracted from bores because of the reduced head of water above the pump;
- pump suction within bores may have to be lowered to maintain sufficient head of water above the pump when the pump is operational. This may increase the cost of extracting groundwater from within bores;
- new pumps may be required if existing pumps are not powerful enough to lift groundwater from the increased depth beneath the surface; and
- in some situations, bores may need to be deepened or relocated in order to ensure sufficient long-term water supply for stock watering and domestic purposes.

The IPCM will maintain contact with surrounding landholders to discuss their groundwater supply, and the demand, location and characteristics of their bores.

Further hydrogeological evaluations will be undertaken by the IPCM to assess the potential availability of alternative groundwater supplies that would be unaffected by the mining operations. Based on the results of these assessments and discussions with relevant landholders, options to ensure access to adequate alternate water supplies will be developed and discussed with any affected parties.

The IPCM will continue discussions with relevant landholders with a view to reaching mutually agreeable arrangements for the provision of alternate supplies throughout the mine life, and after mine closure should their bores be affected detrimentally. The quantity and reliability of the alternative supply arrangements will be at least equal to that required to maintain the existing productive capacity of each property.

The only water supply bores that appear likely to be affected are stock bores No. 17 and No. 18 (refer to **Figure 7-12**) located on the Isaac Plains Coal Project. The protection of an individual property from these bores access groundwater from the alluvial unconfined aquifer and a water level decline of approximately 3 m (as compared to pre-mining conditions) during the later years of mining could be experienced. Groundwater level hydrographs for all aquifers at the location of stock bores No. 17 and 18 are presented in **Figure 7-14** for the Base-Case Scenario. The larger water level declines in the Permian overburden and in the VER seam will not have any impact on the water levels in bores No. 17 and 18. Predicted drawdown was negligible at other stock bores.

Regular and comprehensive groundwater level monitoring will enable early detection of any groundwater level impacts and permit appropriate mitigation or compensation measures to be applied to any borehole affected.

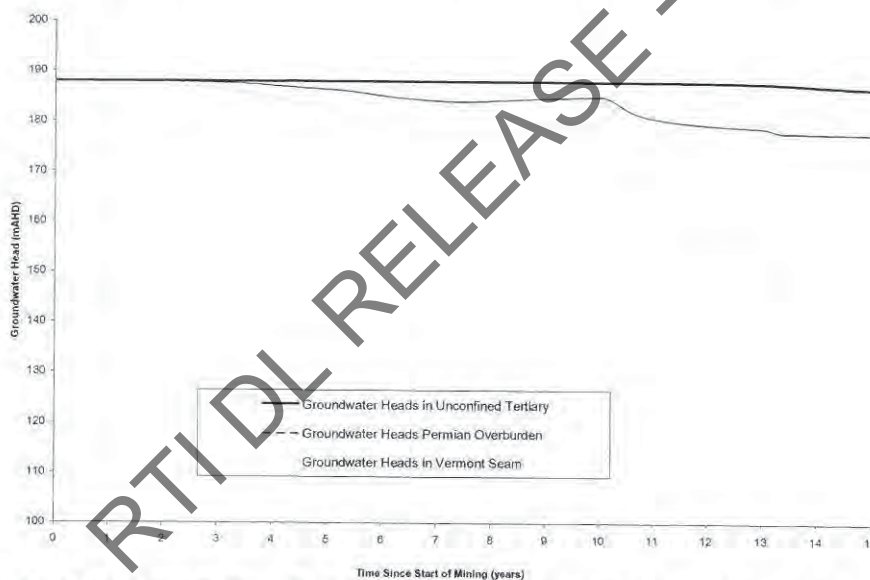


Figure 7-14 Model Predicting Groundwater Hydrographs at the sites of Stock Bores No. 17 and No. 18 (Base-Case Scenario)

(Note: The drawdown impact on stock bores No. 17 and No. 18 is in the unconfined Tertiary aquifer)

7.2.6 Potential Impact on Riparian Vegetation During Mining Operations

All streams within the study area are ephemeral and there are no perennial water holes present. Under natural conditions, groundwater does not contribute to surface water flow within the Isaac River and local creeks. In exceptionally wet years, it is possible that the alluvium associated with the Isaac River may contribute groundwater to the surface water system (refer to **Section 7.1.6.1**).

Riparian vegetation is situated along the banks of the Isaac River. Riparian zones can be defined as the region bordering the active channel that supports long-lived vegetation.

Hydrogeology

The watertable of the alluvium unit was observed at approximately 13 to 14 m below ground level at monitoring bores 585 and 204 respectively. Both of these monitoring bores are located approximately 300 m south of the Isaac River (refer to **Figure 7-2**). Groundwater level data do not exist for the Riparian zone located immediately adjacent the Isaac River. However, the watertable will most likely be located at a shallow depth below ground level adjacent to the Isaac River. Given the shallow depth to the watertable, riparian vegetation is likely to be using the groundwater system for water uptake.

Soil moisture is held within the pores between soil particles as a result of capillary action, and a soil moisture zone occurs whether or not an aquifer is present. Where an aquifer is connected to a soil moisture zone, such as occurs in unconfined aquifers, the soil moisture zone extends from the top of the water table (where the pores between soil particles are fully or almost completely saturated) up to ground level (where the amount of moisture in the soil is highly dependent of rainfall conditions, and may be close to zero in sustained dry conditions). The soil moisture zone is deeper where groundwater elevations are higher and shallower near the main drainage lines in lower topography. The root zone of most plants in semi-arid or arid climates is generally well above the top of the water table in unconfined aquifers.

If paleo-channels are disturbed, the natural groundwater flow through and beyond the mine area may also be disturbed, with a potential to affect groundwater levels in the alluvium for some distance from the mine. However, the nature of the groundwater system suggests that groundwater impacts will be relatively localised.

The results derived from the numerical groundwater flow model indicate a potential groundwater drawdown of 3 m near the Isaac River immediately north of the Expansion Area. Consequently, a drawdown of 3 m is expected to impact the ability of the moisture zone to hold water. However, the degree to which the moisture content is impacted requires further definition by dedicated studies of the interaction between the riparian flora ecology and the shallow alluvium groundwater system.

A network of monitoring bores will be established that will allow monitoring of the impact of the mining operation on alluvial groundwater levels. The groundwater level within the alluvial unit close to the Isaac River will be monitored on a regular basis throughout the duration of the mine operation. The monitoring will provide an opportunity to:

- determine the nature (or dependency) of the riparian vegetation to the groundwater system; and
- detect any drawdown and the potential impacts to the riparian vegetation.

7.2.7 Operational Impact Mitigation

Should a detrimental impact on landholder groundwater supplies be detected, and shown to be related to the Expansion Area mining operations, then the IPCM will seek to reach mutually agreeable arrangements with affected neighbouring groundwater users for the provision of alternate supplies throughout the mine life, and after mine closure (refer to **Section 7.2.5**). Regular groundwater monitoring will be undertaken to enable groundwater level drawdown to be identified prior to any impacts being experienced in surrounding landholder bores. In turn, alternative water supplies can be put in place before supplies from relevant existing landholder bores are adversely affected. Owing to the progressive nature of drawdown within aquifers, the provision of alternate supplies is likely to be staged. Options for alternate supplies include:

- installations of new pumps capable of extracting groundwater from greater depth within existing bores;
- deepening of existing bores;
- installation of a new bore at another location on the property; and
- provision of piped water sourced from the mine (i.e. surplus water from the mine pit void dewatering program, depending on quality).

The specific arrangements for affected properties will be discussed with each relevant landholder with a view to reaching a mutually acceptable agreement.

In the unlikely event that a detrimental impact is forecast from the monitoring program, preventative measures will be taken to ensure the impacts are mitigated. For instance, the mining schedule may be altered so as the alluvium situated in the north area of the mine site is not excavated or engineered structures are implemented to reduce potential impacts.

7.3 POTENTIAL IMPACTS ON GROUNDWATER – POST-MINING

After mining of the Expansion Area is complete, the groundwater system will begin to re-adjust to the new aquifer conditions surrounding the mined area. Water levels/pressures within the regional aquifers will eventually attain a new equilibrium level.

The new equilibrium for the groundwater system will have a different potentiometric surface from that which was present pre-mining owing to the presence of a final void in the east of the mined area.

7.3.1 Final Void Water Balance Modelling

Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) completed an assessment of the final void water balance in the post-mining phase. The assessment methodology and results are presented in this section.

The final landform is illustrated in **Figure 3-12**. The final void will be approximately 2,750 m long and will have the flowing general geometry:

- The width of the pit base – 55 m;
- The height to the top of the high wall – 80 m;
- The slope of the high wall batter - 70°; and
- The slope of the low wall batter - 36°.

The final void will be located above the predicted level of the Probable Maximum Flood (PMF) and will therefore not potentially be filled by flood water from the Isaac River.

Post mining, dewatering of accumulated water from groundwater inflow, rainfall and seepage from the overburden emplacement will cease and the final void will gradually fill with water until an equilibrium condition establishes. The potential sources of water that may contribute to filling the final void are:

- seepage from the overburden emplacement west of the final void;
- groundwater discharge from the Rangal coal measures;
- direct rainfall; and
- surface water runoff from the final void slopes.

The equilibrium elevation of the water level of the final void will therefore be governed by the following components:

- the size and shape of the void;
- direct rainfall into the void;
- surface water runoff over the void's low wall slopes;
- seepage from the in-pit overburden emplacement;
- groundwater inflow from the Rangal coal measures; and
- the rate of evaporation from the surface of the void lake.

The void lake elevation and surface area versus cumulative volume rating curves determined from the final void trapezoid geometry described above are shown in **Figure 7-15**. Polynomial trendlines

derived from the rating curves were used for prediction by regression analysis of the rates of recovery of the water level and the equilibrium water level within the final void.

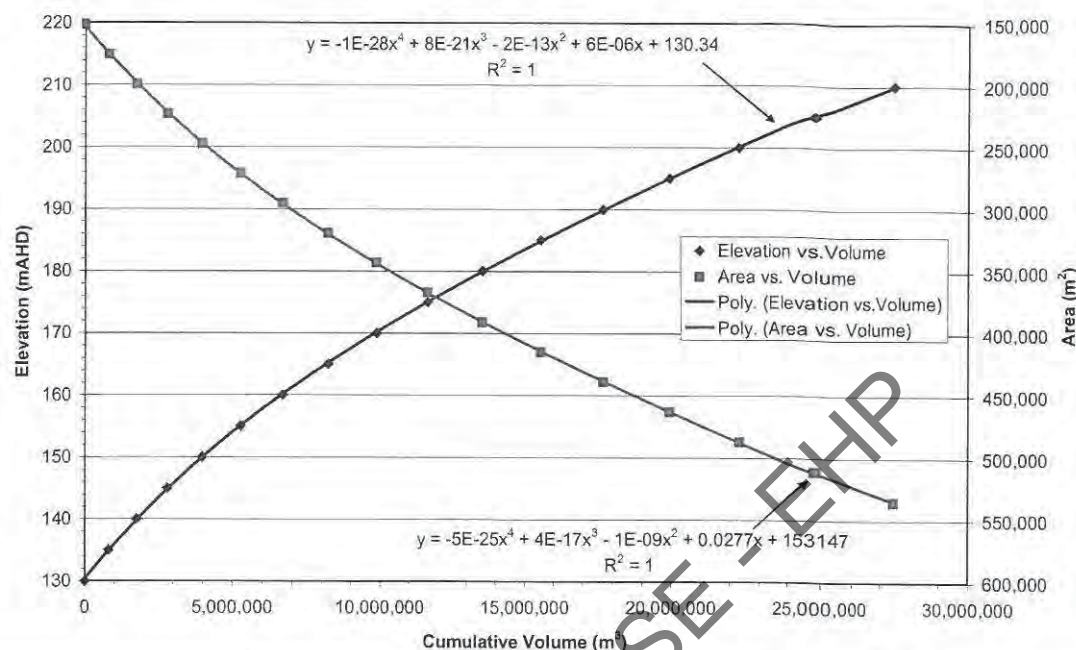


Figure 7-15: Final Void Elevation vs. Cumulative Volume and Area vs. Cumulative Volume Rating Curves

The rates of recovery of the water levels and the equilibrium water levels for the final void were determined using a spreadsheet water balance model developed for the site. The equilibrium water level is obtained when evaporation loss is equivalent to inflow and allows for assessment of whether the pit will act as a sink to groundwater or a source in the long term. The water balance of the final void was based on the following equation:

$$\text{Water Balance of Final Void} = \text{direct rainfall} + \text{surface water runoff} + \text{spoil seepage} + \text{groundwater inflow} - \text{evaporation}$$

7.3.1.1 Direct Rainfall

The rainfall input is based on the mean annual rainfall for the Moranbah Water Treatment Plant weather station (as shown in **Table 7-4**) multiplied by the plan surface area of the void lake, that is direct rainfall was only applied to the void lake.

Table 7-4: MEAN RAINFALL AND EVAPORATION DATA FOR THE MORANBAH WATER TREATMENT PLANT WEATHER STATION

Month	Mean Monthly Rainfall (mm)	Evaporation Data	
		Mean Daily (mm)	Mean Monthly (mm)
January	100.2	8.3	257.3
February	94.3	7.6	212.8
March	48.7	7.1	220.1

<u>April</u>	<u>37.5</u>	<u>5.9</u>	<u>177</u>
<u>May</u>	<u>36.8</u>	<u>4.4</u>	<u>136.4</u>
<u>June</u>	<u>23</u>	<u>3.6</u>	<u>108</u>
<u>July</u>	<u>19</u>	<u>3.8</u>	<u>117.8</u>
<u>August</u>	<u>23.1</u>	<u>4.9</u>	<u>151.9</u>
<u>September</u>	<u>8.1</u>	<u>6.7</u>	<u>201</u>
<u>October</u>	<u>37.1</u>	<u>8.1</u>	<u>251.1</u>
<u>November</u>	<u>68.4</u>	<u>8.6</u>	<u>258</u>
<u>December</u>	<u>97.3</u>	<u>8.7</u>	<u>269.7</u>
<u>Annual</u>	<u>(Total) 590.9</u>	<u>(Average) 6.5</u>	<u>(Total) 2361.1</u>

7.3.1.2 Overburden Seepage

Seepage from the overburden emplacement was determined by applying an infiltration rate using the following equation:

$$\text{Overburden seepage} = \frac{(\text{total mined area} - \text{final void surface area}) \times \text{direct rainfall} \times \text{infiltration coefficient}}{\text{infiltration coefficient}}$$

The infiltration coefficient is equivalent to the amount of rainfall that reaches the base of the overburden emplacement forming a perched groundwater aquifer within the overburden. For this simulation there is no seepage for the first five years, and seepage commences thereafter when it is considered the overburden hydrology has reached a steady state condition whereby infiltration into the overburden is equal to seepage (discharge) to the void. The infiltration coefficient of 2.5% of monthly rainfall totals was adopted for this simulation as considered representative for coal mine overburden emplacements in the Bowen Basin.

7.3.1.3 Surface Water Runoff

Surface water runoff was determined from the volume of rainfall that falls on that portion of the void slopes above the surface of the void lake multiplied by a runoff coefficient, using the following equation:

$$\text{Surface runoff} = \frac{(\text{total void surface area} - \text{void lake surface area}) \times \text{direct rainfall} \times \text{runoff coefficient}}{\text{runoff coefficient}}$$

The runoff coefficient adopted for this simulation was 0.3 which is considered representative of the annual average value based on operational and mine water management experience for rehabilitated overburden emplacements in the Bowen Basin.

7.3.1.4 Groundwater Inflow into the Final Void

Groundwater inflows to the final void were assumed from the Leichardt (~2.3m thick) and Vermont (5-7m thick) coal seams within the Rangal Coal Measures, these being the principle groundwater aquifers intersected within the open pit. A combined thickness of 8.5m was selected for the two coal seams extending along the entire length of the void highwall.

Groundwater inflows were estimated using the following form of the Darcy Equation:

$$Q = KiA \text{ m}^3/\text{day.}$$

Hydrogeology

The spreadsheet model assumed a hydraulic conductivity 'K' value of 1.7×10^{-7} m/sec (0.015m/day) as determined from the permeability testing of the Rangal coal seams.

The hydraulic gradient (*i*) and the saturated aquifer surface area (*A*) are both variable and were determined iteratively from the changed pit water level for each time step. The groundwater level outside the pit footprint was assumed at RL188m for the duration of the simulation which is equivalent to the groundwater level used for the EIS numerical modelling.

7.3.1.5 Open Water Body Evaporation

The average rate of evaporation from a surface water body in the Moranbah area (Table 7-4) was estimated assuming a pan-evaporation factor of 0.7 to account for lake water surface within the final void being contained in a deep, semi-shaded pit and protected from winds, all of which reduce evaporation.

The model simulation was undertaken at monthly time steps for a period of 250 years using average monthly rainfall and evaporation data as described above. Output from the model as shown in Figure 7-16 and predicts the water levels for the void:

- rise relatively slowly within the first five years after the mining operation ceased during which time there is no seepage from the spoil heaps to the void, and then slightly more quickly between five and 50 years when this seepage occurs.
- stabilise within the pit after approximately 150 years post mining at around RL156m which is 26m above the base of the pit.

7.3.1.6 Model Sensitivity

The spreadsheet model was found to be sensitive to the input from surface water flows from the void catchment area (this area making up the greatest portion of water input to the model). Sensitivity analysis by adjusting the monthly rainfall runoff coefficient to 0.5 increased the stabilised void water level to approximately RL160m over a similar time frame as above. This shows that in spite of using a conservative value for the runoff coefficient, the stabilised void water level remains well below the rim of the void (RL210m) and hence the pit does not spill. It should be noted that a monthly runoff coefficient above 0.3 is not considered representative of the runoff potential of an overburden emplacement.

7.3.1.7 Summary

In summary, it is assessed, based on the above that the final void will always be a sink to groundwater flow and should never over top or discharge water from the pit to the regional aquifer. That is, the stabilised pit water level will remain below surrounding Rangal coal seam aquifer levels (RL188m) and the higher pit crest level (RL210m).

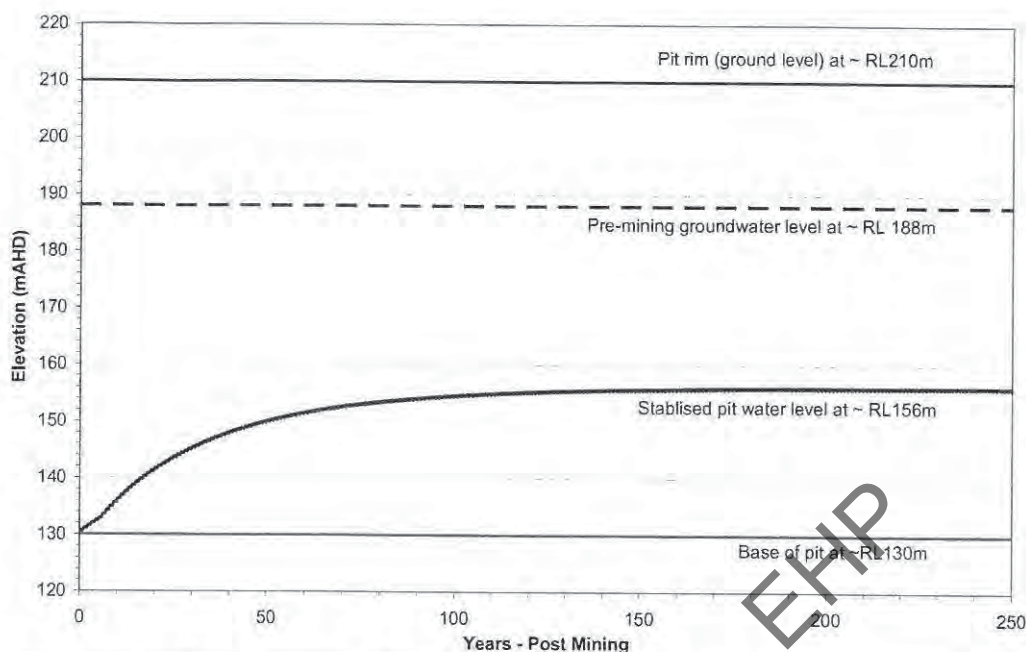


Figure 7-16: Simulated Rate of Recovery and Equilibrium Water Level for the Final Void

The main features of the final landform after mining ceases will consist of waste rock dumps to the west, and a final void in the east, south of the 202 mAHD contour. The final void will be approximately 3,700 m long, approximately 70 m wide (at the base) and have an approximate depth of 80 m.

The final void will collect and accumulate water from groundwater ingress, direct rainfall into the void and from overland surface flows from the slopes of the waste dumps draining into the void. All undisturbed catchment flows will be diverted around the void. Water inflow and losses from the final void, post mining, is illustrated in Figure 7-15.

The high levels of evaporation experienced in central Queensland will slow the rate of recovery of water in the void by constantly removing water from the final void water surface. Average evaporation in the region is almost three times the average annual rainfall.

The final void represents a location at which the alluvium and Rangal Coal Measures have been removed through mining and not backfilled. Groundwater inflow to the pit is expected from the coal measures in the long term and from the alluvium in the short term. Groundwater inflow will occur through the walls of the final void. Groundwater inflow will also occur from areas of backfill material into the void.

Typically, the final void will contain long-term water levels and water quality dependent on a number of inter-related hydrological processes. Water levels in the pit void will determine whether the void will act as a net groundwater source (if final void water levels are high relative to groundwater levels surrounding the void) or act as a net groundwater sink (if final void water levels are low relative to groundwater levels surrounding the void). Given the climate of the Expansion Area is semi-arid, experience suggests that a final void water level will form, but the evaporative demand will result in the void behaving as a groundwater sink. Continued evaporation will also produce a rising TDS concentration.

The long-term final void water levels, water quality and residual groundwater drawdown were predicted using a combination of numerical and analytical modelling that take into account the following hydrological factors:

- — rainfall (directly onto the final void water surface);

Hydrogeology

- final void water surface evaporation (including pit wall shadow effects);
- surface runoff (from spoil catchment; including rainfall intensity effects);
- groundwater flow into the final void;
- final void stage height versus surface area relationship;
- final void stage height versus void volume relationship; and
- water quality (i.e. TDS concentration) of rainfall, runoff and groundwater inflow.

The post mining regional groundwater flow pattern will re-establish itself somewhat; however on a local scale groundwater will gravitate into the final void. The permanent depression in the potentiometric surface around the void acts as a sink and will not permit water within the final void to flow outwards into the regional system. The void waters will essentially remain isolated from other surface waters of the area.

The final void water balance modelling shows that water levels in the final void will be strongly affected by the water surface area relative to the total catchment area. As the final void water surface area increases (with rising water levels) the total evaporation flux increases proportionally.

This relationship stabilises the long term water level within the void in such a way that the inflows (i.e. rainfall, runoff and groundwater inflow) are dynamically balanced by evaporation. Natural variability in climate will also influence the final void water levels; however these variations will be averaged over the long term.

Important information for the final void water balance assessment are the stage height versus surface area, and the stage height versus void volume relationship rating curves for the pit void. These curves were calculated based on the most recent plan of the final void and the geological drill data that reveals the elevation of the VER seam and hence defines the elevation of the floor of the final void. The regression curves (polygons) for these rating curves are provided in **Figure 7-16** and were used in the water balance modelling of water level versus time and TDS versus time.

The modelling of pit void water levels involved the estimation of the annual average rates for rainfall, surface water runoff and evaporation from the BoM's SILO Data Drill climate record (1900-2006). Each of these average rates was multiplied by their respective surface areas (i.e. wet area or dry area) to estimate net water flux as a function of void water level (mAHD). In the long term, the water levels in the void will stabilise when this net flux is zero. The slope of the net flux vs. final void water level relationship indicates that the system is naturally stable and will tend to a dynamic equilibrium and the relationship can be used to estimate the long term water levels. In the analysis, groundwater inflow into the void was assumed constant at 63 ML/yr ($\pm 50\%$). Numerical groundwater flow modelling indicated that groundwater inflow is insensitive to final void water levels when these levels are within the current prediction envelope. A groundwater flux uncertainty of $\pm 50\%$ was also examined in an uncertainty analysis.

Hydrogeology

Daily rainfall and pan evaporation data for the period 1900-2006 were analysed statistically on a daily basis to obtain the annual averages for rainfall, runoff and pan evaporation. A pan evaporation factor of 0.85 ± 0.05 was assumed and the effect of shadows produced by the pit low wall (36 degree slope) and the pit high wall (70 degree slope) were considered in terms of a shadow factor (0.85 ± 0.15) that was calculated as a time integral of maximum possible solar insulation includes a loss of rainfall (20 ± 10 mm) to the ground and atmosphere prior to the generation of surface runoff (calculations on a daily basis). This approach to runoff estimation may be called the 'initial loss' method. A sensitivity analysis identified the initial loss parameter (20 ± 10 mm) as being the most influential parameter in the final void water balance modelling and the resulting uncertainty envelope for the final void water level predictions are presented in **Table 7-4**. Sensitivity also shows that groundwater is the least significant inflow term whereas runoff is the most significant inflow term.

7.3.1 Final Void Water Levels

The long term final void water level is predicted to be 114 (± 9) mAHD or approximately 20 (± 9) m deep at its deepest location (refer to **Figure 7-16** and **Table 7-4**). The early stages of water level recovery in the pit will be most rapid owing to the large initial imbalance in the water fluxing (i.e. inflows will exceed outflows). With time, the void water levels and water surface area will both increase until the average evaporation rate matches in the aggregated inflows from rainfall, runoff and groundwater seepage. Within approximately 3 years (assuming average rainfall conditions) the void water level will achieve 50 % of its long term height, and within approximately 18 years it will approach 90 % of its long term height (refer to **Figure 7-17**). The final void water volume will fill approximately 1,600 to 2,100 ML (i.e. 2 to 3 %) of the approximate 70,000 ML total available final void volume. The freeboard between the final void water level surface and the void spill height is approximately 84 to 94 m. The freeboard volume is approximately 68,000 ML (refer to **Table 7-4**). Although not modelled explicitly, it is important to note that the void water levels will fluctuate with sporadic runoff events that coincide with rainfall greater than approximately 10 to 30 mm/day.

Table 7-4 Final Void Water Balance Modelling: Parameters, Predictions and Uncertainty Envelope

Pan-Factor	0.85	0.80	0.90
Pan-Factor Adjustment (Shadow Effect)	0.85	0.69	1.00
Final Pan-Factor	0.72	0.59	0.85
Initial Daily Loss Before Rainfall-Runoff (mm/d)	20.0	10.00	30.00
Average Annual Rainfall (mm/yr)	553.0	552.98	552.98
Average Annual Runoff (mm/yr)	95.7	49.48	204.94
Average Annual Pan Evaporation (mm/yr)	2,142.5	2,142.45	2,142.45
Average Annual Final Void Evaporation (mm/yr)	1,547.9	1,256.55	1,821.08
Groundwater Inflow Flux at end-of-mining (ML/yr)	63.1	-	-
Average Final Void Evaporation Flux (ML/yr)	-342.9	-	-
Average Runoff Flux (ML/yr)	157.3	-	-
Average Rainfall Flux (ML/yr)	122.5	-	-
Average Net Water Balance (ML/yr)	0.0	-	-
Area of Dry Catchment (m ²)	1,643,450	-	-
Area of Final Void (m ²)	221,550	-	-
Height of Final Void Water Level (mAHD)	114.2	110.3	124.4
Max. Depth of Final Void Water (m)	19.7	15.8	29.9
Floor Min. Elevation (mAHD)	94.5	-	-

Hydrogeology

Years after Cessation of Mining	3	18	>30
Storage Volume (ML)	1,624	1,991	2,149
Storage Level (mAHD)	104.4	112.23	114.2
Freeboard Volume (ML)	68,376	68,009	67,851
Freeboard Height (m)	94.4	86.5	84.5
TDS (mg/L)	1,200±100	6,100±500	9,700±1000

Notes: Climate data (1900-2006) are from Data Drill for 22°06'S & 148°09'E (<http://www.nrmc.qld.gov.au/Silo/>).

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7.3.2 Final Void Water Quality Modelling

The level of data required for advanced hydrologic modelling of final voids for the Expansion Area cannot practically be obtained at the pre-mining stage. As soon as possible, the mining operation should incorporate opportunistic monitoring of temporary pit storages to develop and calibrate a long-term predictive model. If this indicates that general water quality will be unlikely to be acceptable for stock watering, the land use strategy for final voids could be reviewed. Therefore, it will be important to commence field trials and monitoring (i.e. water sample collection and analysis) early so that actions necessary at the end of the life of the mine can be included in planning and scheduling.

To model the final void environment there is a need to understand the nature of the spoil hydrology process, primarily to identify or develop appropriate models to simulate the hydrological behaviour and water quality, and secondary to plan field data collection for model validation and calibration.

As a guide, a lumped parameter water balance model has been run for the final stage landform and water management structures.

TDS concentrations are adopted as a guiding indicator to the future water quality of the water volume in the final void. The future TDS concentration of the final void water was predicted with a mass balance (i.e. TDS concentration x inflow) model of the salt balance coupled to the above-mentioned water balance model. An important input parameter is the average TDS concentration of groundwater that flows into the final void. Groundwater TDS concentration is, on average, higher and more variable towards the north due to patches of brackish-to-saline groundwater. TDS concentration was estimated from EC data collected during exploration of the mine site. The EC data was weighted to account for the depth of mining given that the deeper areas of the pit will receive proportionally more groundwater. The estimate of average groundwater TDS concentration includes a 95 % confidence interval for the calibration of the EC field meter (i.e. 0.58 ± 0.05 for TDS:EC). The final estimate of the spatially-weighted average groundwater TDS concentration is $10,550 \pm 950$ mg/L.

Rainwater was notionally defined with a TDS concentration of 40 mg/L and runoff was notionally defined with a TDS concentration of 400 mg/L (typical for clean fresh surface water). Model uncertainty analysis showed that the predicted TDS concentration for the water stored in the pit void was unaffected by uncertainty in the TDS concentration of rainfall and runoff.

The TDS model does not take into account diffusion and dispersion of salts through the aquifer that is immediately below the void water surface. Diffusion and dispersion may transport salts to or from the water column producing TDS concentrations greater than that predicted by the model; this is most likely for the early years of void water development when the water volume is small.

7.3.3 Final Void Water Quality

The TDS model predicts that, after mine closure, the final void water TDS concentration will increase steadily and will take approximately six years to exceed the ANZECC (2000) stockwater guideline TDS concentration of 2,500 mg/L (refer to **Figure 7-17**). Extrapolating further into the future, the model predicts that in approximately 110 years the final void water TDS concentration will approach that of seawater (i.e. approximately 35,000 mg/L). The void water TDS concentration will continue to increase to a maximum level that is difficult to predict. Ultimately, the TDS concentration will reach a dynamic equilibrium (of uncertain value) in the far-future as diffusion and dispersion of salts into the aquifer begins to take effect.

Final void water will likely stratify thermally during summer and will become increasingly stratified due to the increasing TDS concentration. Buoyant fresh water will tend to 'float' on top of more dense brackish water. This situation may inhibit the vertical mixing of oxygen. This density-stratification will be disturbed by wind-induced mixing of the water profile however, the overall stability of the future water profile is uncertain. It is initially expected that bottom waters will become anoxic while surface waters will remain oxygenated.

7.3.4 Probability of Final Void Flooding/Flooding Mitigation

A system of levees has been designed to prevent Isaac River floodwater from overflowing into the open cut pit during the operational phase of the mine. To eliminate the need for levees mining, the final void between the Isaac River and Conrock Gully will be filled to a level of 202 m AHD, which is 2.2 m above the estimated 1 % AEP flood level of 199.81 m AHD at this location plus 1 m. Therefore,



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the likelihood of Isaac River water overflowing into the final void is extremely remote. By extrapolating from the estimated 2 % and 1 % AEP flood levels at this location (refer to **Table 6-22**) the probability of an Isaac River flood exceeding a level of 202 m AHD is estimated to be lower than 0.1 % AEP.

It is also very unlikely that high water levels in the Isaac River would breach the proposed flood protection measures at flood levels lower than 202 m AHD. The final void is located in a backwater of the river behind the proposed spoil dump where flood velocities will be zero to very low.

Section 6.7.6 provides further details on the levee system and the potential for flooding of the site.

7.3.57.3.4 Potential Impacts on Groundwater Quality Post-Mining

Although water quality in the final void is expected to deteriorate over time post-mining, this reduction in water quality is not expected to impact the surrounding aquifers. Water present within the final void (post-mining) will not flow out of the final void and into the regional aquifer for the following reasons:

- high evaporation rates over the final void will result in the final void water level being lower than the potentiometric levels within the surrounding aquifers. Evaporation over the surface of the final void water body causes a permanent sink in the regional potentiometric surface within the vicinity of the final void;
- groundwater will flow under pressure towards the final void along a hydraulic gradient, from areas of high pressure head to areas of low pressure head (i.e. the final void). Accordingly, the permanent depression of the potentiometric surface within the vicinity of the void acts like a sink and will not permit water within the final void to flow outwards into the regional system; and
- the local and regional aquifers will be replenished by rainfall on groundwater recharge zones, and are not expected to change in quality from pre-mining levels.

The mining activities are not expected to have a detrimental impact to the groundwater quality in the vicinity of the Expansion Area. Hence, the post-mining groundwater quality within both the alluvium and the Rangal Coal Measures surrounding the mining area are expected to remain the same as pre-mining groundwater quality.

7.3.67.3.5 Potential Impacts on Groundwater Levels Post-Mining

The different hydrogeological parameters of the backfill material combined with the high rate of evaporation within the final void will create a different final equilibrium potentiometric surface than was present prior to mining. This will result in residual drawdown immediately surrounding the mined area when the potentiometric surface reaches an equilibrium level.

The results of the analytical modelling are presented in **Figure 7-18** and **Figure 7-19**. These figures show that there may be some long-term drawdown impact on three active stockwater bores (No. 17, No. 18 and No. 20 detailed in **Figure 7-18**). The stream recharge, which will tend to ameliorate drawdown impacts near streams where most stock water bores are located, was not considered in the analysis.

With regard to the Rangal Coal Measures, drawdown of the potentiometric surface within areas that have more than 50 m drawdown at the cessation of mining (as illustrated in **Figure 7-13**) begin to recover immediately following cessation of mining. These areas are within and immediately surrounding the mined area. The initial rise in the potentiometric surface at these locations is related to the rise in the water levels within the final void.

In contrast, outside the immediate vicinity of the final void, the potentiometric surface will continue fall up to 5 to 10 m following cessation of mining as the groundwater system adjusts to new regional aquifer conditions. The drop in water level at distances away from the final void (post-mining) occurs as a result of a flattening of the regional hydraulic gradient, as the groundwater system moves towards its new equilibrium state. The simulated regional residual drawdown post-mining for the Rangal Coal Measures is shown in **Figure 7-19**. The potentiometric surface within an area approximately 8 km surrounding mined area is expected to contain a residual drawdown of between 1 and 2 m (with larger drawdown located immediately surrounding the pit void).

7.3.7.3.6 Potential Impacts on Groundwater Users Post-Mining

Potential impacts post-mining may occur in three of the 21 bores identified on properties surrounding the Expansion Area. These impacts may include a groundwater drawdown of approximately 2 m or more from their pre-mining water levels.

Lowering of pump intake valves within some bores may have been required during mine operation owing to mining related aquifer drawdown.

The water quality within landholder bores is not expected to change from pre-mining conditions.

The IPCM will seek to reach mutually agreeable arrangements with affected neighbouring groundwater users for the provision of alternative supplies throughout the mine life, and after mine closure. The provision of alternative supplies from deepened bores and/or replacement bores would provide the most secure and most independent supply after mine closure.

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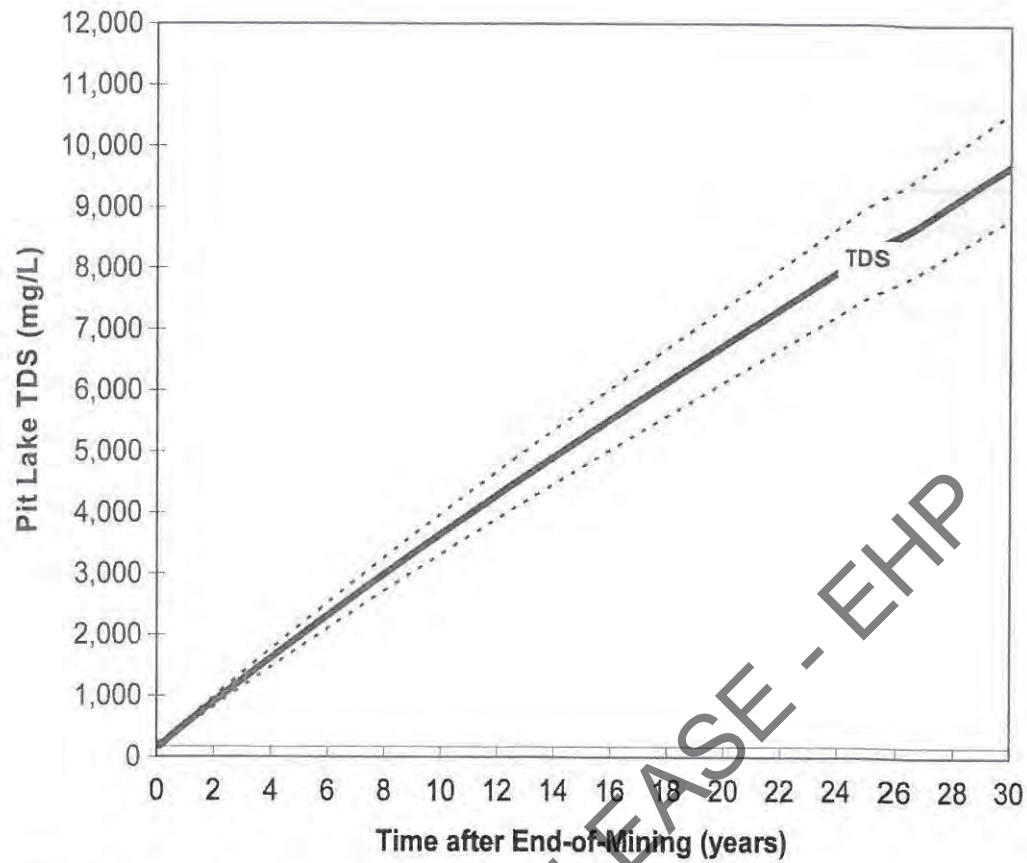
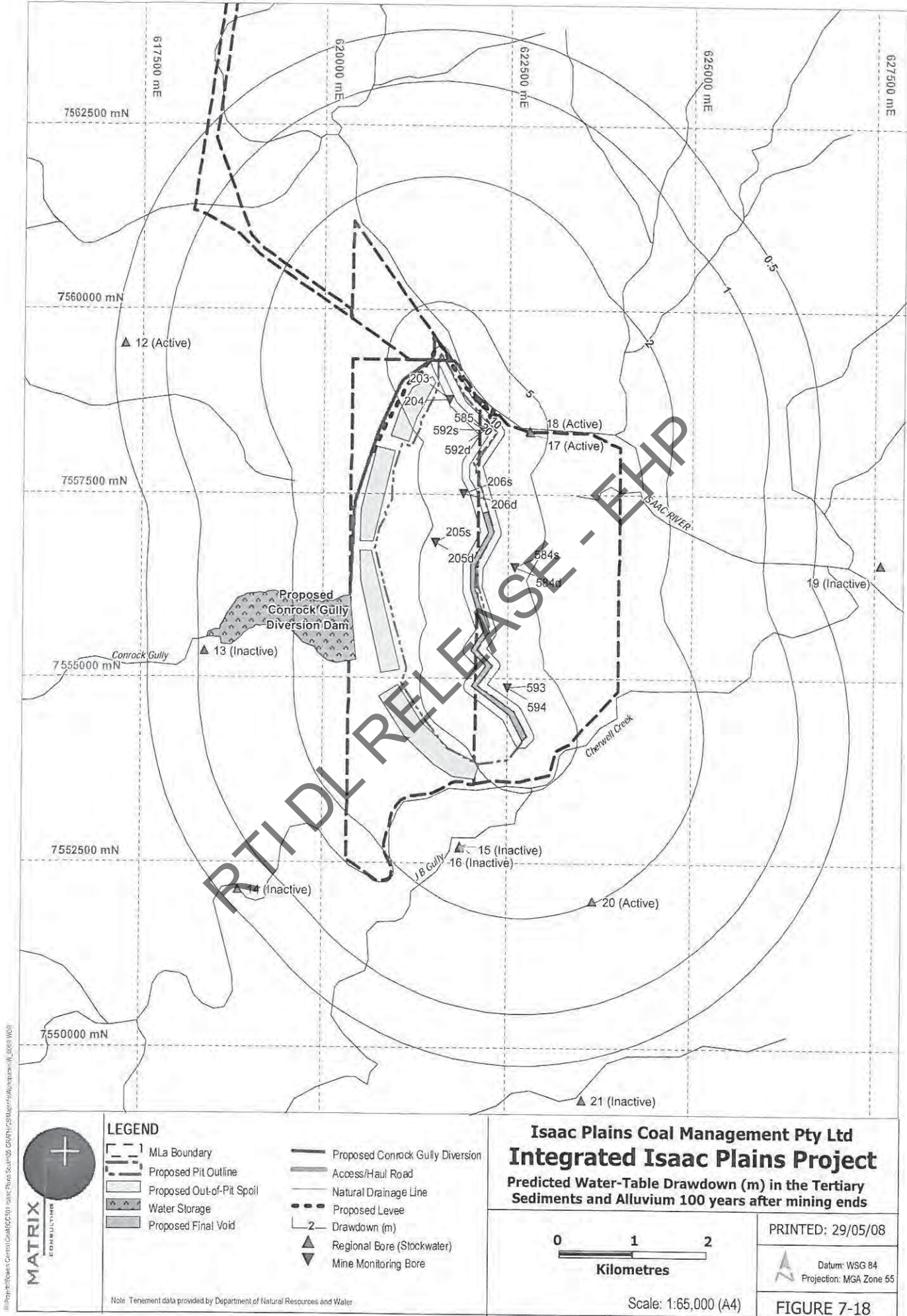
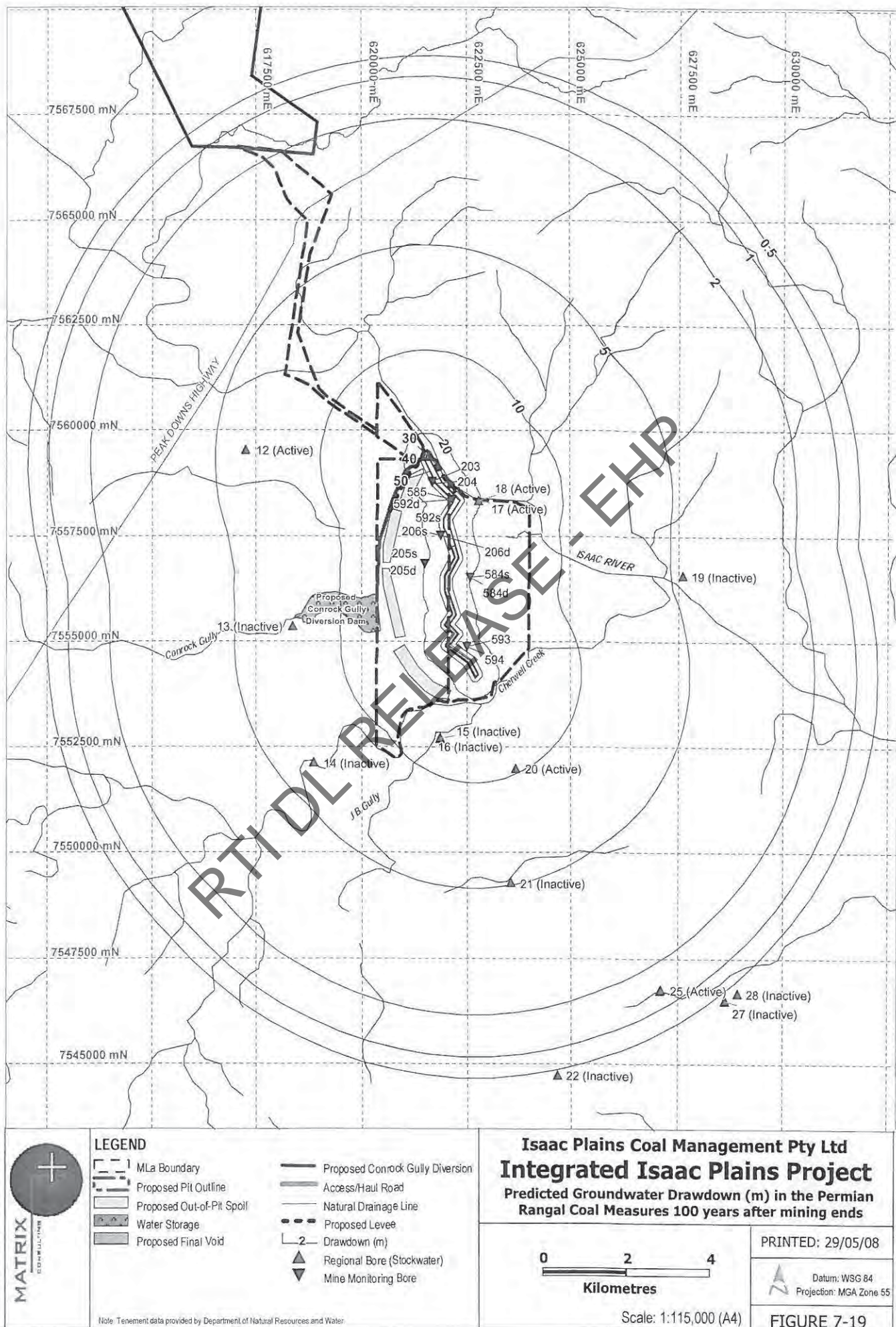


Figure 7-17 Final Void Water Level Predictions: TDS





7.4 GROUNDWATER MONITORING PROGRAM

Groundwater monitoring will be undertaken during and post-mining operations at the Expansion Area. The aim of the monitoring will be to assess the impact that mine progression has on the surrounding groundwater environment, both in radial extent and in the magnitude of the drawdown. Monitoring will provide early warning of any variation of the groundwater system from that predicted. This will enable the undertaking of mitigation measures to minimise impact on surrounding groundwater users.

The monitoring program will include monitoring of groundwater levels in all groundwater monitoring bores and in stock water bores located within 2 km of the Expansion Area. Groundwater quality monitoring will be more selective, targeting only the productive stock water bores, near field bores and existing monitoring bores. The bores located in the alluvium of the Isaac River will be monitored for EC only. It is quite likely that there will be very little depth of groundwater in the alluvium and it will be exceedingly difficult to take a water sample. In addition, because the alluvium is very thin, approximately 10 to 15 m in depth only, it is not likely that there will be any adverse return flow from the mine pit to the alluvium which could cause a deterioration of water quality.

It is proposed that a network of four additional near field monitoring locations and four regional monitoring locations be added to the existing monitoring bores 584s, 584d, 593 and 594 upon project approval. Existing bores will be monitored as per the proposed monitoring program in **Section 7.4.1**. Additional bores will be installed within 12 months of project approval. The exact total number of new bores to be installed will be unknown until drilling is conducted, as each monitoring site may include a number of aquifers.

Proposed locations for monitoring sites are indicated in **Figure 7-20**. At each location, separate monitoring bores will be installed within each aquifer encountered, e.g. the alluvial aquifer and coal measures. It is possible that not all aquifers will be present at each monitoring location.

7.4.1 Groundwater Monitoring Program During Mining Operations

Mine monitoring bores to the south of the Isaac River (203, 204, 585, 592s and 592d) will be destroyed as mining progresses in these areas. Stock Bore Nos 17 and 18, adjacent to the river, may not be suitable for long-term monitoring because of inadequate data on construction and condition. Consequently, additional monitoring bore(s) will be installed for the Isaac River monitoring area to cover these limitations and to monitor stream-aquifer interactions, i.e. Near Field Bore 1 and Near Field Bore 2 (refer to **Figure 7-20**).

The river-aquifer interaction can be determined best through analysis of long-term hydrologic records and site-specific data collection. Such data collection will include the following:

- periodic river flow measurements of river reaches within the general area (refer to **Section 6**);
- continuous river height monitoring at Isaac River gauging stations near the upstream and downstream boundaries of the proposed mining area (refer to **Section 6**);
- periodic water level measurements in bores near the Isaac River;
- continuous water level measurements using a data logger, for a 12 month period, in Near Field Bore 1 located between the mining operations and the Isaac River;
- installation of a gauge board in the Isaac River in the vicinity of Near Field Bore 1;
- measurement of EC in Near Field Bore 1 and Near Field Bore 2 on a six monthly basis;
- local precipitation measurements; and
- periodic monitoring of mine dewatering volumes.

Groundwater level fluctuation and water chemistry monitoring will be undertaken in groundwater bores surrounding the mining operations. The proposed operational phase groundwater monitoring program is outlined below. **Table 7-5** also provides a summary of the proposed program.

- Near field monitoring:
 - water levels will be continuously monitored using a data logger for a 12 month period then every six months, in Near Field Bore 1, which is a proposed new bore drilled into the alluvium between the mining operations and the Isaac River, to detect any aquifer-river interaction;
 - water levels will be monitored three monthly for the first 12 months of mining operations and then six monthly at a new monitoring site, Near Field Bore 2, and existing monitoring bores 584s, 584d, 593 and 594. These monitoring bores are located within 1.5 km of the proposed mining activities (refer to **Figure 7-20**). It is expected that some of these monitoring bores will detect a drop in water level within the first few years of the operational phase; and
 - where possible, groundwater samples will be collected six monthly from all near field monitoring sites. With the exception of samples from Near Field Bores 1 and 2, groundwater samples will undergo laboratory analysis for pH, EC, total dissolved solids, major cations, major anions, nutrients (total nitrogen, ammonia, total phosphorous and reactive phosphorous) and selected metals (aluminium, arsenic, cadmium, copper, lead, mercury, selenium and zinc) as indicated in **Table 7-5**. Analysis of Samples from Near Field Bores 1 and 2 will only be analysed for EC every six months.
- Regional monitoring:
 - water levels will be monitored monthly at four new monitoring sites (Regional Bores 1, 2, 3 and 4) for a period of two years, then monitored annually. Each of these monitoring locations is more than 1.5 km from the mining operations (refer to **Figure 7-20**). It is likely that these monitoring sites will detect a minimal decline in groundwater levels by the cessation of mining operations. Two monitoring sites are deliberately located outside of the predicted extent of impact to confirm the groundwater drawdown impact extent; and
 - groundwater samples will be collected annually from two new monitoring sites (Regional Bores 2 and 4). Groundwater samples will undergo laboratory analysis for pH, EC, total dissolved solids, major cations, major anions, nutrients (total nitrogen, ammonia, total phosphorous and reactive phosphorous) and selected metals (aluminium, arsenic, cadmium, copper, lead, mercury, selenium and zinc) as indicated in **Table 7-5**.

Monitoring results (water level and water chemistry) will be entered into the existing IPCM environmental database which will be updated regularly.

Table 7-5 Proposed Groundwater Monitoring Program

Bore	Parameter	Frequency
Near Field 1	Water levels	Water levels will be monitored continuously for a period of 12 months and then every six months
	EC	Every six months
Near Field 2	Water levels	Every three months for a period of 12 months and then every six months
	EC	Every six months
Near Field 3 and 4 and 584s, 584d, 593 and 594	Water levels pH, EC and TDS, major cations and major anions, total nitrogen, ammonia, total phosphorous and reactive phosphorous, Al, As, Cd, Cu, Pb, Hg, Se and Zn	Every three months for a period of 12 months and then every six months Every six months

Hydrogeology

Bore	Parameter	Frequency
Regional 1, 2, 3 and 4	Water levels Regional Bores 2 and 4 only - pH, EC and TDS, major cations and major anions, total nitrogen, ammonia, total phosphorous and reactive phosphorous, Al, As, Cd, Cu, Pb, Hg, Se and Zn	Monthly Annually
*Stock Watering Bores 12 and 20	Water levels	Every three months for a period of 12 months and then annually
*Stock Watering Bore 18	Water levels, abstraction rates, EC	Every three months for a period of 12 months and then annually

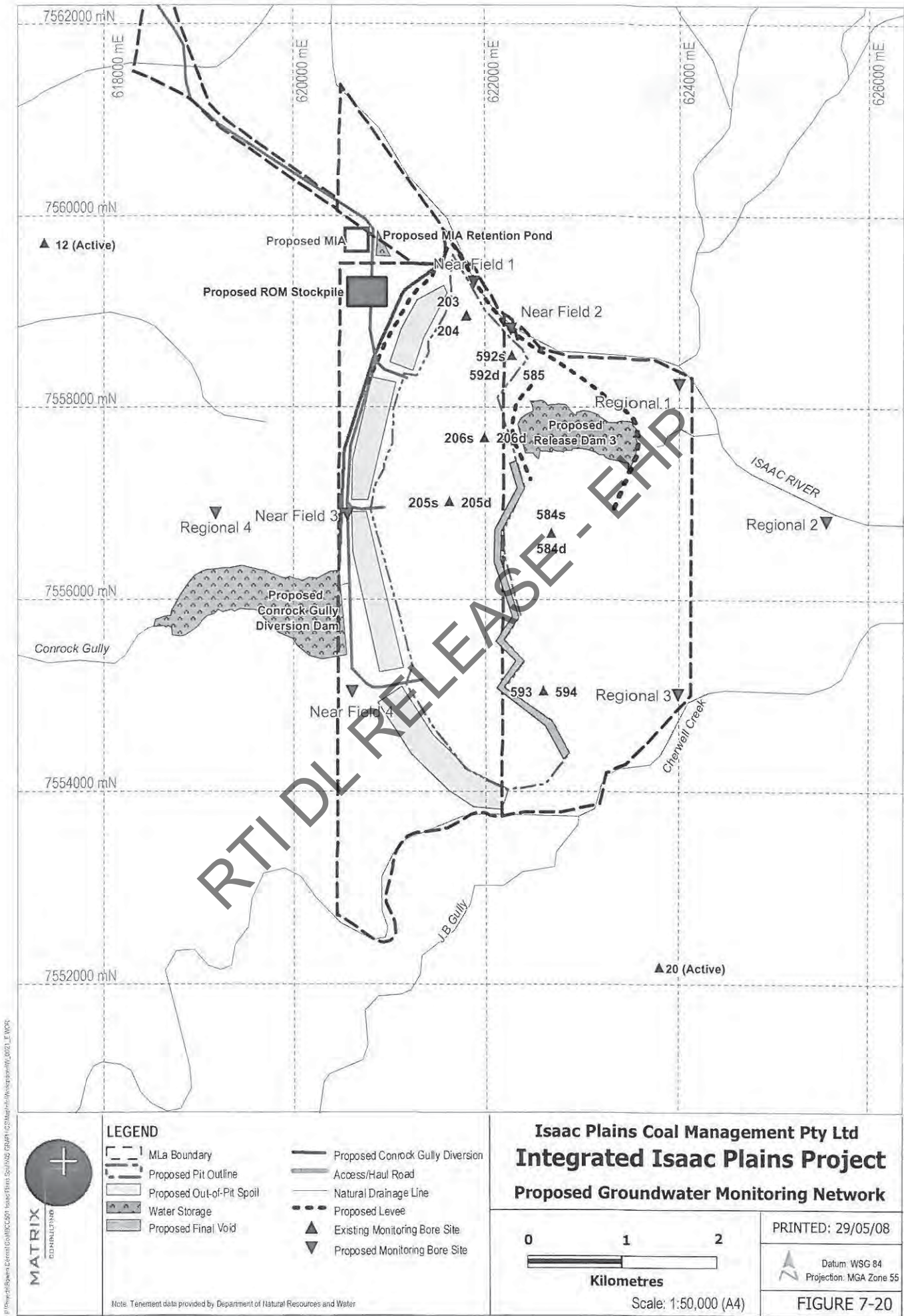
*After the initial monitoring period, any stock water bores believed to be unreliable due to poor construction, age, corrosion and other factors may be removed from the monitoring program.

7.4.1.1 Regional Landholder Bore Monitoring

To monitor the lateral extent of spread and the magnitude of drawdown and possible impacts on landholder water supplies, the water levels in all active stock water bores within 2 km of the Expansion Area will be monitored on a quarterly basis during the first year of mining followed by annual monitoring (refer to **Table 7-5**). After the initial monitoring period, any stock water bores believed to be unreliable due to poor construction, age, corrosion and other factors may be removed from the monitoring program. Bores No. 12 and 20 are the only existing stock water bores (within 2 km of the Expansion Area) which are being used at present and which are suitable for monitoring, and monitoring of water levels in these bores will continue throughout mining (refer to **Table 7-2** and **Figure 7-7**).

Stock water bore No. 20 has headworks, which prevent access for monitoring, and this bore is often pumped by its owners. Consequently, an agreement with the owners of bore No. 20 to monitor the bore may be required in the event the owners are concerned about the effects of mining. The hydrogeological risk at this bore is predicted to be low (refer to **Figure 7-12** and **Figure 7-13**). The monitoring of water levels, abstraction rates and salinity at bore No. 20 would provide useful historical data should any stakeholder concerns arise in the future and help to determine whether any such decline is as a result of over pumping, climatic conditions or due to mining impacts.

Bore No. 18, which is located in the Isaac River alluvium and approximately 340 m from the proposed pit, should be monitored (quarterly) for water levels, approximate abstraction rates and salinity as there exists some potential for drawdown at this point (refer to **Figure 7-12** and **Table 7-5**). The ephemeral river flow is likely to produce sporadic groundwater recharge and this may negate any drawdown impact produced by mining.



7.4.1.2 *Riparian Zone Monitoring*

The current assessment has indicated that there is likely to be potential for impacts on the riparian vegetation of the Isaac River as a consequence of groundwater level drawdown in the alluvium unit. A monitoring program will be initiated prior to and during mine operations to ensure the riparian vegetation is not threatened by groundwater level drawdown (if any). This component of the monitoring program will be developed and conducted to:

- determine the nature (or dependency) of the riparian vegetation to the groundwater system; and
- detect any drawdown and the potential impacts to the riparian vegetation.

In the unlikely event that a detrimental impact is forecast from the monitoring program, preventative measures will be taken to ensure the impacts are mitigated.

7.4.2 **Groundwater Monitoring Program Post-Closure Monitoring**

After mining has ceased and decommissioning and rehabilitation works are complete, the IPCM will seek to relinquish the Expansion Area Mining Leases. Prior to relinquishment, the Proponent will discuss the nature, scope and resourcing of an on-going groundwater monitoring program with the parties with whom it has had alternate water supply agreements. This program may be a continuation of that outlined for operational mining, or an agreed variation, depending on the circumstances at the time. It is anticipated that continuation of the agreed on-going program would become a condition of the EA.

Post-mining groundwater monitoring will be undertaken within monitoring bores that were installed during the operational phase of the project.

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8

AIR QUALITY

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

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RTI DL RELEASE - EHP

Air quality impacts, from coal mining and related activities such as coal transportation and processing, have the potential to be a nuisance to nearby residents in the absence of an adequate buffer distance or intervening barriers, or if there are inadequate source controls. At sufficiently high levels, dust can be intrusive and adversely affect amenity.

As potential impacts from air quality have the potential to combine with other outside emissions (i.e. cumulative impacts), of the potential for the IIPP to impact on air quality was undertaken by Noise Mapping Australia Pty Ltd (NMA) in the context of the Queensland *Environmental Protection (Air) Policy 1997* (EPP(Air)). A copy of the full technical report by Noise Mapping Australia (NMA, 2007) is included in **Appendix H**.

- the environmental values to be enhanced or protected;
- an outline of the parameters used in the air quality assessment;
- the air quality assessment criteria and policies applicable to the IIPP;
- the methodology adopted in the investigations; and
- potential impacts on the nearest sensitive receptors and mitigation measures.

8.1 ENVIRONMENTAL VALUES

- the wellbeing of the community or a part of the community, including its social and economic amenity; or
- the wellbeing of an individual without unreasonable interference from intrusive dust.

The nearby homesteads are deemed to be the nearest sensitive receptors. The nearest residence to the Expansion Area is the [redacted] homestead, approximately 1 km south of the southern most extent of the proposed area of disturbance. Other residences include the protection of an individual [redacted]

Figure 1-2 and Figure 1-3 illustrates the location of the homesteads in relation to the location of the IIPP and its features. The locations are annotated as S1 to S4. Distances from each homestead to the four most likely sources of dust generation at the IIPP are presented below in Table 8-1.

Table 8-1 Nearest Sensitive Receptors

Site No	Homestead	Approximate distance to mine features (km)			
		Northern Limit of Expansion Area	Nearest Access/Haul Road	CHPP	Existing Isaac Plains Coal Mine
S1	3) Prejudice the protection of an individuals right to privacy	1	2.5	20	15
S2		7	2	8	2
S3		9.5	2.5	5.5	3
S4		13	4	5	3

8.2 AIR QUALITY CRITERIA, LEGISLATION AND GUIDELINES

The EPP (Air) commenced on 1 February 1998. The objective of the policy (Part 2, Section 5) is to achieve the object of the EP Act in relation to Queensland's air environment. The EPP (Air) defines the unreasonable release of a contaminant to the air environment as meaning the release of odours, dust, smoke or other atmospheric contaminants that:

- cause unlawful environmental harm; and
- is unreasonable having regard to the following matters:
 - its characteristics;
 - its intrusiveness;
 - other releases of contaminants at the place affected by the release;
 - where the effects of the release of the contaminant can be noticed; and
 - the order in which the person releasing the contaminant started to carry out the activity from which the release is made, and persons affected by the release started to carry out other activities that may be affected by the release of the contaminant.

Schedule 1 of the EPP (Air) nominates relevant air quality indicators and goals. The relevant air quality indicators for the IIPP are:

- total suspended particulate (TSP) concentration of $90 \mu\text{g}/\text{m}^3$ averaged over a year; and
- a concentration of particulate matter with an aerodynamic diameter of less than $10 \mu\text{m}$ (PM10) of $150 \mu\text{g}/\text{m}^3$ averaged over 24 hrs, and $50 \mu\text{g}/\text{m}^3$ averaged over a year.

The *National Environmental Protection Measure for Ambient Air Quality* (NEPM Air) recommends the fifth highest PM10 dust concentration of $50 \mu\text{g}/\text{m}^3$ over a 24 hour averaging time.

The EPA Guideline "Preparing an Environmental Management Overview Strategy (EMOS) for Non-Standard Mining Projects" contains design limits for the release of dust and particulate matter. It states that dust or particulate matter or both resulting from a mining activity must not cause an environmental nuisance, at any sensitive or commercial place. The maximum permissible measured dust levels comprise:

- dust deposition of $120 \text{ mg}/\text{m}^2/\text{day}$, averaged over one month; and
- PM10 suspended in the atmosphere of $150 \mu\text{g}/\text{m}^3$ over a 24 hr averaging time, at a sensitive or commercial place downwind of the operational land.

8.3 EXISTING ENVIRONMENT

Potential sources of particulate emissions from the existing surrounding environment include:

- agricultural activities;
- unsealed roads;
- smoke;
- railway traffic; and
- the various coal mines and coal processing plants in the surrounding area.

Existing mines in the area, with approximate distances to IIPP, are:

- Peak Downs Mine, 8 km south-west of the existing mine and 5 km south of the Expansion Area;
- Carborough Downs Mine, 5 km east of the existing mine and 9 km north of the Expansion Area;

Air Quality

- Broadlea Mine, 4.5 km north-east of the existing mine and 17.5 km north of the Expansion Area;
- Poitrel Mine, 9 km south-east of the existing mine and 3 km east of the Expansion Area;
- Millennium Mine, 6 km south-east of the existing mine and 3 km north-east of the Expansion Area;
- Winchester Mine, 12 km south-east of the existing mine and 3.5 km east of the Expansion Area; and
- Moranbah North Mine, 7 km north-west of the existing mine and 20.5 km north-west of the Expansion Area.

Coal's Burton Mallowa Train Load-Out is also located in the area.

Figure 8-1 illustrates the ML boundaries of the above listed mines operating in the area surrounding the IIPP which contribute to the background levels present in the existing airshed.

Air pollutants other than dust, such as SO₂ and NO_x, are not considered relevant to this study, owing to their very low levels of emission and their very localised impact. The air pollutants of concern for open cut coal mines include TSP, respirable particulates less than (PM₁₀) and fine respirable particulates less than (PM_{2.5}).

Smoke may be generated occasionally from spontaneous combustion sourced from stockpiled coal or reject, although the Leichhardt seam coals are generally not prone to spontaneous combustion.

In 2004, an ambient air quality survey was conducted as part of the investigation for the existing Isaac Plains Coal Mine (ASK Consulting Engineers, 2005). Monitoring results are contained in **Table 8-2**. The 2005 report notes that the measurements were obtained after a rainy period and that dust levels were low. The results are expressed in terms of TSP, PM₁₀ and PM_{2.5}.

Table 8-2 Ambient Atmospheric Dust Concentration at Homestead

Location	Ambient Concentration(µg/m ³)		
	Total Particulates	PM ₁₀	PM _{2.5}
Homestead	13	6	2

Note: Average concentration over the period 14 October 2004 to 21 October 2004.

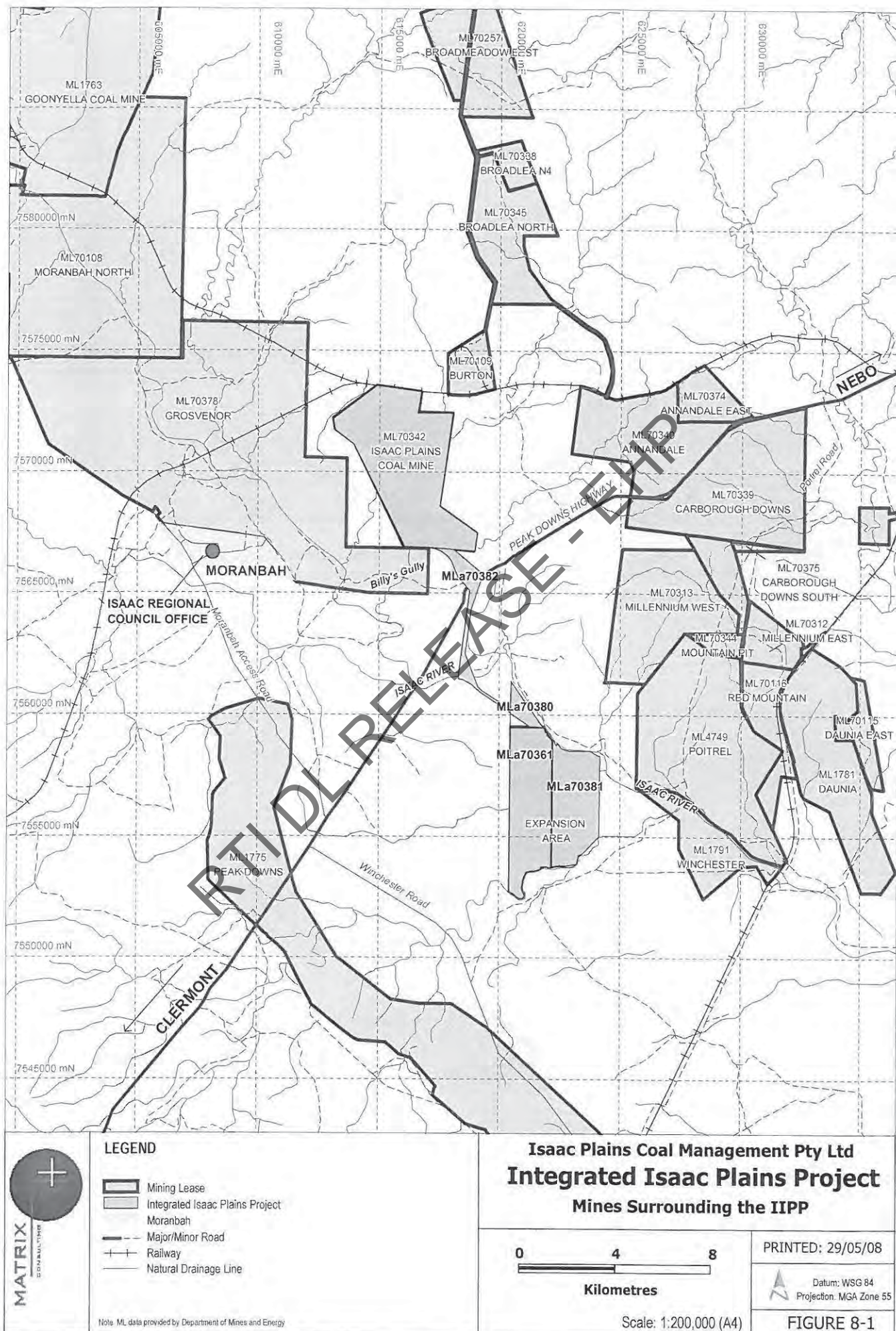
Although not required by the EA for the existing Isaac Plains Coal Mine, (in collaboration with the Broadlea and Carborough Downs Mines) IPCM has undertaken dust deposition monitoring since late 2005 (the commencement of the EA) at 22 locations within the site and in the wider surrounding community. Dust monitoring data obtained during this period will provide useful baseline information for the site and its immediate surrounds. Depositional dust monitoring will continue to be carried out regularly thereafter to ensure accurate data is available in the event of a complaint. In the case of valid complaints, real time monitoring for PM₁₀ and PM_{2.5} will be carried out immediately at a suitable location for an appropriate timeframe in accordance with the EPP (Air) and the EA.

Dust monitoring locations are listed in **Table 8-3** and are illustrated in **Figure 8-2**.

Code	Location Description
sch4p3(3)	Prejudice the protection of an individual's right to privacy east of Moranbah.
sch4p3(3)	Prejudice the protection of an individual's right to privacy east of Moranbah.
sch4p3(3)	Prejudice the protection of an individual's right to privacy east of Moranbah.
DD-19sch4p3*	Prejudice the protection of an individual's right to privacy Moranbah.
DD-19sch4p3*	Prejudice the protection of an individual's right to privacy east of Moranbah.
sch4p3(3)	Prejudice the protection of an individual's right to privacy east of Moranbah.
sch4p3(3)	Prejudice the protection of an individual's right to privacy east of Moranbah.
sch4p3(3)	Prejudice the protection of an individual's right to privacy east of Moranbah.
DD-9sch4p3(3)	Prejudice the protection of an individual's right to privacy Moranbah.
DD-19sch4p3*	Prejudice the protection of an individual's right to privacy east of Moranbah.
sch4p3(3)	Prejudice the protection of an individual's right to privacy east of Moranbah.
DD-13sch4p3(3)	Prejudice the protection of an individual's right to privacy east of Moranbah.
sch4p3(3)	Prejudice the protection of an individual's right to privacy Moranbah.
sch4p3(3)	Prejudice the protection of an individual's right to privacy Moranbah.
sch4p3(3)	Prejudice the protection of an individual's right to privacy east of Moranbah.
sch4p3(3)	Prejudice the protection of an individual's right to privacy east of Moranbah.
(3) DD-17sch4p3*	Prejudice the protection of an individual's right to privacy south-east of Moranbah
DD-19sch4p3*	Prejudice the protection of an individual's right to privacy east of Moranbah
DD-19sch4p3(3)	Prejudice the protection of an individual's right to privacy south-east of Moranbah
DD-20sch4p3(3)	Prejudice the protection of an individual's right to privacy south-east of Moranbah
sch4p3(3)	Prejudice the protection of an individual's right to privacy east of Moranbah
DD-22sch4p3(3)	Prejudice the protection of an individual's right to privacy east of Moranbah

* IPCM is responsible for the dust results from these locations.

Dust results collected to date are provided in **Table 8-4**. A review of the results illustrate that occasional exceedences have occurred at Moorvale (DD-1) and Moranbah residence (DD-10) since the commencement of monitoring in October 2005, none of which have been the subject of complaints. The results are a combination of all background sources of dust, including the surrounding mines, in combination with any emissions from mining activities conducted by IPCM. Monitoring sites which exhibit exceedences are not located in the same part of the monitoring area, i.e. they are scattered throughout the monitoring area, with two in close proximity to the IPCM mining activities. The remainder are not downwind of the activities. Averaged results over the period since monitoring commenced were all well below the monthly limit. No dust complaints have been received about the existing Isaac Plains Coal Mine since construction and operations began at the site in the third quarter of 2006.



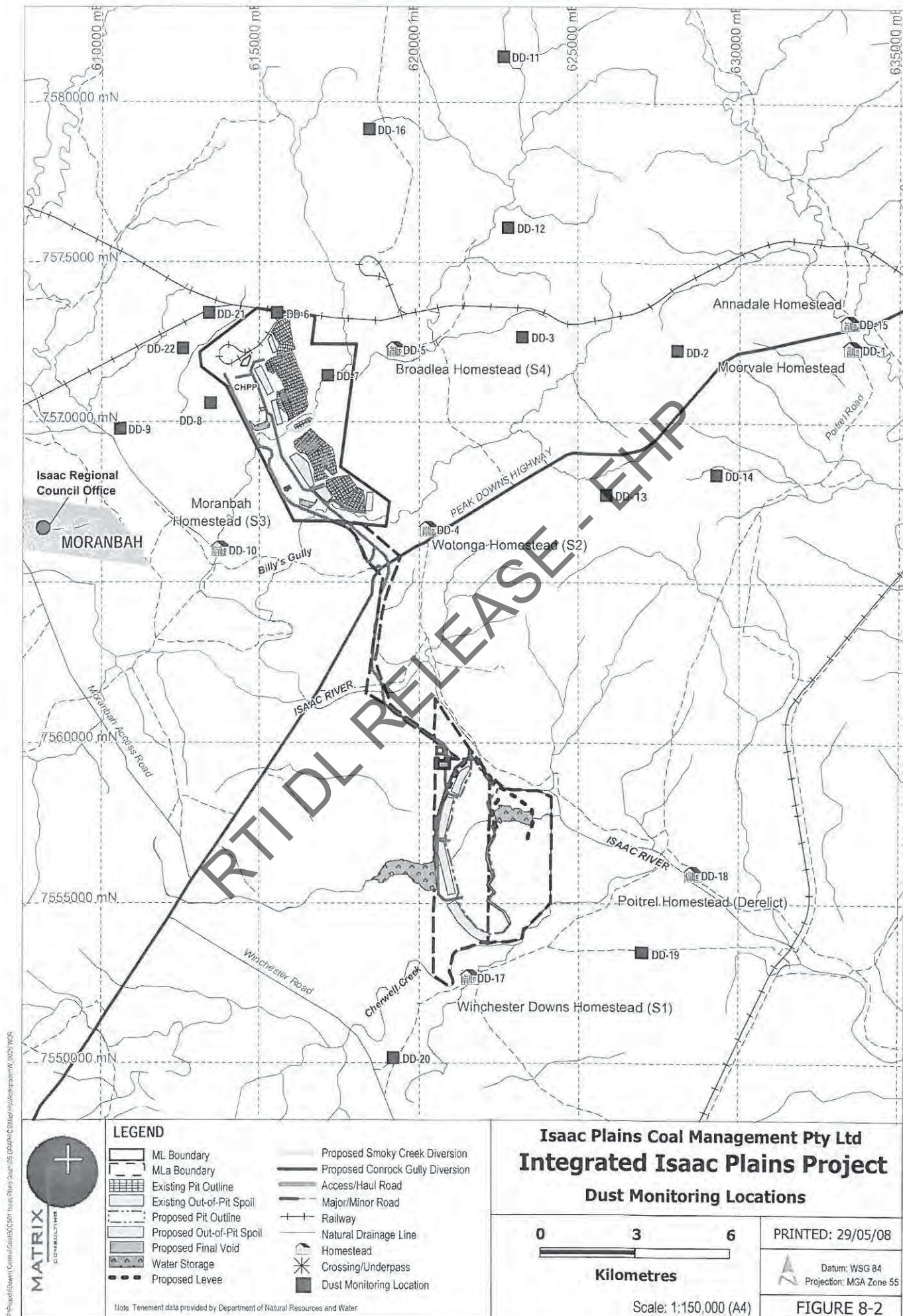


Table 8-4 Ambient Atmospheric Dust Deposition Results

Monitoring Period		Dust deposition (DD)- Insoluble matter g/m ² /month														
Start	End	DD1	DD4◇	DD5◇	DD6	DD7	DD8	DD9	DD10◇	DD13	DD17◇	DD18	DD19	DD20	DD21	DD22
Limit - 3.6 g/m ² /month (from the EPA Guideline 8 Limit 120 mg/m ² /day)																
5/10/05	9/11/05	0.8	0.8	0.9	1.0	1.0	1.1	1.3	1.6	0.5	-	-	-	-	-	-
9/11/05	6/12/05	0.6	1.4	1.6	1.2	0.9	1.6	1.3	1.0	2.3	-	-	-	-	-	-
6/12/05	16/01/06	1.2	1.1	1.2	1.3	0.5	0.6	0.3	1.5	1.1	-	-	-	-	-	-
16/01/06	17/02/06	0.8	1.0	1.2	0.4	0.7	0.7	1.0	1.1	1.5	0.5	0.6	0.6	1.1	-	-
17/02/06	17/03/06	1.6	0.9	0.8	1.2	0.7	0.7	0.6	3.4	1.6	0.8	0.5	0.5	0.4	-	-
17/03/06	18/04/06	1.2	0.5	0.4	1.0	0.2	0.5	0.3	1.0	0.6	0.6	0.3	0.4	0.4	-	-
18/04/06	19/05/06	0.8	0.8	0.3	1.6	0.3	1.0	0.4	1.4	0.8	0.4	0.3	0.3	0.4	-	-
19/05/06	16/06/06	1.3	0.6	0.8	1.2	0.8	0.5	1.4	8.2	0.9	0.7	0.5	0.5	0.6	0.7	-
16/06/06	21/07/06	0.8	0.6	1.0	1.0	0.4	4.8	0.3	7.3	0.8	0.5	0.3	0.3	0.6	0.3	-
21/07/06	22/08/06	0.1	0.4	0.2	0.7	0.4	0.8	0.3	0.7	0.2	0.2	0.2	0.2	0.4	0.8	1.0
22/08/06	25/09/06	1.0	0.8	1.1	11.5	0.7	1.8	1.6	0.4	1.3	0.3	0.2	0.2	1.1	0.8	3.4
21/09/06	20/10/06	1.1	0.8	0.1	1.5	0.9	1.9	1.8	3.3	0.2	0.3	1.1	0.6	0.6	0.8	1.2
20/10/06	16/11/06	7.8	0.8	0.2	1.5	0.9	1.9	1.8	3.3	1.1	0.3	1.1	0.6	0.6	0.8	1.2
16/11/06	21/12/06	5.8	1.2	0.4	1.6	0.8	1.9	1.9	1.6	1.9	0.9	0.9	1.2	0.9	1.1	1.3
Average		1.7	0.8	0.7	2.0	0.7	1.4	1.0	2.6	1.1	0.5	0.5	0.5	0.6	0.8	1.6

◇ signifies a sensitive receptor.

Bold – exceed the EPA Guideline 8 Limit.

8.4 MODELLING

In order to determine the potential impacts of dust from the IIPP on the surrounding environment air quality modelling was undertaken. The air quality modelling comprised:

- generation of meteorological conditions using CSIRO's TAPM V3 model using database for the years 2004 and 2005. TAPM is a prognostic meteorological model which eliminates the need to have site-specific meteorological observations. The model can predict airflow importance to local scale air pollution such as sea breezes and terrain induced flows. The EPA consider it is preferable to use the TAPM model for the generation of meteorological data for sites where observed meteorological data is not available and in cases where the site is subject to land breeze effects;
- development of an emissions database using both US-EPA AP-42 (2003) 5th Update 2003 and the Australian National Pollution Inventory (NPI) "Emission Estimation Technique Manual for Mining Version 2.3"; and
- modelling of the likely downwind ground level concentrations using the Ausplume model.

Typically, particulate matter is characterised by its size. The usual particulate size ranges specified in ambient air criteria are TSP, PM10 and PM2.5. By definition, TSP includes both the PM10 and PM2.5 fractions, and PM10 includes the 2.5 fraction.

Normally dust particles with an aerodynamic diameter of more than PM10 will typically fall out and be deposited onto the ground within several minutes. Aerodynamic diameters account for the density of the dust involved. The PM10 fraction does not have a significant settling velocity component and will tend to behave in a gaseous fashion, that is, the fall out time is significantly longer than a few minutes.

Ausplume V6 was used to determine the downwind ground level concentrations. Ausplume is a gaussian plume dispersion model whose mathematical basis derives from the Victorian Environment Protection Authority's "Plume Calculation Procedure" (EPAV: 1985), which is itself an extension of the US EPA ISC model of Bowers *et al.* (1979). It is designed to predict ground level concentrations or dry deposition of pollutants emitted from one or more sources, which may be stacks, area sources, volume sources, or any combination of these. Line sources are not explicitly handled, but it is possible to improvise by modelling with multiple volume sources. The Ausplume model for the IIPP utilised the TAPM meteorological file developed for the site using the 2004 and 2005 meteorological data.

The TAPM results have compared favourably with long-term manual monitoring records for Moranbah. In recent air quality assessments, the use of TAPM has been confirmed as acceptable by the EPA.

8.4.1 Meteorology

The Moranbah region has a warm, dry climate with two distinct seasons, a dry winter season and a wet summer season. Winter temperatures average from 3°C to 25°C, while summer temperatures range from around 15°C to 34°C. The region averages approximately 600 mm of rainfall each year, falling mostly between October and March, however, the average evaporation rate for the Moranbah area is over four times that of the average rainfall. Further details on the climate of the Moranbah area are provided in **Section 4**.

The CSIRO's air quality model TAPM was used to generate hourly two-year meteorological data required for the air pollution dispersion model Ausplume.

Air Quality

The general features of winds affecting plume dispersion are illustrated in the wind rose diagrams for the year 2005, illustrated in **Figure 8-3** and **Figure 8-4**. The wind roses summarise the wind statistics at a 10 m height on-site, as calculated by the TAPM meteorological model. The wind roses show the frequency of occurrence of winds by direction and strength. The bars correspond to the 16 compass points, i.e. N, NNE, NE, ENE, E etc. The length of the bar represents the frequency of occurrence of winds from that direction, and the colour of the bar sections correspond to wind speed categories. It is noted that the predominant wind direction during the year is from the north-east through to the south-east. **Table 8-5** presents the representative frequency of Pasquil stability classes for the region and is based on data from TAPM. Pasquil stability classes represent the stability of the atmosphere. The stable Class F conditions, which result in poor dispersion of pollutants, occur for approximately 36 % of the time.

Table 8-5 Frequency of Stability Classes at IIPP

Stability Class	Description	Frequency of Occurrence (%)
A	Very unstable	2
B	Moderately unstable	13
C	Slightly unstable	18
D	Neutral	21
E	Slightly stable	10
F	Stable	36

8.4.2 Air Quality – Emissions Data

The potential dust emission sources comprise the following:

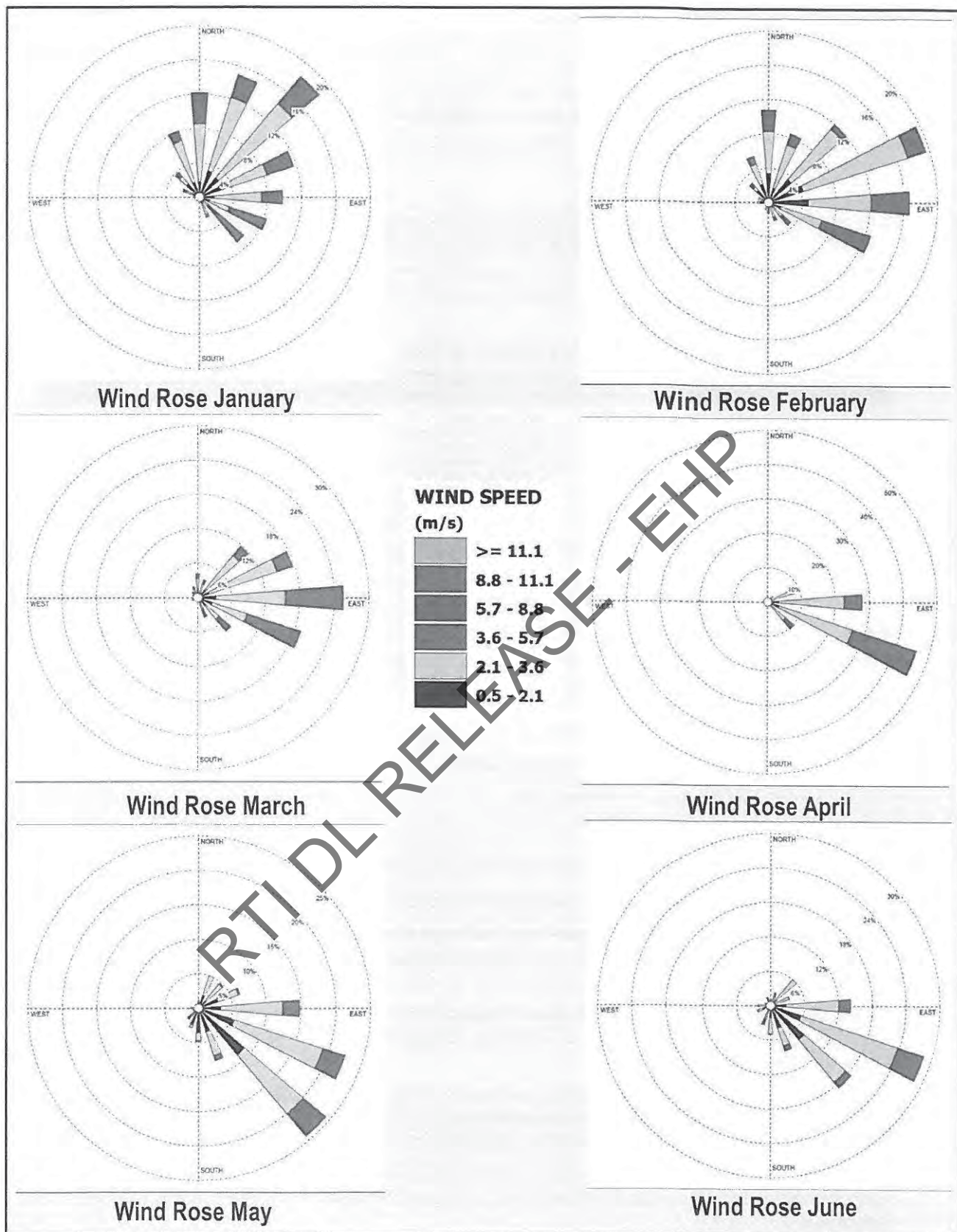
- clearing vegetation and removing topsoil;
- drilling and blasting spoil;
- excavation and replacement of spoil;
- extracting and handling coal;
- the CHPP operation;
- coal crushing, stockpiling and rail load-out; and
- vehicle movements on unpaved roads such as the transport of coal on haul roads.

In addition to these activities, dust generation will occur through wind erosion of stockpiles and areas of bare soil. Vehicle generated dust is also partially wind generated. The main emission during coal rail transport is wind generated dust.

Each of these emission sources have been included in the model. It will be noted that the emission rates are for future operations, i.e. an annual production of up to 4 Mtpa ROM coal and 3.3 Mtpa washed product coal.

Additional emission sources are internal combustion engines. Emissions from internal combustion engines are significant contributors to the greenhouse gas (CO₂) emissions but contribute only a small fraction of the particulate load and therefore have not been included in the modelling conducted.

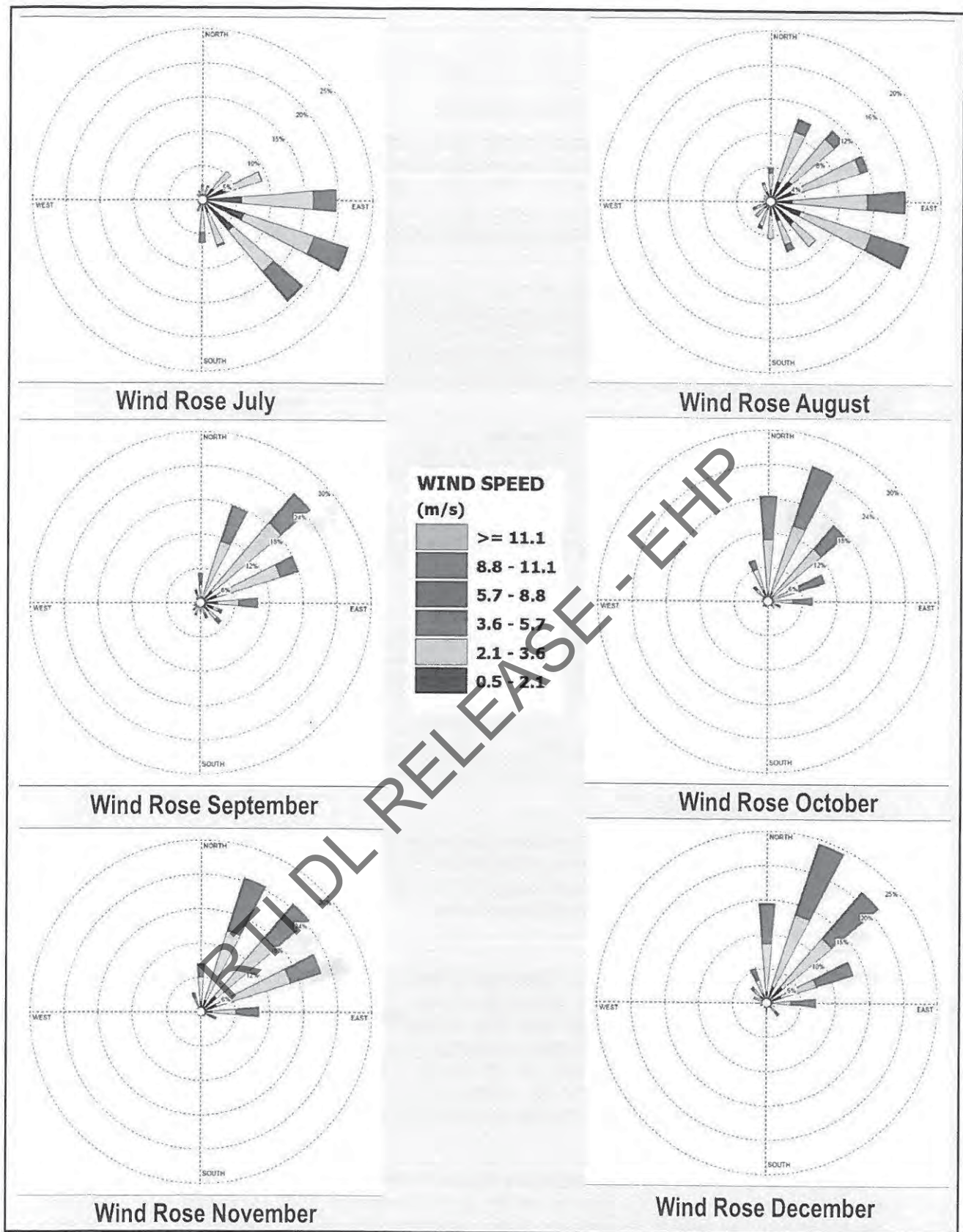
A summary of relevant emission factors with further details on the methodology to calculate the various emission factors contained in the full Air, Noise and Vibration Assessment Report is provided in **Appendix H**.



Isaac Plains Coal Management Pty Ltd
Integrated Isaac Plains Project
 Wind Speed Direction Charts January to June 2005
 (based on TAPM-generated wind modelling data)
 Moranbah Climate Data

FIGURE 8-3

Note: Climate Data Provided by BOM, 2007



Isaac Plains Coal Management Pty Ltd
Integrated Isaac Plains Project
 Wind Speed Direction Charts July to December 2005
 (based on TAPM-generated wind modelling data)
 Moranbah Climate Data

FIGURE 8-4

Note: Climate Data Provided by BOM, 2007

8.4.2.1 *Wind Erosion from ROM Coal Stockpiles*

An existing ROM coal stockpile is located adjacent to the CHPP at the existing Isaac Plains Coal Mine. A new ROM coal stockpile is proposed for the Expansion Area where coal will be stored prior to transport to the ROM coal stockpile at the CHPP. At the existing Isaac Plains Coal Mine, ROM coal is pushed from stockpiles into the feeder breaker by bulldozers where it is then transported into the CHPP by conveyor. It is assumed that the 'Emerald' wind erosion emission rate of 0.06 kg/ha/hr applies.

The wind erosion factor of 0.06 kg/ha/hr was calculated using the Australian National Pollution Inventory (NPI) standard equation and by inputting local BoM meteorological input data for the Moranbah area. This results in the same "default" emission rate of 0.06 kg/ha/hr which was obtained by Sinclair Knight Mertz in June 2005¹ for the Emerald region (refer to **Appendix H** for further details). NB: The wind erosion factor was also discussed with EPA technical staff following their review of the draft EIS.

8.4.2.2 *Stockpile Loading and Unloading*

At the Expansion Area ROM, the coal will be loaded onto coal haulage trucks by means of a front-end loader.

For an excavator or a front-end loading truck, emission rates of 0.029 kg/t for TSP and 0.014 kg/t for PM10 have been adopted, as per the NPI "Emission Estimation Technique Manual for Mining Version 2.3".

8.4.2.3 *CHPP*

The CHPP comprises various crushing and washing operations. The operation is 'wet' and has limited dust emissions. The emission rates are taken to be 0.02 kg/t for PM10 and 0.05 kg/t for TSP, have been sourced directly from the NPI "Emission Estimation Technique Manual for Mining Version 2.3" for crushing and screening wet product. The CHPP already exists as part of the existing Isaac Plains Coal Mine, and the emission source refers to both the existing and additional coal to be processed for IIPP, i.e. the total from the IIPP. NB: The CHPP was approved for the existing Isaac Plains Coal Mine based on conservative modelling for a 24 hr, 7 days per week operation.

8.4.2.4 *Rail Loader*

Using the NPI "Emission Estimation Technique Manual for Mining Version 2.3" the emission factor for a rail loader is calculated to be 0.0004 kg/t for TSP and 0.00017 kg/t for PM10. This emission refers to the existing and additional coal to be processed, by the rail loader, for the IIPP, i.e. the total from the existing Isaac Plains Coal Mine and the Expansion Area.

8.4.2.5 *Access/Haul Road*

Using the NPI "Emission Estimation Technique Manual for Mining Version 2.3" the calculated emissions, from the access/haul road are based on laden 180 tonne vehicle travelling at an average speed of 40 km/h on an uncontrolled road. The emissions are 9 kg/VKT for TSP and 3 kg/VKT for PM10 (VKT represents vehicle kilometre travelled). The application of water or chemical dust suppressants on the access/haul road will significantly reduce emissions. Therefore, the emission factor is highly conservative given that the access/haul roads will be watered. Vehicle speeds on the access/haul roads will also be limited so that excessive dust generation will not occur.

8.4.2.6 *Dragline*

Using the NPI "Emission Estimation Technique Manual for Mining Version 2.3" the calculated emissions during dragline use are 0.026 kg/bcm (PM10) and 0.06 kg/bcm (TSP) where bcm is a bank cubic meters moved. The default NPI emission factor, adopted in this report, is based on significant drop heights (15 m) and very low moisture content (2.5%). It is likely that the actual drop heights would be lower and moisture content higher due to less exposure time which would result in lower emissions from use of the dragline.

¹ Recommendations contained in a review of the NPI document by Sinclair Knight Mertz (SKM) "Improvement of NPI Fugitive Particulate Matter Emission Estimation Techniques", June 2005 commissioned by the Western Australian Department of Environment.

Air Quality

8.4.2.7 Truck and Shovel

Using the NPI "Emission Estimation Technique Manual for Mining Version 2.3" the calculated emissions for shovels are based on the number of tonnes moved. For PM10 the emission factor is 0.012 kg/t and for TSP the emission factor is 0.025 kg/t.

8.4.2.8 Combined Emissions

A summary of the dust emissions, calculated using NPI techniques, for each of the dust generating activities associated with the IIPP is contained in **Table 8-6**. For the IIPP, dust from unpaved roads is the main dust source associated with hauling coal from the ROM coal stockpile within the Expansion Area to the CHPP at the existing Isaac Plains Coal Mine.

Table 8-6 Maximum Annual Dust Emissions for the IIPP (4 Mtpa ROM)

Operation/Activities	Emission Type	Units	PM10	TSP
Unpaved roads in pit	Coal	kg/y	140,000	670,000
Loading trucks	Coal	kg/y	70,000	128,000
Trucks unloading	Coal	kg/y	18,500	44,000
CHPP	Coal	kg/y	9,000	58,400
Rail loader	Coal	kg/y	340	800
Dragline dumping spoil	Soil	kg/y	211,200	756,800
Trucks loading/dumping spoil/pre-strip	Soil	kg/y	246,400	510,400
Stockpiles	Coal	kg/y	2,100	2,100
Unpaved roads	Road base	kg/y	1,200,000	4,000,000
Blasting	Soil	kg/y	2,067	3,976
Road grading	Road base	kg/y	1,836	7,111
Truck and Shovel	Coal	kg/y	119	248
Dragline	Coal	kg/y	257	594

8.4.3 Air Quality Calculations

The dust emissions listed in **Table 8-6** were included in the Ausplume model at the appropriate locations. The likely dust levels resulting from the operation of the IIPP at each of the identified sensitive receptors, i.e. nearby residences, have been calculated and are presented in **Table 8-7**.

The pit in the Expansion Area has been divided into four zones as noted in **Table 8-6**, each section being approximately one quarter of the pit divided along the east-west axis. Thus, Zone 1 is the northern end of the pit and Zone 4 at the southern end (refer to **Figure 8-5** to **Figure 8-14**). Zones delineate the distance from the nearest sensitive receptor at the southern end of the proposed Expansion Area.

It should be noted that for the purpose of this EIS, all modelling is based on the future operations of the IIPP, i.e. cumulative modelling of existing Isaac Plains Coal Mine and Expansion Area. The impacts of the existing Isaac Plains Coal mine operations alone (if any) would be observed in the extensive dust deposition records.

Table 8-7 Predicted Dust Concentration and Dust Deposition from IIPP Operations (at Sensitive Receptors)*

Receptor	Predicted Dust Values from IIPP			
	PM10 (24 hr) ($\mu\text{g}/\text{m}^3$)	PM10 (Annual Average) ($\mu\text{g}/\text{m}^3$)	TSP (Annual Average) ($\mu\text{g}/\text{m}^3$)	Dust Deposition (Annual Average) ($\text{mg}/\text{m}^2/\text{day}$)**
Guideline	150	50	90	120
Assumed Existing Ambient	20	8	20	25
CHPP, Haulage, Surface & Pit Operations (Shovel) Zone 1 - northern end of pit				
S1	82	12	24	30
S2	92	12	24	28
S3	101	30	42	28
S4	92	10	22	27
CHPP, Haulage, Surface & Pit Operations (Shovel) Zone 2 - 1.4 km from northern end of pit				
S1	83	12	24	30
S2	95	12	24	28
S3	108	28	40	28
S4	92	10	22	27
CHPP, Haulage, Surface & Pit Operations (Shovel) Zone 3 - 2.8 km from northern end of pit				
S1	111	15	25	30
S2	93	12	24	28
S3	90	28	40	28
S4	92	10	22	27
CHPP, Haulage, Surface & Pit Operations (Shovel) Zone 4 - 3.2 km from northern end of pit				
S1	240	27	39	48
S2	90	12	24	28
S3	86	29	41	28
S4	91	10	22	27

* Sensitive Receptors as defined in **Table 8-1**.

** The calculated dust deposition was modelled as the maximum daily dust deposition (not an average over all time periods)

NB: 1. The modelled deposition and concentrations include the assumed ambient levels. Distances are approximate.

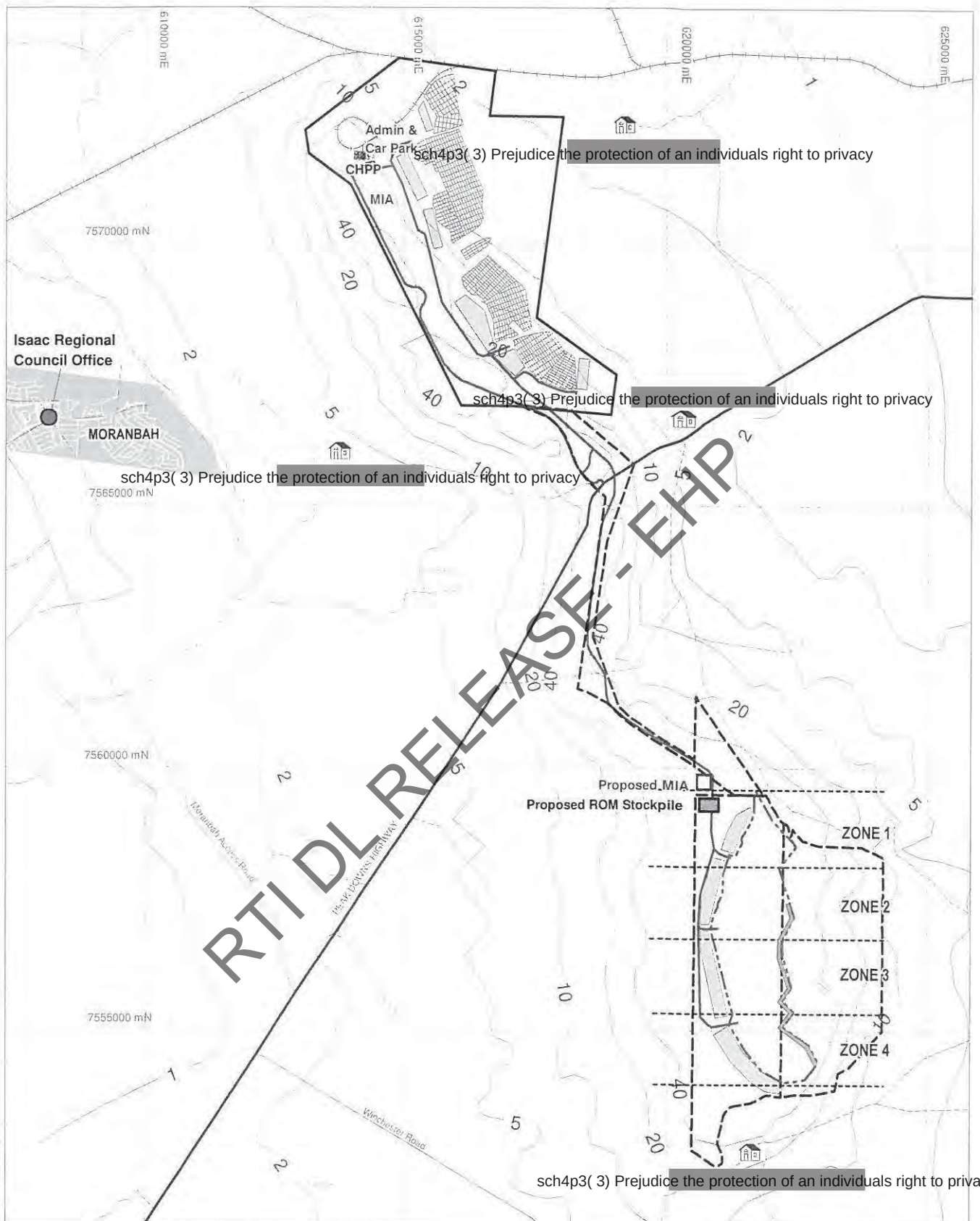
2. Bold text indicates an exceedance of the Guideline.

Contours have been modelled to illustrate dust deposition rates and concentrations for the IIPP as follows:

- maximum 24 hr dust deposition for truck and shovel and dragline operations – refer to **Figure 8-5** and **Figure 8-6** respectively;
- annual average PM10 dust concentrations for truck and shovel and dragline operations – refer to **Figure 8-7** and **Figure 8-8** respectively;
- 24 hr maximum PM10 dust concentrations for truck and shovel and dragline operations are illustrated in **Figure 8-9** and **Figure 8-10** respectively;
- annual average TSP dust concentrations for truck and shovel and dragline operations are illustrated in **Figure 8-11** and **Figure 8-12** respectively; and
- 24 hr maximum TSP dust concentrations for truck and shovel and dragline operations are illustrated in **Figure 8-13** and **Figure 8-14** respectively.

A discussion of the results is provided in **Section 8.5**.

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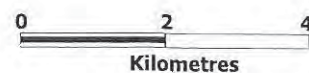
- ML Boundary
- MLa Boundary
- Existing Pit Outline
- Proposed Pit Outline
- Existing Out-of-Pit Spoil
- Proposed Out-of-Pit Spoil
- Proposed Final Void
- Access/Haul Road
- Major/Minor Road

Note: Topographic data provided by Department of Natural Resources and Water

- 10 Dust Deposition Contour mg/m²/day
- Railway
- Homestead

Isaac Plains Coal Management Pty Ltd Integrated Isaac Plains Project

Maximum 24 hr Dust Deposition - Truck and Shovel



Scale: 1:100,000 (A4)

PRINTED: 29/05/08

Datum: WGS 84
Projection: MGA Zone 55

FIGURE 8-5

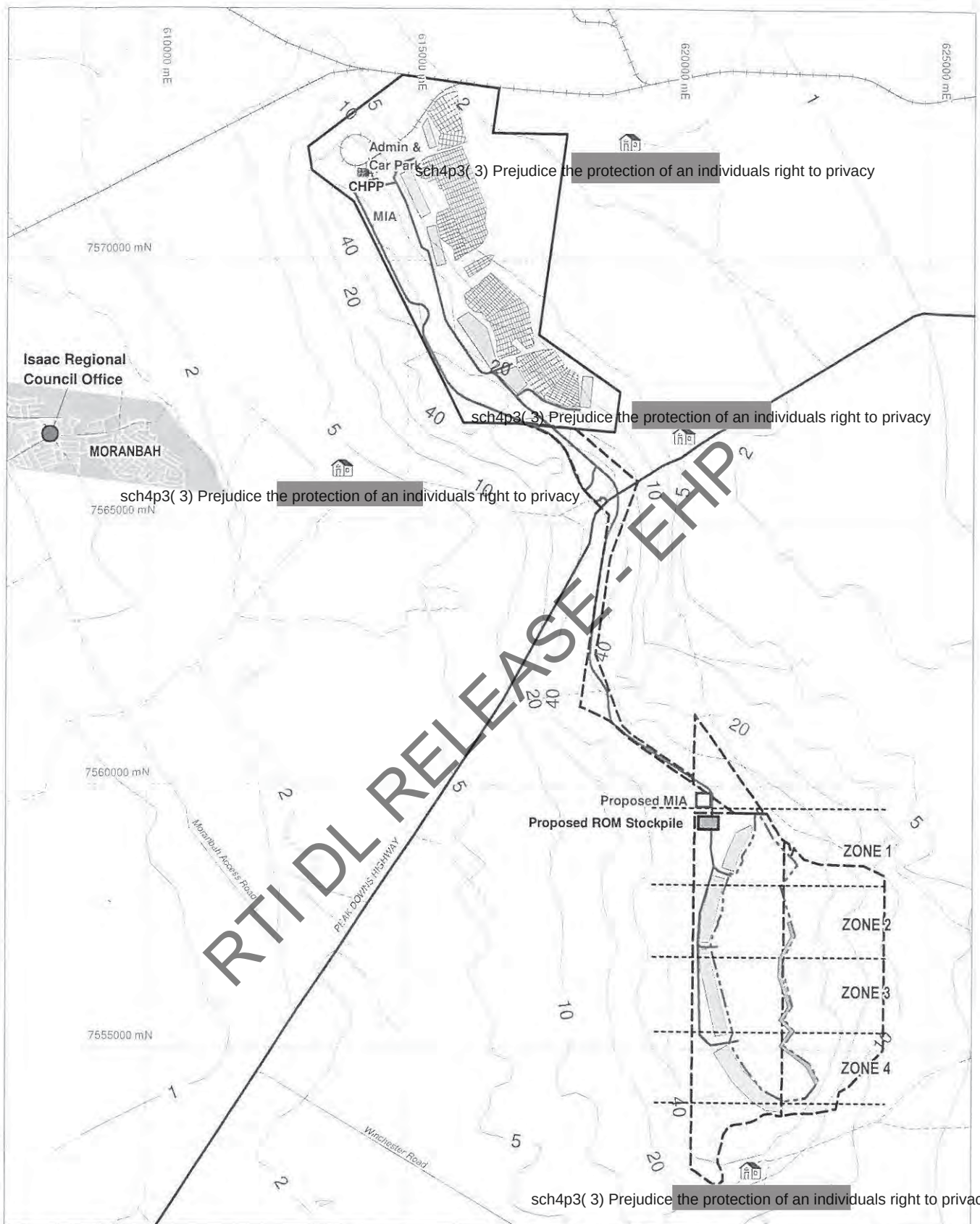
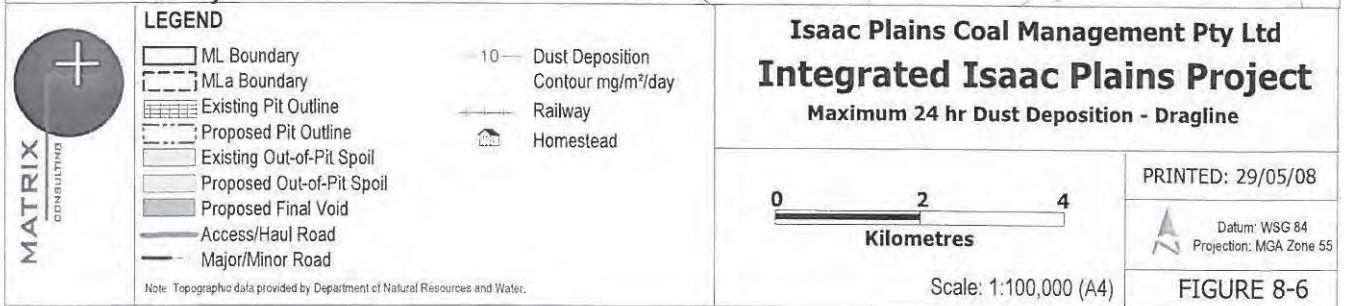
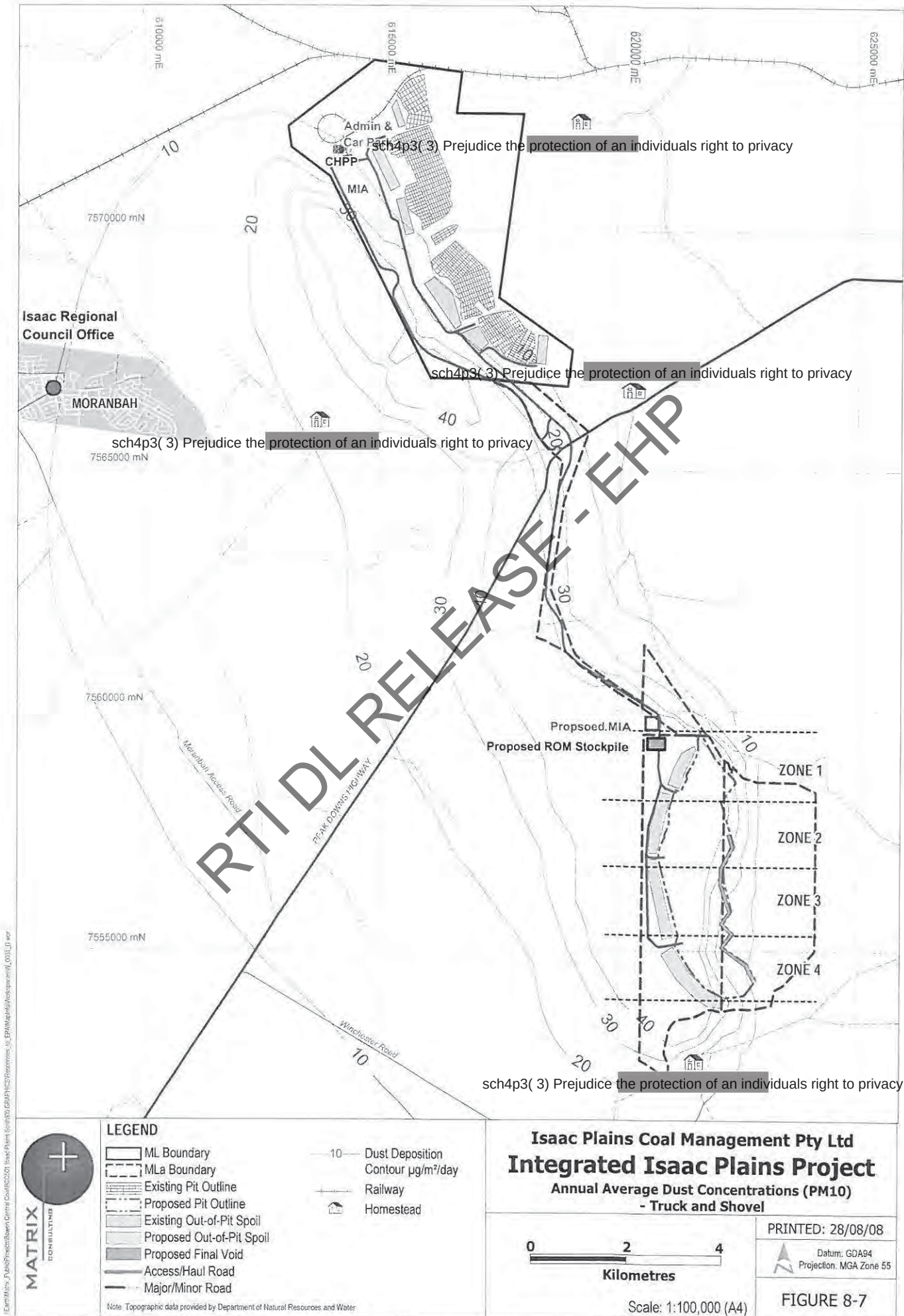
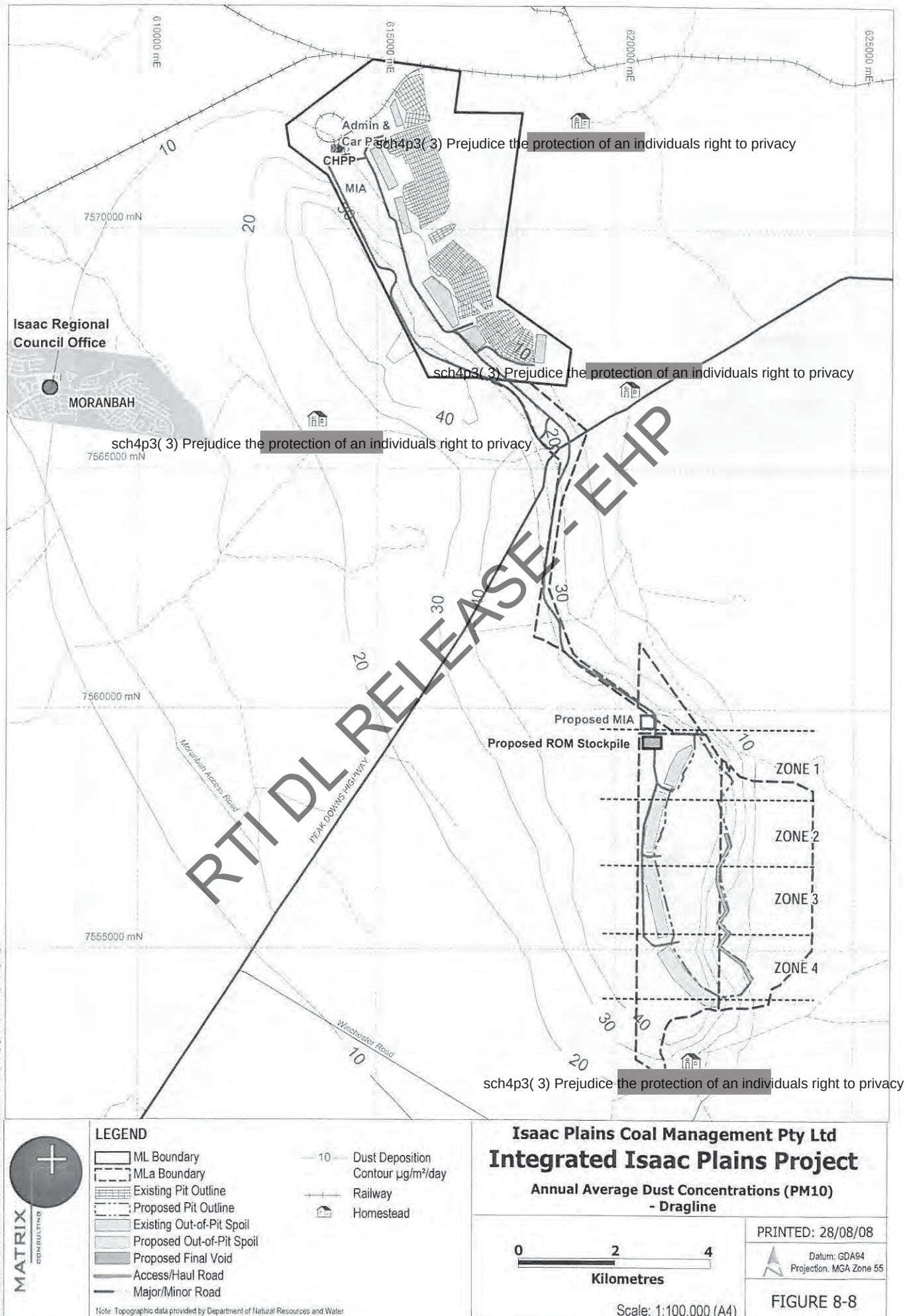
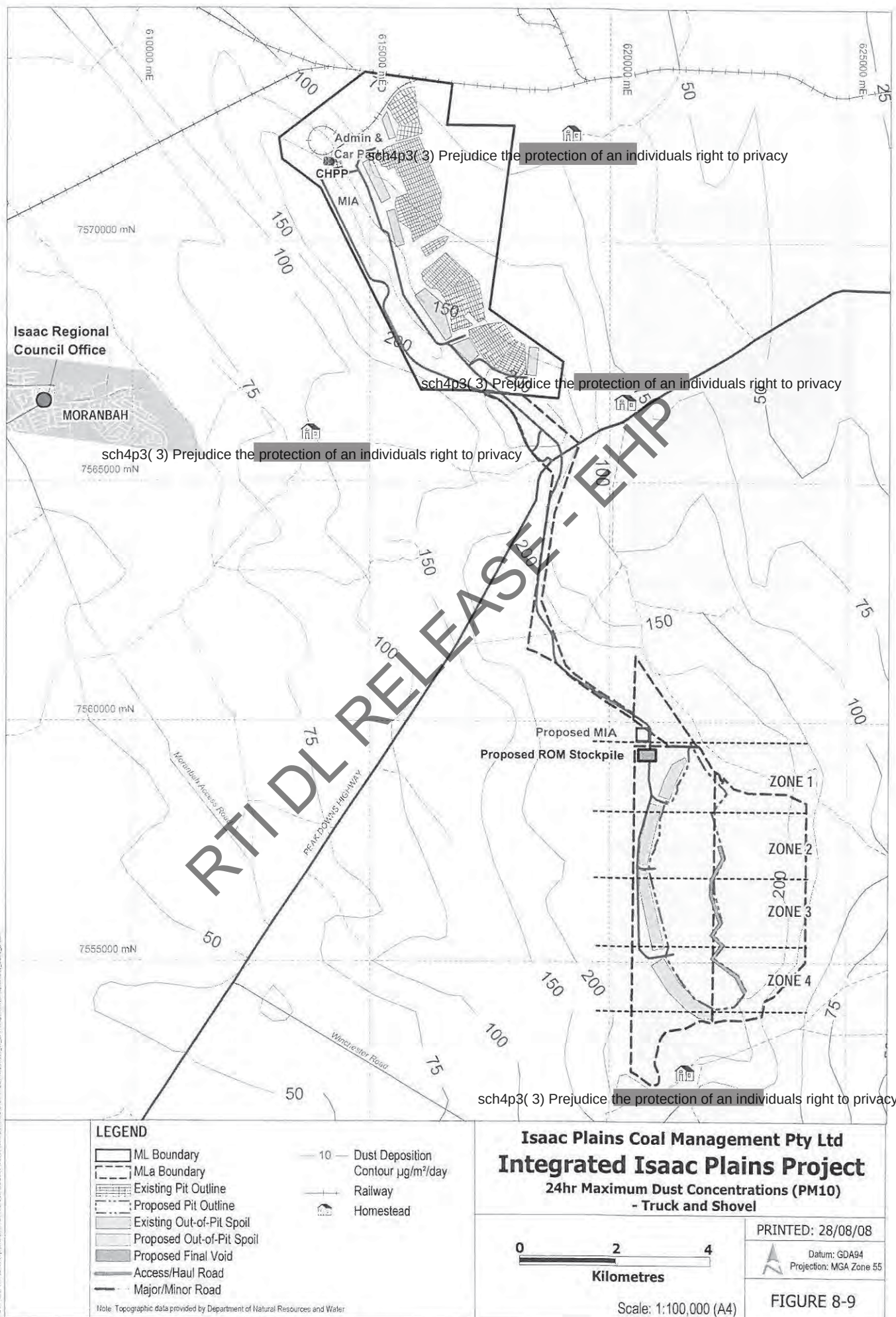


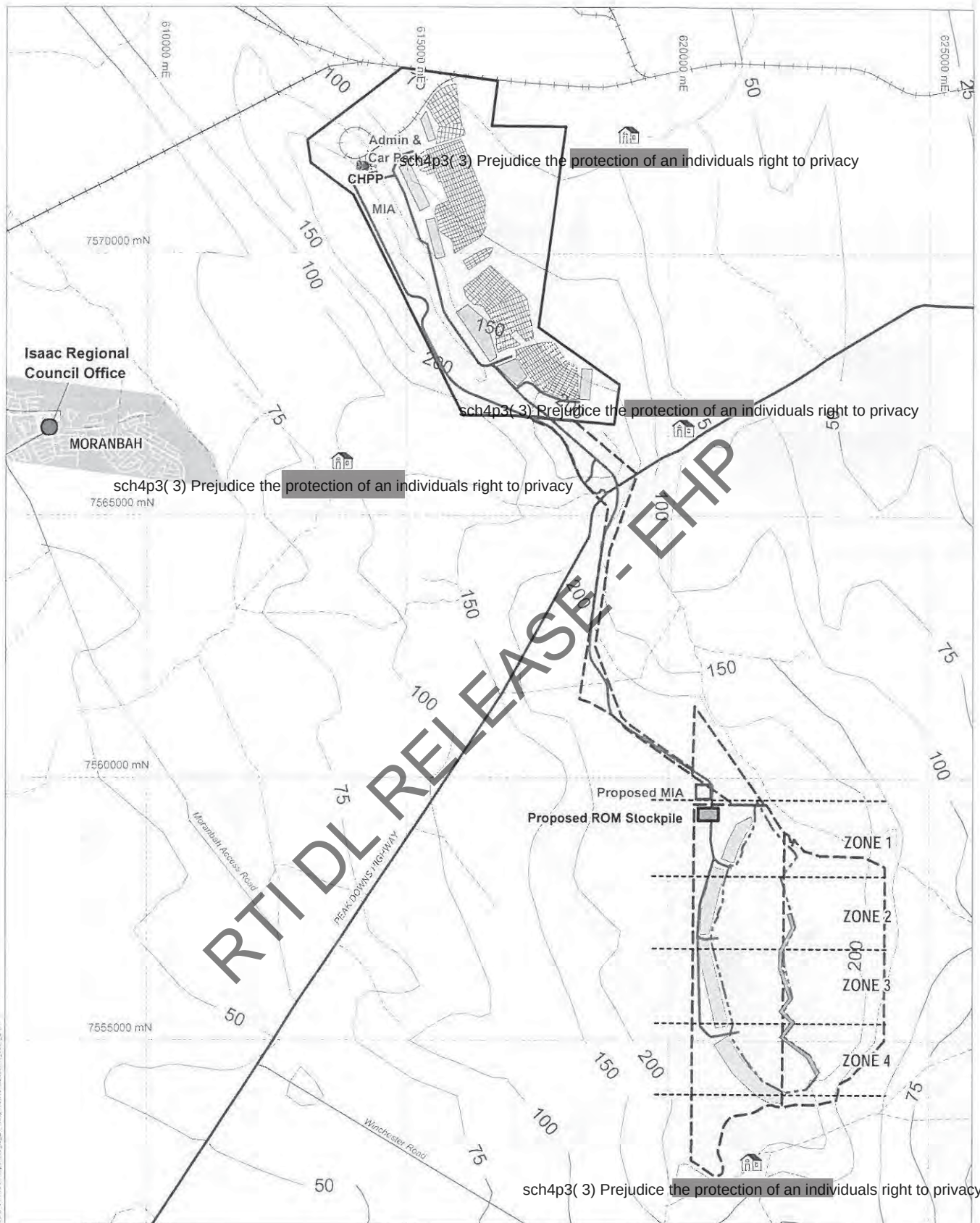
FIGURE 8-6



\\E:\Matrix_Planet\Projects\Barron Central Coalfields\2001 Isaac Plains Coalfields\GRA\HLS\ISPP\Proposals_Isac\BPM\Media\Workpapers\W_0002_D.doc







LEGEND

- ML Boundary
- MLa Boundary
- Existing Pit Outline
- Proposed Pit Outline
- Existing Out-of-Pit Spoil
- Proposed Out-of-Pit Spoil
- Proposed Final Void
- Access/Haul Road
- Major/Minor Road

- 10 — Dust Deposition Contour $\mu\text{g}/\text{m}^3/\text{day}$
- Railway
- Homestead

Note: Topographic data provided by Department of Natural Resources and Water

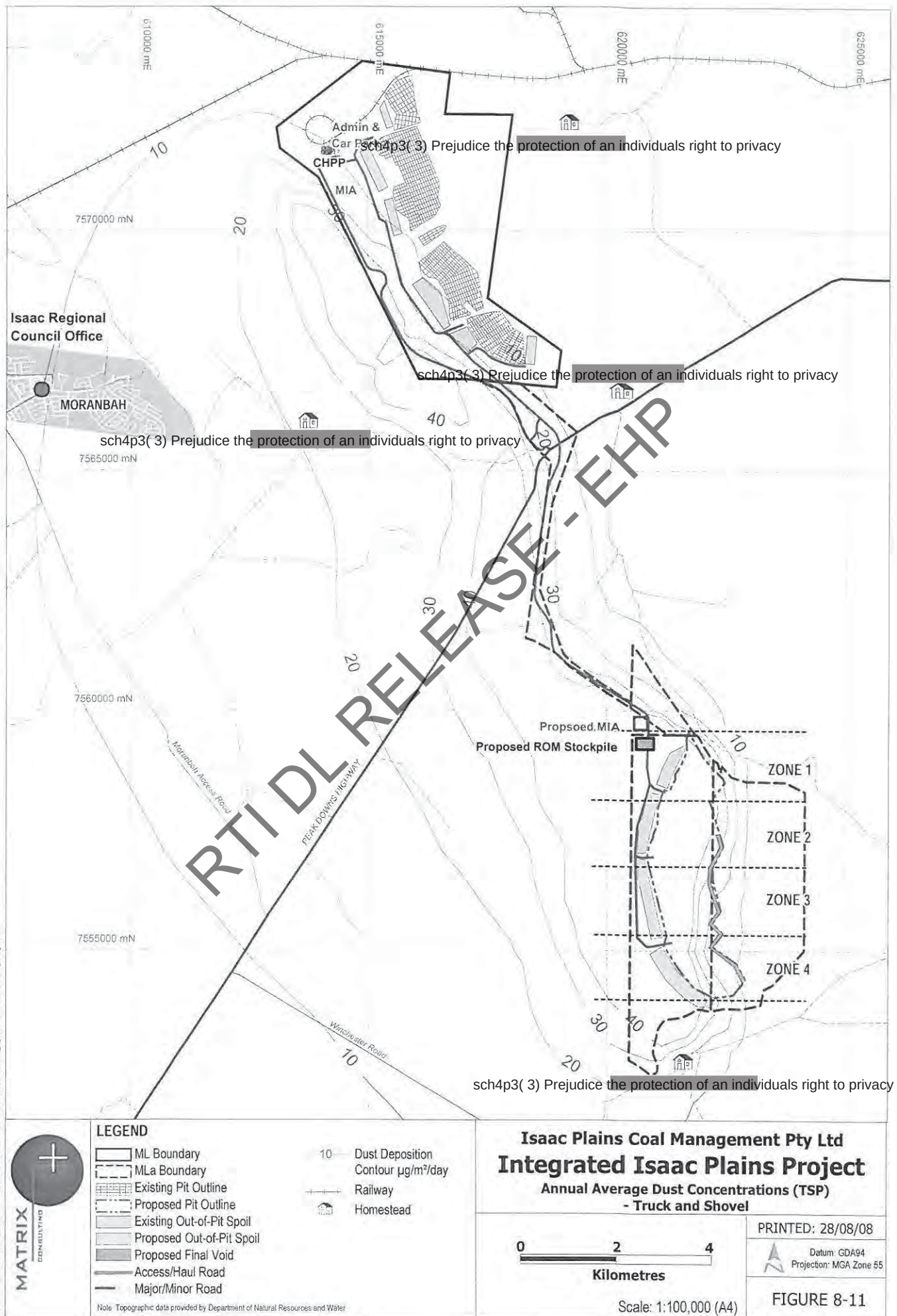
0 2 4
Kilometres

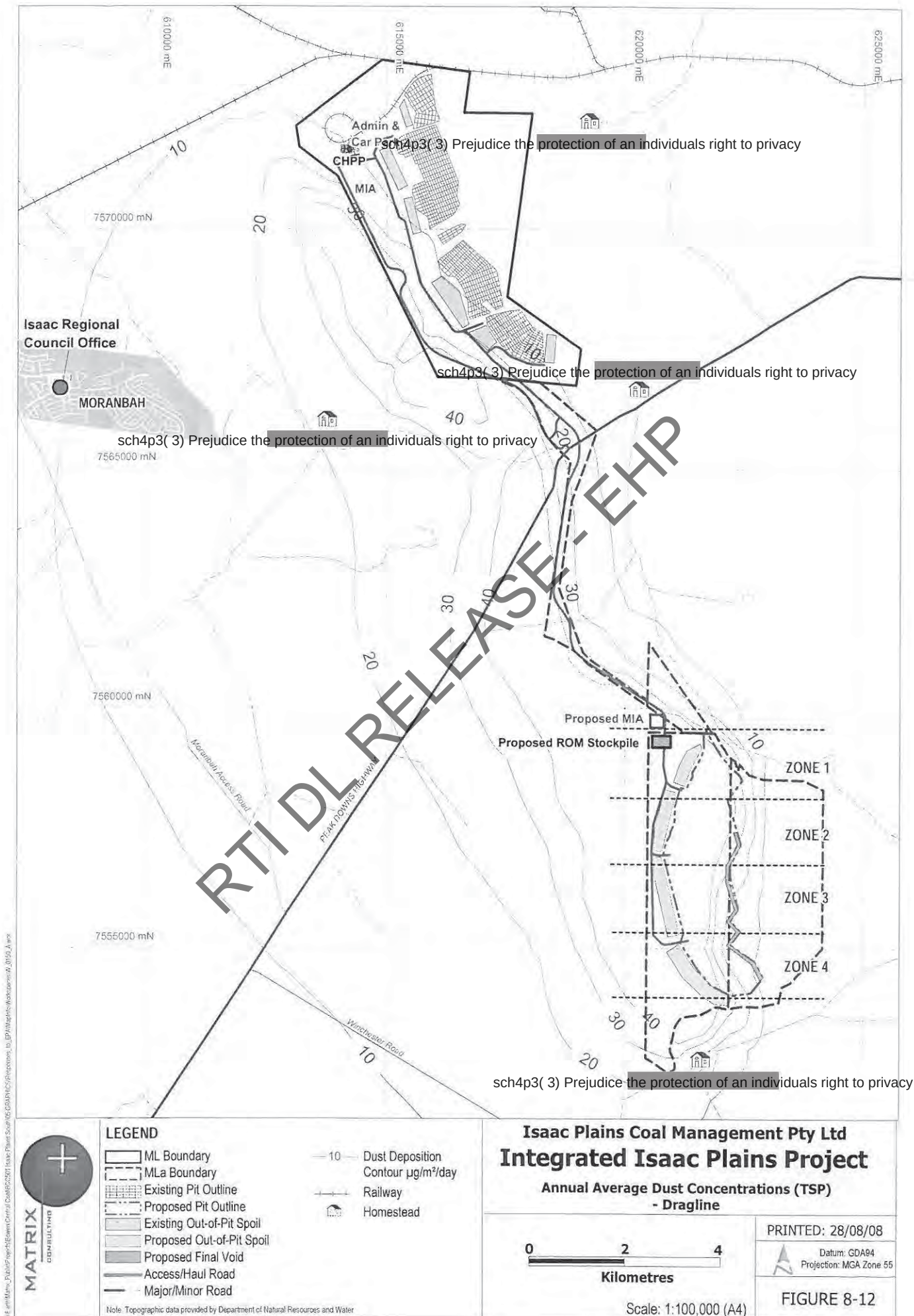
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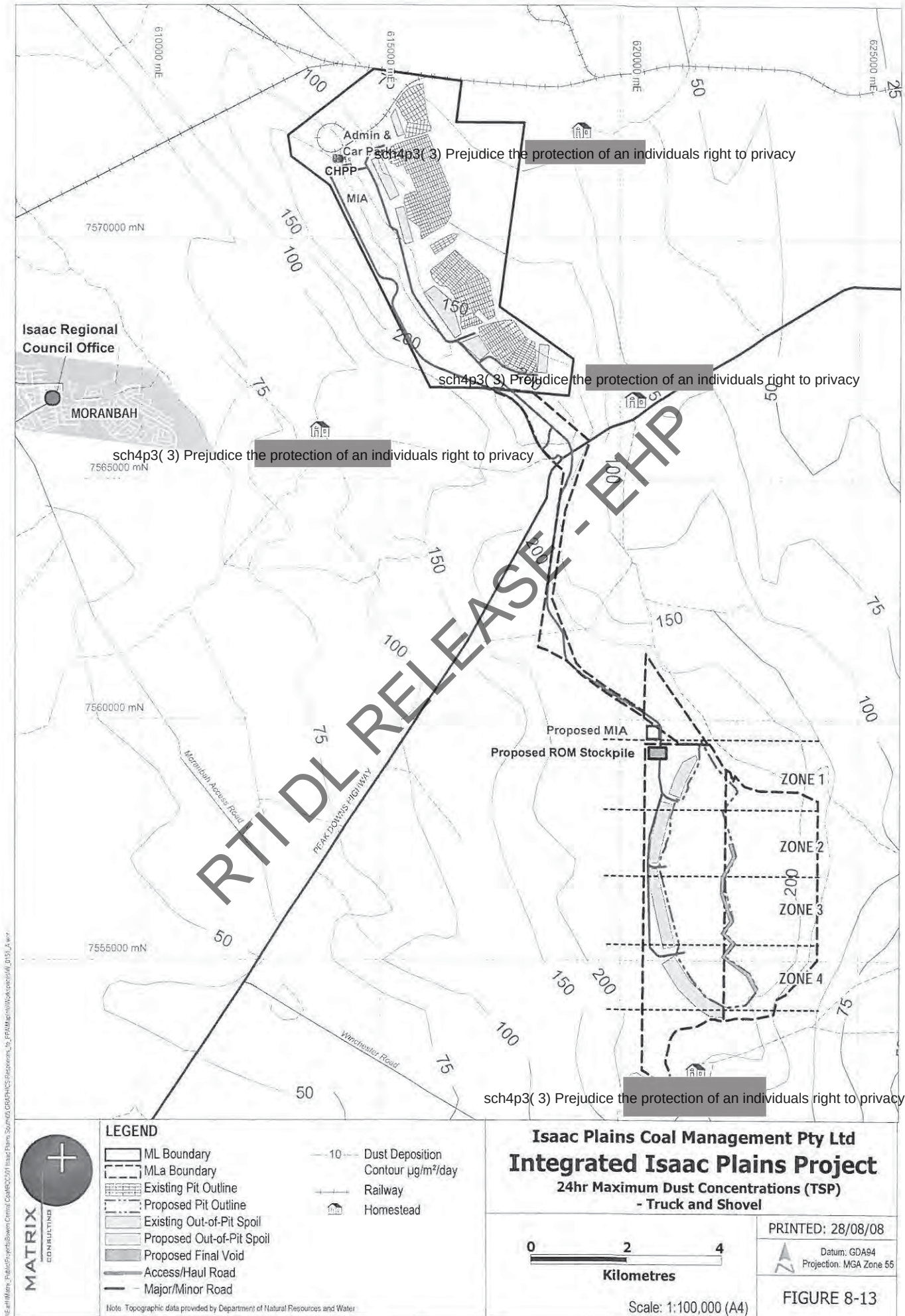
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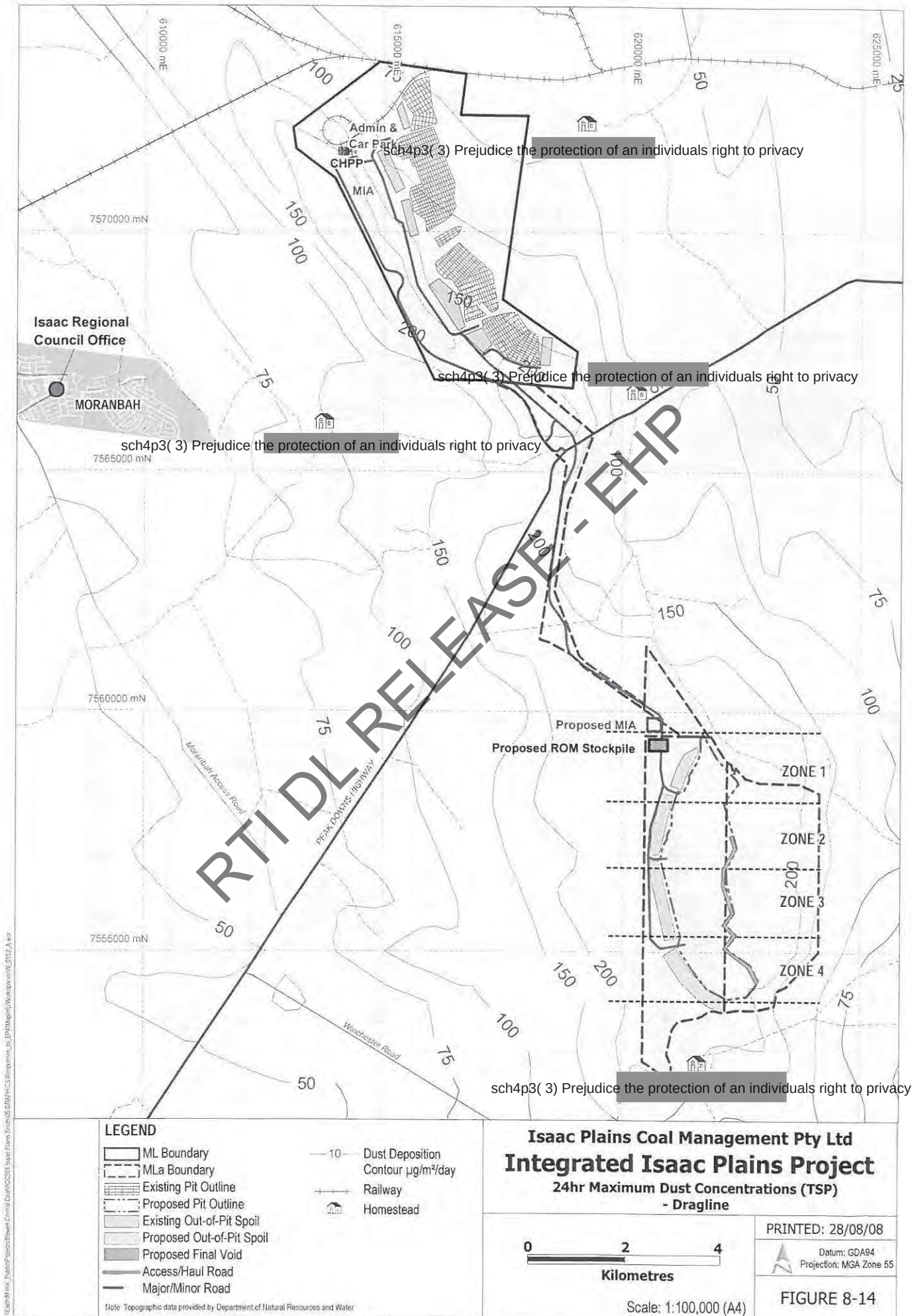
Datum: GDA94
Projection: MGA Zone 55

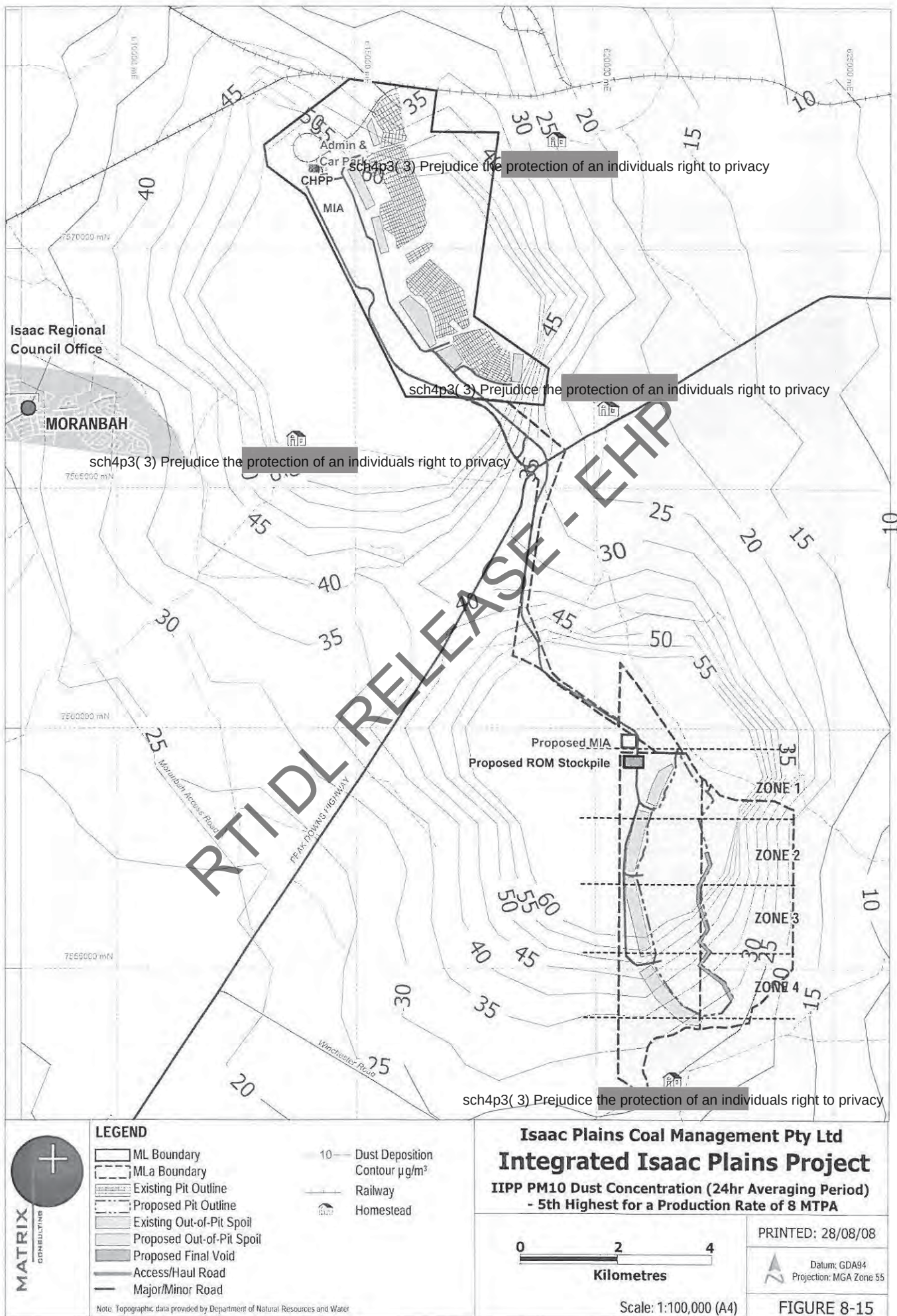
FIGURE 8-10











It is noted that location 11 (b) (5) (DPP) is the highest predicted annual average exposure to dust because the access/haul road was modelled as an uncontrolled emission source, i.e. it was assumed, a dry unsealed dirt road; and the prevailing wind directions are to the west. If the road is regularly watered and maintained at a level of least 5% moisture content, as will be the case, the annual average dust from the access/haul road would be less than the existing ambient levels, i.e. existing dust emissions will be reduced to approximately 5 % of the uncontrolled emissions (refer to page 45 of **Appendix H** for further detail). In addition, the receptors are downwind of the access/haul road for a significant period of time.

The addition of the existing measured dust concentration levels together with the predicted dust concentration levels gives a maximum 24 hr PM₁₀ level of 35 µg/m³ plus 6 µg/m³ giving a fifth highest 24 hour dust concentration of 41 µg/m³ at Moranbah. This is below the NEPM goal of 50 µg/m³ which is designed to ensure there are no adverse effects on human health statistics in large urban populations.

Dusts of PM₁₀ diameter are primarily produced by mechanical processes such as construction activities, road dust re-suspension and wind, whereas dusts of PM_{2.5} diameter of less originates primarily from combustion sources. It is expected that the dusts from Isaac Plains will mostly contribute the heavier PM₁₀ fractions.

The dust levels likely to be experienced in Moranbah are lower than levels expected to be directly linked to any health concerns and below levels likely to affect lifestyle and aesthetic values.

² EPA Guideline “Preparing an Environmental Management Overview Strategy (EMOS) for Non-Standard Mining Projects” states that the maximum permissible measured dust levels comprise dust deposition of 120 mg/m²/day, averaged over one month; and PM10 suspended in the atmosphere of 150 µg/m³ over a 24 hr averaging time, at a sensitive or commercial place downwind of the operational land.

Moranbah. This data will be critically reviewed to and to evaluate operations and controls. It is expected the equipment will be installed during December 2008.

Dust monitoring around the IIPP site was conducted monthly from October 2005 to December 2006, the results of this monitoring are provided in **Table 8-4**. A comparison of these results corroborates the modelled concentrations of dust deposition under truck and shovel operations, as illustrated in **Figure 8-5**. As noted in **Section 8.4.3** for the purpose of this EIS, all modelling is based on the future operations of the IIPP, i.e. cumulative modelling of existing Isaac Plains Coal Mine and Expansion Area. The impacts of the existing Isaac Plains Coal mine operations alone (if any) would be observed in the extensive dust deposition records.

The dust deposition modelling results, based on wind statistics provided by the BoM, suggest that the sites to the west of the existing Isaac Plains Coal Mine are currently subjected to higher dust deposition levels than those to the east. However, wind statistics, provided by a meteorological station at the Isaac Plains Coal Mine, for the period, indicated that the most common wind direction is from the north. It is likely that the dust deposition levels are more likely to be related to local activities such as farming or other household activities rather than an indication of mining impacts of the existing Isaac Plains Coal Mine.

The modelling indicates that there will be short-term (24 hr) elevated dust events at most of the sensitive receptors. The highest dust levels are likely to occur at the southern extent of the Expansion Area. As the pit moves southwards, the dust levels will increase until maximum disturbance at the southernmost end of the pit, at which point the 24 hr dust concentration criterion is predicted to be exceeded, at least five days annually, during periods of sustained northerly winds. In these cases, all dust sources from the CHPP, access/haul roads, spoil and pit sources are almost linear with the homestead. As a consequence, the dust from all sources contributes to this level of concentration, although the closest sources are the most significant (i.e. the southern extent of activities in the Expansion Area). However, the modelling assumptions are conservative in that it is assumed none of the PM10 dust generated within the pit will remain (trapped) within the pit and dust from access/haul roads outside the pit are uncontrolled, i.e. the worst case scenario, whereas in practice, they will be regularly watered.

It is noted that the contours for the PM10 and TSP concentrations are virtually identical at all the sensitive receptors, including the township of Moranbah. The reason is the heavier fractions of dust (represented by the fraction heavier/larger than PM10) deposit fairly close to the source. Lighter fraction PM10 behaves more like a gas and remains in the air for a much longer period of time. It is also noted that the dust concentration contours for either truck and shovel operations or dragline are virtually identical. This is an expected result, as the emissions database illustrates that these sources contribute less than 1% of the total emission sources from the IIPP. Therefore, even though the dragline has higher dust emissions than truck and shovel, it does not significantly influence the overall dust levels from the IIPP activities due to its small contribution to emissions.

Dust emissions from rail transportation were not specifically addressed in this assessment. QR are currently undertaking studies to reduce emissions from all coal haulage operations on the rail network. IPCM will assess the need for, and the options arising from, the QR investigations in order to minimise coal dust emissions during rail transportation. The increase in product coal being railed from the site to DBCT results in an increase from three trains per week to six trains per week. This is an increase in the contribution of coal dust emissions on the Goonyella System from approximately 2.2% to 4.6% per annum (based on total coal throughput at Hay Point Terminal (HPT) of 86.3 Mt in 2006-07). There is no change to the total tonnage hauled on the Goonyella line since tonnage is limited by the terminal throughput, which is already at capacity. Since coal dust emissions are related to tonnage hauled then there is unlikely to be any significant change to dust emissions from the Goonyella system.

8.6 MITIGATION MEASURES

The main dust sources associated with the pit comprise loading of trucks, dumping spoil from trucks and unpaved roads. In order to reduce the potential for nuisance dust emissions from the IIPP, IPCM will employ the following mitigation measures:

- dump truck routes are to be kept as short as is practicable;
- drop heights of coal and overburden from mining machinery will be kept to a minimum;

Air Quality

- tall vegetation around the IIPP area will be established to encourage dust fallout;
- spoil will not be permitted to dry out prior to removal, i.e. spoil will be removed and dumped as soon as practicable after blasting;
- speed limits will be enforced on access/haul roads;
- the access/haul road between Peak Downs Highway underpass and CHPP and for a 2 km section north-north-west of the ROM stockpile will be watered regularly;
- all other impacted areas will be watered on an as needs basis; and
- progressive rehabilitation will be completed as outlined in **Section 19**.

IPCM will investigate any complaints in relation to nuisance dust emissions and resolve the matter with the complainant using reasonable and practicable measures. No dust complaints have been received from the existing Isaac Plains Coal Mine since construction and operations began at the site in the third quarter of 2006.

The IPCM has and will continue to demonstrate a pro-active commitment to minimising impacts on local air quality as a consequence of its activities and will undertake routine monitoring of dust at the nearest potentially affected residences to verify compliance with the guidelines as outlined in **Section 8.6.1** below and the EM Plan in **Section 20**. IPCM also intend to implement a shut down procedure in the event of significant and sustained adverse meteorological conditions. These will be established with the specific purpose of protecting noise and air quality amenity for residents within Moranbah and at dust sensitive receptors. The procedure will be implemented at the commencement of mining in the Expansion Area. These shutdown limits will be based on the limits described in this report and the appropriate meteorological conditions will be established following an analysis of the emissions and propagation characteristics of the operational mine. As part of this process, the EM Plan will also be amended to include any additional appropriate dust control and mitigation measures that may be appropriate to reduce emissions during extreme events at sensitive receptors, including Moranbah.

8.6.1 Monitoring

IPCM will maintain the existing dust deposition monitoring network for the foreseeable future and assess the monthly depositional records. These results will be critically reviewed regularly to determine if the mining activities are causing an increase in dust deposition above that predicted by the modelling (refer to **Section 8.4**). The dust deposition data will include an analysis of the prevailing meteorology and mining rates/mining processes (refer to the EM Plan in **Section 20**). Where required, if in response to air quality complaint investigations, monitoring will also be carried out in accordance with EPA requirements.

In addition to the dust deposition monitoring network, IPCM will install a real-time low volume dust sampler in a location between the existing Isaac Plains Coal Mine and the township of Moranbah. This will allow for ongoing monitoring of dust levels at this location which may occur as a result of activities at the IIPP. The dust sampler to be procured will be fitted with wind speed/direction logger and filter to allow for subsequent analysis to verify the origin of dust components and will be linked via telemetry to the site communications system.

Ongoing dust monitoring will also be carried out between the Expansion Area pit and the protection of an individual's right to privacy. The dust monitoring will include a real-time dust monitor to measure the daily dust levels and meteorology and enable IIPP staff to view dust levels during operations. This will allow analysis of the dust levels and permit correlation of dust exposure with wind direction. As with the real-time monitor installed by IPCM between the existing Isaac Plains Coal Mine and the township of Moranbah, the monitor will have a filter which will permit subsequent analysis to identify coal dust components and will be linked via telemetry back to the site communications system. This method of monitoring will enable IPCM to carry out a regular review of the daily dust data to determine whether additional controls would be required during operations in the southern section of the Expansion Area pit. It is recommended that further detailed air quality assessments of the operations be carried out during mining in the northern end of the pit when actual data will be available to better characterise the sources. This will also help to ensure adequate controls to mitigate or negate these sources are in place should they be identified as posing a likely risk to the protection of an individual's right to privacy. It is expected that with suitable dust controls

employed within the pit and on haulage operations, the dust limits at the pit are not the protection of an individual's right to privacy met.

8.7 GREENHOUSE GAS EMISSIONS

8.7.1 Methodology

The Australian Greenhouse Office (AGO), part of the DEWHA, delivers the majority of programs under the Australian Government's climate change strategy including the AGO Greenhouse Challenge Plus. The AGO provides a Factors and Methods Workbook³ to enable industry to calculate greenhouse gas emissions (GHG) using appropriate methods and emission factors. The 2006 AGO Workbook was used to estimate the future emissions from the IIPP.

The calculations are based on the IIPP, as opposed to just the Expansion Area, on the basis that at the time of the application for approval for the existing Isaac Plains Coal Mine, there was no requirement to calculate greenhouse gas emission.

8.7.2 Estimated Greenhouse Gas Emissions

The existing Isaac Plains Coal Mine currently exports approximately 1.6 Mt of product coal annually. With the addition of the Expansion Area deposit, the integrated operation, i.e. the IIPP, will produce and export 3.3 Mtpa. This greenhouse gas assessment assesses the impact of the IIPP. The coal production is made up of 25% thermal coal (for electricity generation), 25 % coking coal and 50 % PCI coal (both used in the steel industry).

The principal direct and indirect sources of greenhouse gas emissions from the IIPP open cut coal mine would be:

- the consumption of electricity;
- the consumption of diesel;
- methane emissions from ROM and product coal; and
- spoil and coal blasting.

Table 8-8 provides a summary of the greenhouse gas emissions from the project activities based on the above sources. Energy consumption, methane emission and explosive quantities have been projected to 2011 and for the purpose of this assessment it has been assumed that the emission rates in the 2011 financial year represent the annual emission until the end of life of the mine.

The key assumptions underlying the greenhouse gas inventory are accessed from the 2006 AGO Workbook and listed below.

- Emission factors for diesel use are based on the full fuel cycle basis which includes emissions from the fuel and emissions from the extraction, production and transport of the diesel. The factor used is provided in **Table 8-9**.
- Emission factors for purchased electricity consumption are on the full fuel cycle basis which includes emissions from the fuel combustion at the power station and the emissions from the extraction, production and transport of that fuel as well as for emissions associated with the electricity lost in transmission and distribution. The full fuel cycle emission factor used to calculate the CO₂ equivalent tonnes for electricity purchased in Queensland is 1.046 kg CO₂-e/kWh.
- The factors to enable calculations of the methane emitted from mined open cut coal are contained in the AGO Workbook (2006). IPCM have used the default factor of 0.81 kg methane/tonne of raw coal, as no site specific studies have been done to evaluate the actual methane content.

³ Greenhouse gas emissions for the purposes of this EIS were calculated using the 2006 AGO Factors and Methods Workbook. This document has since been superseded by the National Greenhouse Accounts (NGA) Factors published by the Federal Department of Climate Change, January 2008.

Table 8-8 IIPP Greenhouse Gas Emissions

Descriptor	Units	2007	2008	2009	2010	2011
Coal Mined (ROM)	million tonnes	1.9	4.0	4.0	4.0	4.0
Raw Data						
Waste Coal Methane	tonnes	1,458	3,240	3,240	3,240	3,240
Diesel Consumption	kilolitres	9,765	4,033	4,692	10,250	9,900
Electricity	MWh	300	36,260	36,260	36,260	36,260
Explosives	tonnes	4,554	4,719	7,416	9,950	10,050
Calculated Emissions						
Waste Coal Methane	CO ₂ -e tonnes	30,618	68,040	68,040	68,040	68,040
Diesel Consumption	CO ₂ -e tonnes	29,853	12,330	14,343	31,335	30,265
Electricity	CO ₂ -e tonnes	314	37,928	37,928	37,928	37,928
Explosives	CO ₂ -e tonnes	756	783	1,230	1,651	1,668
TOTAL	CO₂-e tonnes	61,540	119,081	121,541	138,954	137,901

Table 8-9 Emission Factor for Diesel

Fuel Combusted	Energy Content (GJ/kL)	Full Fuel Cycle (kg CO ₂ -e/GJ)
Automotive diesel oil	38.6	77.2

8.8 POTENTIAL IMPACTS OF IIPP GREENHOUSE GAS EMISSIONS

IPCM is committed to reducing greenhouse emissions by optimising energy efficiency in the areas of coal extraction and transportation where technically and commercially feasible.

At full production, IPCM will annually export approximately 3.3 Mtpa of coal for steel production and electricity generation.

To put the amount of coal, which will be produced by the IIPP in context, approximately 3.3 Mtpa of coal exported equates to:

- 1.917 % of the coal produced in Queensland in 2005 (173.2 million saleable tonnes⁴);
- 1.078 % of the saleable coal produced in Australia in 2005 (307.9 Mt⁵); and
- 0.062 % of the tonnage of hard coal produced in the World in 2006 (5370 Mt⁶).

The maximum calculated greenhouse gas emissions from the full fuel cycle of 3.3 Mtpa of coal used in the steel industry and thermal coal energy generation is estimated as 9.732 Mt of CO₂-e annually, calculated using the emission factors in **Table 8-10**.

Table 8-10 Emission Factors for Product Coal

Fuel Combusted	Energy Content (GJ/t)	Full Fuel Cycle (kg CO ₂ -e/GJ)
Coal used in the steel industry	30	111
Black Coal – Queensland Electricity Generation	27 (washed)	93.8

Source: AGO Factors and Methods Workbook December 2006

The total global CO₂ emissions from the burning of fossil fuels in 2005 were 27,055 Mt⁷CO₂-e.

To produce 4 Mtpa and combust 3.3 Mtpa annually:

- using the 2011 emission data, the IIPP will emit 0.138 Mt CO₂-e annually, mainly from the use of diesel and electricity, to produce the coal; and
- coal from the IIPP will emit 9.732 Mt of CO₂-e annually from use in the steel industry and the generation of electricity.

Therefore, the IIPP production and the ultimate overseas use and combustion of the coal will contribute 9.870 Mt CO₂-e annually towards global greenhouse gas emissions in 2011 until closure in 2024.

The percentages of the IIPP emissions relative to total global emissions are detailed in **Table 8-11**.

Table 8-11 Annual Greenhouse Emissions Relative to Global Emissions

Activity	Annual Greenhouse Gas Emitted (Mt CO ₂ -e)	Percentage of 2005 global fossil fuel Greenhouse Gas emissions (%)
Coal Mining	0.138	0.00051
Coal use for Steel Manufacture and Electricity Generation	9.732	0.0360
Total	9.870	0.0365

⁴ Australian Coal Association <http://www.australiancoal.com.au>

⁵ Australian Coal Association <http://www.australiancoal.com.au/production.htm>

⁶ International Energy Agency Key World Energy Statistics 2007 Page 14. (Total includes China's brown coal production) http://www.iea.org/textbase/nppdf/free/2007/Key_Stats_2007.pdf

⁷ International Energy Agency Key World Energy Statistics 2007 Page 44. (This figure adjusted to exclude emissions from industrial waste and non-renewable municipal waste) http://www.iea.org/Textbase/nppdf/free/2007/Key_Stats_2007.pdf

8.9 MITIGATION MEASURES FOR GREENHOUSE GASES

8.9.1 Greenhouse Gas Abatement

To ensure that greenhouse gas generation from coal mining from the IIPP is minimised to the extent practicable, the following actions will be undertaken:

- diesel efficiency considerations will be included in assessments of new mobile and fixed equipment-the less diesel used the less CO₂ emitted during combustion;
- electrical efficiency considerations will be included in assessments of new mobile and fixed equipment-the less electricity used the lower the externally emitted CO₂ level per tonne of coal produced;
- Vale may consider participating in the Australian Government's Energy Efficiency Opportunities (EEO) program which came into effect in mid 2006. This program encourages large energy-using businesses to improve their energy efficiency by requiring businesses, using more than 0.5 Petajoules a year of energy, to identify, evaluate and report publicly on cost effective energy savings opportunities;
- ensuring equipment is maintained to retain high levels of energy efficiency;
- minimising clearing – to minimise loss of vegetation sinks;
- minimising burning of vegetation – to minimise emissions to the atmosphere;
- greenhouse awareness training at induction – to make employees aware of the science of global warming and efforts to minimise emissions;
- promoting recycling; and
- development and maintenance of an inventory of greenhouse emissions and sinks – to be aware of the extent of site emissions.

Gas emissions from the IIPP are not in sufficient enough quantities for capture and use. The petroleum/gas lease holders currently have no plans to capture methane gas across the IIPP area.

8.9.2 Climate Change Adaptation

The potential for changed weather patterns as a consequence of climate change, to impact on the operation and future of the IIPP, is assessed below in terms of changes in temperature and the effect of periodic extreme weather events such as sea level rise and lack of rainfall.

Temperature

The risk that increases in temperature will materially affect the viability and environmental management of the IIPP is considered to be low. Projections using the SRES emissions scenarios in a range of climate models result in an increase in globally averaged surface temperature of 1.4 to 5.8°C over the period 1990 to 2100⁸. Therefore, during the life of the mine (i.e. approximately 15 yrs) it is not anticipated that any minor increase in temperature will affect the viability and environmental management of the mine.

Sea Level Rise

Being inland and west of the Great Dividing Range, there is no risk that sea level rises will materially affect the viability and environmental management of the IIPP.

⁸ An Assessment of the Intergovernmental Panel on Climate Change. This summary, approved in detail at IPCC Plenary XVIII (Wembley, United Kingdom, 24-29 September 2001), represents the formally agreed statement of the IPCC concerning key findings and uncertainties contained in the Working Group contributions to the Third Assessment Report.

Rainfall

The risk that low rainfall in the catchment of the source of water to supply the IIPP will affect the viability and environmental management of the mining activities is moderate. As described in **Section 6**, IPCM intends to construct water storages collecting potentially sediment-laden runoff and pit water to provide water to supplement water obtained from external sources such as the Burdekin pipeline.

By monitoring any future climate change impacts on the mine environment, IPCM will assess the need for reinforcing water minimisation and recycling, including giving consideration to the reduction of major water usage, such as for watering haul roads/access roads, by using road sealing or dust suppressants.

In addition to the routine measures in **Section 8.9.1**, other measures may be taken to effectively mitigate the impact of the Mine Expansion. Environmental management of the mine operation will necessitate that IIPP work with all levels of government, research institutions and other mines in the area.

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9

NOISE &
VIBRATION

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

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Noise and Vibration

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9 NOISE AND VIBRATION

9.1 INTRODUCTION

Noise from coal mining, and related activities such as coal transportation and processing, has the potential to disturb nearby residents in the absence of an adequate buffer distance or intervening barriers, or if there are inadequate source controls. At sufficiently loud levels, noise can be intrusive and adversely affect amenity.

An assessment of potential noise and vibration impacts arising as a consequence of the Expansion Area was undertaken by Noise Mapping Australia (NMA). A copy of the technical report prepared by NMA is presented in **Appendix H**. The assessment takes into consideration noise produced as a result of the expansion of mining, increased production of the CHPP, noise from access/haul roads and noise and vibration from blasting.

The following are detailed below: the environmental values to be enhanced or protected; an outline of the statistical descriptors used in the noise assessment; the noise criteria and policies applicable to the IIPP; the methodology adopted in the investigations; potential impacts on the nearest sensitive receptors and mitigation measures. Noise predictions were determined using the PEN3D acoustical model.

9.2 ENVIRONMENTAL VALUES

The environmental values to be enhanced or protected under the *Environmental Protection (Noise) Policy 1997* (EPP(Noise)) are the qualities of the acoustic environment that are conducive to:

- the wellbeing of the community or a part of the community, including its social and economic amenity; or
- the wellbeing of an individual, including the individual's opportunity to have sleep, relaxation and conversation without unreasonable interference from intrusive noise.

The nearest town, Moranbah, is approximately 10-12 km north-west of the Expansion Area. The nearest residences to the Expansion Area are:

- [REDACTED]
- [REDACTED]
- sch4p3(3) Prejudice the protection of an individuals right to privacy
- [REDACTED]
- [REDACTED]

Residences, in relation to the IIPP, are illustrated on **Figure 1-2** and **Figure 1-3**.

9.2.1 Statistical Descriptors

Environmental noise levels vary with time, and consequently it is necessary to describe the noise in terms of statistical descriptors. The statistical noise exceedence levels LN in dB(A) are the levels exceeded for N percent of the measurement period. For example, L90 is the noise level which is exceeded for 90 percent of the measurement period and approximates the average minimum noise level. This is often referred to as the "background" noise level. L10 is the level exceeded for 10 percent of the measurement period and approximates the average maximum noise level. Leq provides a measure of the total noise energy during the measurement period.

The A-weighting is a standard electronic weighting applied to the measurement of sound to approximate the frequency response characteristics of the human ear when judging the loudness of a sound. **Table 9-1** presents a list of typical noise levels.

Table 9-1 Typical Noise Levels

Noise Level (dB(A))	Typical Noise	Noise Level (dB(A))	Typical Noise
0	Threshold of hearing for a youth	70	Loud television; kerbside of busy street
20	Quiet countryside	80	Motor car at 7 m; telephone ringing
30	Soft whisper at 2 m; clock ticking	90	Heavy truck at 7 m; lawn mower
40	Quiet refrigerator; library	100	Angle grinder
50	Trees and grass rustling	110	Loud car horn at 1 m
60	Inside a large store or busy office	130	Threshold of pain
60	Birds whistling	140	Jet aircraft taking off

Source: Adapted from EPP (Noise) 1997.

9.3 NOISE CRITERIA

9.3.1 Legislation and Guidelines

The following legislation and guidelines provide for the management of noise in Queensland:

- Environmental Protection (Noise) Policy 1997;
- EPA Ecoaccess Guideline – Assessment of Low Frequency Noise;
- Queensland EPA Ecoaccess Guideline – Planning for Noise Control; and
- EPA Ecoaccess Guideline - Noise and Vibration from Blasting.

The EPA is primarily responsible for regulating noise in Queensland and, in July 2004, approved and released Ecoaccess Guideline - Planning for Noise Control. The Guideline contains methods and procedures that are applicable for setting conditions relating to noise emitted from industrial premises, commercial premises and mining operations, and are intended for planning purposes. The Guideline is applicable to sounds from all sources, individually and in combination, which contribute to the total noise from a site.

This Guideline also includes criteria for estimating the probability of sleep disturbance from transient noise, such as heavy truck or rail operations, given various window types and settings. It may be used for assessing noises that contain impulsive components but it is not suitable for assessing noise that consists solely of discrete impulses, for example gunfire or blasting.

The procedure takes into account:

- the control and prevention of background noise creep in the case of a steady noise level from equipment such as that caused by ventilation fans and other continuously operating machinery;
- the containment of variable noise levels and short-term noise events, such as those caused by forklift trucks and isolated hand tools, to an 'acceptable' level above the background noise level; and
- the setting of noise levels that should not be exceeded to avoid sleep disturbance.

The methodology to set suitable limits identified in this Guideline is a multi-step process involving measurement, comparison against acceptable maxima and correcting the measurements for the amount of leeway available between the acceptable/desirable levels and the measurements.

9.3.2 Control and Prevention of Background Creep

There are three steps to determine the permissible planning background (L90) level for developments. These are:

- measure the existing background noise level during the day, evening and night;
- assess the receiver land use and determine recommended background noise levels, (refer to **Table 9-2**); and
- finally, calculate the appropriate planning background (L90) noise levels for developments using **Table 9-3**.

Note: the formulation used to obtain the planning background (L90) ensures that when the existing background and the planning background are logarithmically added it equals the recommended background level of **Table 9-2** (or the existing background level, whichever is greater).

Table 9-2 Recommended Outdoor Background Noise Planning Levels (LA90, 1hr)

Receiver Land Use	Receiver Area Dominant Land Use ¹	Background Noise Planning Levels (in Terms of min LA90, 1hr) in dB(A) in Time Period ²		
		Day	Evening	Night
Purely residential	Very rural	35	30	25
	Rural residential, church, hospital	40	35	30
	Shop or commercial office	45	40	35
	Light industry	50	45	40
Residential area on a busy road or near an industrial area or commercial area	Residential, church, hospital, school	45	40	35
	Shop or commercial office	50	45	40
	Light industry	55	50	45
Industrial area	Residential, church, hospital, school	50	45	40
	Shop or commercial office	55	50	45
	Factory office or factory	60	60	60
Passive recreation area	Picnic grounds, public beaches, bush walks, public gardens, etc	35	35	35

Note 1: The receiver area dominant land use is defined by the area encompassed by a radius of 200 m from the receiver location under consideration.

Note 2: Time periods refer to day (0700-1800 hrs), evening (1800-2200 hrs) and night (2200-0700 hrs).

Source: EPA Planning For Noise Control, Table 1.

Table 9-3 Recommended Noise Planning Levels (LA90, 1 hr) for Developments

Existing Background Noise Level at the Most Sensitive Point in an Affected Residential Area	Recommended L90,1 hr Maximum Noise Level Contribution, for Planning Approval Purposes, at that Point as a Result of a Proposed New Noise Source
Background noise level is above recommended level	Preferably, set maximum planning level 10 dB(A) or more below relevant recommended level. At least, set maximum planning level 10 dB(A) below existing background level.
Background noise level is at recommended level	Set maximum planning level 10 dB(A) below relevant recommended level.
Background noise level is below recommended level by	Set maximum planning level:
1 dB(A)	9 dB(A) below recommended level
2 dB(A)	5 dB(A) below recommended level
3 dB(A)	3 dB(A) below recommended level
4 dB(A)	2 dB(A) below recommended level
5 dB(A)	2 dB(A) below recommended level
6 dB(A) or more	5 dB(A) above background level

Note: It may not be possible to maintain background noise level in very rural areas below 25 dB(A) as developments occur. In such cases a threshold background level of 25 dB(A) is to be used. Source: EPA Planning For Noise Control, Table 2.



Noise and Vibration

9.3.3 Planning Noise Level

There are also three steps to determine the Planning Noise Level (PNL). These are:

- measure the existing Leq (1 hr) noise level during the day, evening and night;
- assess the receiver noise area category and determine Leq (1 hr) PNL for all industrial noise sources combined in **Table 9-4**; and
- if the existing noise level mostly comprises noise from other specific noise sources (industrial etc.), correct the PNL using **Table 9-5** to obtain the PNL (max).

Note: It should be noted that the formula used to obtain the PNL (max) ensures that when the existing Leq (1 hr) and the PNL (Max) are logarithmically added it equals the PNL of **Table 9-4** (or the existing level Leq (1 hr), whichever is greater).

The PNL is expressed in terms of the maximum Leq (1 hr) in each time period.

Table 9-4 Estimated Maximum Values of Planning Noise Levels (PNL) – Adjusted for Proposed Noise Sources

Noise Area Category	Description of Neighbourhood	Maximum Hourly Sound Pressure Level LAeq, 1 hr (PNL)		
		Day	Evening	Night
Z1	Very rural, purely residential. Less than 40 vehicles an hour	40	35	30
Z2	Negligible transportation. Less than 80 vehicles an hour	50	45	40
Z3	Low-density transportation. Less than 200 vehicles an hour	55	50	45
Z4	Medium density transportation (less than 600 vehicles an hour) or some commerce or industry	60	55	50
Z5	Dense transportation (less than 1,400 vehicles an hour) or some commerce or industry	65	60	55
Z6	Very dense transportation (less than 3,000 vehicles an hour) or in commercial or bordering industrial districts	70	65	60
Z7	Extremely dense transportation (3,000 or greater vehicles an hour) or within predominantly industrial districts	75	70	65

Source: EPA Planning For Noise Control, Table 3.

Table 9-5 Modified Recommended Maximum Planning Noise Levels to Account for Existing Level of Specific Noise

Total Existing Noise Level From Specific Sources dB(A)	Maximum Planning Noise Level for Noise From New Source Alone dB(A)
≥ PNL + 2	If existing noise level is likely to decrease in the future PNL – 10. If existing noise level is unlikely to decrease in the future existing level – 10.
PNL + 1	PNL – 9
PNL	PNL – 8
PNL – 1	PNL – 6
PNL – 2	PNL – 4
PNL – 3	PNL – 3
PNL – 4	PNL – 2
PNL – 5	PNL – 2
PNL – 6	PNL – 1
<PNL – 6	PNL

Source EPA Planning For Noise Control, Table 4.

There are two zones containing noise sensitive receptors which are relevant for the project. One zone is close to Peak Downs Highway and represented by the noise levels obtained at a domestic right to privacy site. The second zone is further removed from Peak Downs Highway and is represented by the noise levels obtained at the protection of an individual's right to privacy.

9.3.4 Noise Criterion

The noise criterion is the lesser of the specific noise level, and the PNL (max), when the specific noise level is defined as $L_{90}(\text{min}) + 3 \text{ dB(A)}$. The noise criterion is the lesser of the specific noise level, and the PNL (max) and is assessed at each of the noise sensitive receiver locations likely to be affected by the development.

9.3.4.1 Maximum Noise Level to Avoid Sleep Disturbance

The Guideline makes the following general recommendation regarding sleep disturbance.

'As a rule in planning for short-term or transient noise events, for good sleep over eight hrs, the indoor sound pressure level measured as a maximum instantaneous value (max L_p (A)) should not exceed approximately 45 dB(A) max L_p (A) more than 10 to 15 times per night. The corresponding external noise level, assuming partially closed windows, is 52 dB(A) max L_p (A) measured in the free field.'

For less regular night events, the allowable external noise level is higher, as follows.

- approximately 3 events per night: 57 dB(A) max L_p (A) and
- approximately 1 event per night: 62 dB(A) max L_p (A).

The recommended levels in dB(A) referred to in **Table 9-3** are ascertainable by reference to **Table 9-4**.

9.3.4.2 EPA Ecoaccess Guideline – Assessment of Low Frequency Noise

The EPA's Ecoaccess Guideline - Assessment of Low Frequency Noise categorises items such as boilers, pumps, transformers, cooling fans, compressors, oil and gas burners, foundries, wind farms, electrical installations, diesel engines, ventilation and air-conditioning equipment, wind turbulence and large chimney resonance as sources of high level noise having a frequency content less than 200 Hz.

These sources exhibit a spectrum that characteristically shows a general increase in sound pressure level with a decrease in frequency. Annoyance due to low frequency noise can be high, even though the dB(A) level measured is relatively low. Typically, annoyance is experienced in the otherwise quiet environs of residences, offices and factories adjacent to, or near, low frequency noise sources. Generally, low level/low frequency noises become annoying when the masking effect of higher frequencies is absent.

This loss of high frequency components may occur as a result of transmission through the fabric of a building, or in propagation over long distances. Where a noise emission occurs exhibiting an unbalanced frequency spectra, the overall sound pressure level inside residences should not exceed 50 dB(Linear) to avoid complaints of low frequency noise annoyance.

9.3.4.3 EPA Licence and Permits – Guideline 8

The EPA Guideline - Preparing an Environmental Management Overview Strategy (EMOS) for Non-Standard Mining Projects (Guideline 8) contains noise level limits measured at a noise sensitive place. Schedule D, Table 1 of the Guideline is reproduced in **Table 9-6**.

Table 9-6 Noise Limits at Noise Sensitive and Commercial Places

Noise Level dB(A)	Monday to Saturday			Sunday and Public Holidays		
	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am	9 am to 6 pm	6 pm to 10 pm	10 pm to 9 am
Noise measured at a noise sensitive place						
LA10 (Adj 10 mins) ¹	B/G ³ + 5	B/G + 5	B/G + 3	B/G + 5	B/G + 5	B/G + 0
LA1 (Adj 10 mins) ²	B/G + 10	B/G + 10	B/G + 5	B/G + 10	B/G + 10	B/G + 5
Noise measured at a commercial place						
LA1 (Adj 10 mins)	B/G + 10	B/G + 10	B/G + 5	B/G + 10	B/G + 10	B/G + 5
LA10 (Adj 10 mins)	B/G + 15	B/G + 15	B/G + 10	B/G + 15	B/G + 15	B/G + 10

¹ The LA10 (Adj 10 mins) is the noise level (adjusted for tonality or impulsivity) exceeded 10 % of the time.

² The LA1 (Adj 10 mins) is the adjusted noise level exceeded 1 % of the time.

³ B/G is the background noise level occurring over the time period in question.

The criteria nominated are 'background plus 5 dB(A)' for the period 7 am to 10 pm and 'background plus 3 dB(A)' between 10 pm to 7 am, Monday to Saturday. For Sundays and Public Holidays, the criteria are 'background plus 5 dB(A)' between 9 am to 10 pm and 'background' after 10 pm and before 7 am.

The criteria identified in **Table 9-6** are applicable for continuous noise sources such as those from mining operations and plant from the mine. Therefore all noise emissions from the mine should meet the above listed noise criteria at the surrounding residences.

9.3.4.4 EPA Ecoaccess Guideline - Noise and Vibration from Blasting

Blasting operations have the potential to cause excessive noise and vibration impacts on the community. Excessive levels of structural vibration caused by ground vibration can result in damage to, or failure of, a structure if not appropriately managed. However, people are able to detect vibration at levels much lower than those required to cause even superficial damage to the most susceptible structures.

The criteria set out in the EPA's Ecoaccess Guideline Noise and Vibration from Blasting, assist in minimising annoyance and discomfort that may be caused by blasting from activities such as mining, quarrying, construction and other operations which involve the use of explosives for fragmenting rock.

Further, all blasting must be carried out in a proper manner by a competent person in accordance with industry accepted standards to minimise the likelihood of adverse effects being caused by the impact of airblast overpressure and ground-borne vibration in noise-sensitive places, or to people living in or using the surrounding area.

9.3.4.5 Blasting Hours of Operation Criteria

Blasting at the existing Isaac Plains Coal Mine is currently approved under the existing EA, between the hrs of 9 am and 7 pm Monday to Sunday. Blasting is not approved for other times and public holidays.

IPCM generally conducts blasting only between the hrs of 9 am to 3 pm, Monday to Friday, and from 9 am to 1 pm on Saturdays and blasting should not generally take place on Sundays or public holidays. Blasting outside these hrs should only be approved where:

- blasting during the preferred times is clearly impractical (blasting on such occasions should be limited in number and more strict airblast overpressure and ground vibration limits should apply); or
- the remote location of the blast site means there is no likelihood of persons in a noise sensitive place being affected.

Monitoring conducted to date has illustrated that at all times blasting has conformed to the conditions of the EA.

9.3.4.6 Noise Criteria

At the existing Isaac Plains Coal Mine blasting activities must be carried out in such a manner that if blasting noise should propagate to a noise-sensitive place, then:

- the airblast overpressure must be not more than 115 dB(linear) peak for four out of five consecutive blasts; and
- the airblast overpressure must not exceed 120 dB(linear) peak for any blast.

These criteria will also be apply to the IIPP.

9.3.4.7 Vibration Criteria

At the existing Isaac Plains Coal Mine, blasting operations must be carried out in such a manner that if ground vibration should propagate to a noise-sensitive place:

- the ground-borne vibration must not exceed a peak particle velocity of 5 mm/second for four out of five consecutive blasts; and
- the ground-borne vibration must not exceed a peak particle velocity of 10 mm/second for any blast.

As with noise criteria, these criteria will also apply to the IIPP.

9.3.5 Environmental Protection (Noise) Policy 1997 - Railway Noise Criteria

The Queensland Railways (QR) is responsible for setting noise level limits from rail traffic. However, as there are no criteria directly applicable to assess the impact of noise from a railway noise generating development, it is recommended that railway noise be limited to a 3 dB(A) increase based on the expertise of the noise specialist and other similar projects.

The EPP (Noise) identifies the planning levels for a railway, assessed 1 m in front of the most exposed part of an affected noise sensitive place as:

- 65 dB(A), assessed as the 24 hr average equivalent continuous A-weighted sound pressure level; and
- 87 dB(A), assessed as a single event maximum sound pressure level.

Given the proposed wagon and locomotives to be used for the haulage of coal from the Expansion Area are currently in service, as are the train configurations and other operational considerations, the noise assessment has concentrated on assessing the increase in railway noise as a consequence of the increase in movements associated with the IIPP, i.e. from three rail movements per week to six rail movements per week.

9.4 NOISE SOURCES

Background noises in the area of the Expansion Area include the Peak Downs Highway, coal trains, native bird life, insects, general farming traffic (tractors, trucks, and light 4WDs), cattle and existing mines in the area. The closest existing mines are:

- Peak Downs Mine 10 km to the south-west;
- Poitrel Mine 4 km to the east; and
- Millennium Mine 8 km to the north-east.

Figure 8-1 illustrates the ML boundaries of the above listed mines operating in the area surrounding the IIPP which contribute to the background levels present.

Noise and Vibration

The major operational noise and vibration sources at the IIPP will result from:

- dragline or truck and shovel operation in the pit;
- rockdrilling and blasting;
- coal haulage trucks between the Expansion Area ROM stockpile and CHPP, comprising B-doubles with prime mover and trailer configurations that would satisfy the ADR28 certification;
- dump trucks, loaders dozers etc; and
- various surface earth working machines.

There is also a railway line to Peak Downs 10 km, to the east and south of the site. The Peak Downs Highway is 5 km north of the Expansion Area.

Coal mined from the Expansion Area will be processed through the CHPP and rail load-out facility already approved for the existing Isaac Plains Coal Mine. However, the plant and equipment will be operated for longer durations to handle the IIPP throughput. Additional items of plant such as the dragline will also be introduced for the IIPP.

The likely maximum noise levels from mining equipment are contained in **Table 9-7**, expressed as a sound power level and a sound pressure level at 100 m from a working machine. The octave band sound power levels are "linear" while the overall sound pressure levels are "A" weighted. The "A" weighting emulates the way the human ear responds to sound.

Table 9-7 Maximum Noise Levels from Mining Machinery

Item	Sound Power Levels (dB) in Octave Band Centre Frequency (Hz)								Overall dB(A)	Overall Sound Pressure Level at 100 m dB(A)
	63 ¹ Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 ² Hz		
998 loader	97	114	110	113	112	114	107	101	118	70
Haul truck	107	115	110	110	108	107	102	97	113	65
Dump truck	115	123	118	118	116	115	110	105	121	73
D11 Dozer	110	112	114	106	108	105	103	97	113	65
Rockdrill	113	117	112	116	115	114	116	115	122	74
Grader	106	108	110	102	104	101	99	93	109	61
Excavator	111	122	118	117	115	110	104	99	119	71
Rope shovel	111	112	114	118	112	108	103	96	118	70
Dragline – engine	91	108	104	107	106	108	101	95	114	64
Dragline – sheaves	114	115	119	125	127	128	125	114	133	85

Note 1: All energy in the frequencies below 63 Hz is added to the 63 Hz octave band.

Note 2: All energy in the frequencies above 8000 Hz is added to the 8000 Hz octave band.

These noise levels are mostly based on measurements obtained at mines in Queensland since August 2005 and published data. The measurements cover the frequency range 8 Hz to 20 kHz and this includes part of the infrasonic frequency range, i.e. frequencies below the normal audible sound range of 20 Hz to 20 kHz. As with many environmental noise models, PEN3D models noise in the frequency bands between 63 Hz to 8 kHz. The sound energy level below 63 Hz is included in the 'A' weighted 63 Hz band. A similar method was applied for the sound energy in the upper frequency range.

9.5 EXISTING ACOUSTICAL ENVIRONMENT

A survey of the existing noise levels was carried out at the protection of an individual's right to privacy. The survey was conducted in May 2006 at a residential site adjacent to the Peak Downs Highway. Traffic on Peak Downs Highway is the main noise source and the distance from the source determines noise levels. In addition, the noise can be measured anywhere along the road and still be representative for all residences since the characteristics determining traffic, i.e. speed, traffic composition, road surface, will vary little. The protection of an individual's right to privacy is also largely unaffected by any mining noise and has been used as an analogue monitoring location in this instance as sites near the existing Isaac Plains Coal Mine could have been influenced by construction activities at the time of the survey.

(3) Prejudice the protection of an individual's right to privacy is not considered a sensitive receptor for the IIPP, and therefore has not been considered as such for this assessment.

The ambient noise level measurements were conducted using a calibrated ARL EL215 Type 2 environmental noise level meter. The meter was configured to record continuous 15-minute samples over the period Saturday 6 May 2006 to Saturday 13 May 2006. The recorded noise levels for the protection of an individual's right to privacy and the protection of an individual's right to privacy are contained in **Table 9-8** and **Table 9-9** respectively.

It was noted that the noise levels for both sites were often at or near the noise floor of the noise logger, typically about 24 dB(A). The noise levels are expressed in terms of the L90 and the Leq. The L90 is the statistical noise level exceeded 90 % of the time and is commonly referred to as the background noise level. The Leq is the energy average noise level over the time period in question. The L10 is the noise level exceeded 10 % of the time and is commonly referred to as the average maximum noise level.

Table 9-8 Noise Survey at Homestead During May 2006

Date	L90 Background Noise Level (dB(A))				Leq Noise Level (dB(A))		
	Day ¹	Evening	Night	24 hr	Day	Evening	Night
6 May 2006	28	29	28	52	59	35	31
7 May 2006	29	28	27	44	47	37	38
8 May 2006	29	26	26	43	46	33	36
9 May 2006	30	25	25	44	46	30	41
10 May 2006	28	25	25	41	43	32	36
11 May 2006	33	34	25	43	46	39	39
12 May 2006	32	25	25	48	48	34	49
13 May 2006	30	28	26	49	52	34	42
14 May 2006	30	25	25	44	46	32	39
15 May 2006	-	-	25	-	-	-	39
Median	30	26	25	44	47	34	39

Note 1: Time periods refer to day (0700-1800), evening (1800-2200) and night (2200-0700).

Table 9-9 Noise Survey at Homestead During May 2006

Date	L90 Background Noise Level (dB(A))				Leq Noise Level (dB(A))		
	Day ¹	Evening	Night	24 hr	Day	Evening	Night
6 May 2006	36	33	31	-	48	38	36
7 May 2006	32	34	29	44	46	40	35
8 May 2006	30	32	40	45	47	44	36
9 May 2006	36	27	27	46	48	41	37
10 May 2006	36	32	27	46	46	41	39
11 May 2006	36	36	28	45	46	44	37
12 May 2006	36	28	28	45	47	40	37
13 May 2006	38	33	28	47	50	40	36
14 May 2006	35	29	29	47	49	41	35
15 May 2006	38	-	28	-	49	-	38
Median	36	32	28	45	47	41	36

Note 1: Time periods refer to day (0700-1800), evening (1800-2200) and night (2200-0700).

Additional attended measurements were obtained using a hand-held analyser with a noise floor of 15 dB. The results of the attended noise survey are found in **Table 9-10**. The noise level recorded at 2:15 am would be representative of the quietest period. No noise from mining or construction activities was audible at this time.

Table 9-10 Attended Noise Survey at Homestead During May 2006 in dB(A)

Date / Time	L10	L90	Leq	Comment
14 May 2006 23:50	43	29	40	Several vehicles passed the site, still cool conditions
15 May 2006 02:15	37	22	36	Several vehicles passed the site, still cool conditions
15 May 2006 09:45	48	42	46	Various noise sources including traffic- some wind noise

In 2004, a noise survey was conducted at Homestead as part of the investigation for the existing Isaac Plains Coal Mine. The ambient noise level measurements were conducted using calibrated ARL EL215 Type 2 environmental noise level meters. The environmental noise level meters were configured to record continuous 15-minute samples over the entire monitoring period between 19 August 2004 and 30 August 2004. The measured noise levels from 2004 are summarised in **Table 9-11**.

Table 9-11 Summary of Ambient Noise Monitoring (2004)

Location	Measured Noise Levels dB(A)			
	LAeq (24 hr)	LA90 (16 hr) Day & Evening 6 am to 10 pm	LA90 (8 hr) Night-time 10 pm to 6 am	Night-time Background Noise Level (Average of Quiet Periods)
	55	32	30	24
	53	34	29	27
	55	37	30	27

The noise levels in **Table 9-11** illustrate a background noise level of approximately 24 dB(A) for the homestead which is close to the noise floor of the monitoring equipment. In that study, a background noise level of 25 dB(A) during the night and a background noise level during the day and evening of 30 dB(A) was adopted for all residences.

Noise and Vibration

In September 2005 an attended noise survey was also carried out at the protection of an individual's right to privacy. During this survey, noise levels were measured every three hrs over a 24 hour period. These results were extracted from NMA report "Isaac Plains - Ambient Noise Survey", dated 17 October 2005 and are summarised in Table 9-12 for the protection of an individual's right to privacy, Table 9-13 for the protection of an individual's right to privacy, and Table 9-14 for the protection of an individual's right to privacy.

During the September 2005 monitoring period, noise from crickets and other insects were noted. This is usually a feature of the warmer months. The noise from crickets is in the higher frequencies and, by using a frequency analyser, it is possible to isolate and exclude this type of insect noise from the readings. Table 9-12, Table 9-13 and Table 9-14 also provide the noise level in each three hour block with and without the cricket noise present. The background noise without insects is highlighted.

Table 9-12 Noise Survey at the protection of an individual's right to privacy over the period 3:00 pm Tuesday 20 September 2005 to 3:00 pm Wednesday 21 September 2005.

Period (Hours)	Noise Level (Including insect noise) dB(A)			Noise Level (Excluding insect noise) dB(A)			Meteorology			Comments
	L10	L90	Leq	L10	L90	Leq	Wind Speed (m/s)	Wind Direction	Temp (C)	
0 to 3	34.4	28.0	32.7	32.1	23.8	32.7	0	-	16	Crickets, distant machinery
3 to 6	27.9	23.3	27.4	27.9	21.7	27.4	0	-	14	Mine noise, reversing beeper, Magpie
6 to 9	44.6	32.9	38.9	42.7	30.6	38.9	1	E	15	Mine, birds
9 to 12	44.1	32.8	38.1	41.6	30.4	38.1	3	E	22	Wind noise and distant machinery
12 to 15	45.9	27.8	40.4	43.2	26.9	40.4	3	E	27	Wind noise, birds, distant machinery
15 to 18	38.0	31.4	37.4	37.3	25.5	37.4	0.5	NE	25	Birds
18 to 21	38.2	35.0	36.3	33.0	25.1	36.3	0	-	18	Crickets and distant machinery
21 to 24	30.6	27.5	26.7	25.3	21.3	26.7	0	-	17	Crickets

Table 9-13 Noise Survey at the protection of an individual's right to privacy over the period 3:00 pm Tuesday 20 September 2005 to 3:00 pm Wednesday 21 September 2005

Period (Hours)	Noise Level (Including insect noise) in dB(A)			Noise Level (Excluding insect noise) in dB(A)			Meteorology			Comments
	L10	L90	Leq	L10	L90	Leq	Wind Speed (m/s)	Wind Direction	Temp (C)	
0 to 3	41.6	30.6	37.0	37.6	28.4	37.0	0	-	16	Crickets, distant traffic
3 to 6	45.5	34.7	41.9	44.1	33.8	41.9	0	-	13	Traffic
6 to 9	44.0	34.7	40.9	44.0	33.6	40.9	1	E	13	Traffic, birds
9 to 12	43.8	32.9	41.0	43.7	31.6	41.0	3	E	22	Traffic, birds, wind noise
12 to 15	39.5	37.4	37.1	39.1	35.9	37.1	1	E	27	Traffic, birds, wind noise
15 to 18	47.6	37.1	37.8	46.7	35.2	37.8	1	NE	25	Traffic
18 to 21	39.9	37.2	38.8	39.2	29.5	38.8	2	NE	18	Distant traffic
21 to 24	40.7	32.5	34.7	36.0	25.5	34.7	0	-	17	Crickets

Table 9-14 Noise Survey at [redacted] Homestead over the period 3:00 pm Tuesday 20 September 2005 to 3:00 pm Wednesday 21 September 2005

Period (Hours)	Noise Level (Including insect noise) dB(A)			Noise Level (Excluding insect noise) dB(A)			Meteorology			Comments
	L10	L90	Leq	L10	L90	Leq	Wind Speed (m/s)	Wind Direction	Temp (C)	
0 to 3	32.7	20.8	37.6	31.0	19.8	37.6	0	-	16	Crickets
3 to 6	33.9	27.8	30.2	32.8	26.0	30.2	0	-	12	Birds
6 to 9	37.6	27.7	34.0	37.4	26.6	34.0	1	E	13	Birds
9 to 12	41.1	31.2	37.3	40.0	29.9	37.3	3	E	22	Wind noise
12 to 15	45.5	31.2	42.2	44.9	29.8	42.2	3	E	27	Wind noise, crows
15 to 18	42.9	29.2	36.4	42.3	26.7	36.4	0.5	NE	25	Birds
18 to 21	32.0	27.1	30.9	31.6	23.8	30.9	0	-	18	Crickets, wind in trees
21 to 24	34.6	30.4	28.4	29.9	21.6	28.4	0	-	17	Crickets, distant traffic

9.6 MODELLING

In order to determine the potential impacts of noise from the IIPP on the surrounding environment noise modelling was conducted as follows.

A digital terrain noise model of the site and surroundings was developed using PEN3D. The PEN3D General Prediction Model (GPM) is based on an accepted published method¹. The model is virtually identical to the ENM noise model with the exception of the treatment of ground effects. Ground attenuation in PEN3D is typically between 0 and 3 dB(A) while in ENM it is potentially much larger. In the far field, the PEN3D algorithm is preferred while in the near field the ENM algorithm is preferred. All calculations in this report are in the far field.

The noise sources for the IIPP comprise:

- either dragline or truck and shovel operation in the pit;
- rockdrilling and blasting;
- coal haulage trucks between the Expansion Area ROM stockpile and CHPP, comprising B-doubles with prime mover and trailer configurations that would satisfy ADR28 (ADR specifies maximum noise level emissions used for vehicles operating on the public road network);
- dump trucks, loaders dozers etc; and
- various surface earth working machines.

The CHPP and rail load-out facility are the same as those already approved for the existing Isaac Plains mining operations. However, the plant and equipment will be operated for longer durations to handle the IIPP mine throughput. These sources have not been modelled as the assessment for the existing Isaac Plains Coal Mine assumed that the CHPP and rail loader operate continuously, that is, operations in excess of those proposed case have already been assessed and approved.

¹ Engineering Noise Control - Theory and Practice" by David Bies & Colin H Hansen of the Department of Mechanical Engineering, University Of Adelaide, Publisher Unwin Hyman 1988. Chapter 5.9, pages 117 to 127 describes the model.

The maximum noise levels from emission sources identified in **Table 9-7** were included in the noise model as follows:

- haul trucks on access/haul route at a source height of 1 m;
- 998 loader to fill haul trucks at a source height of 3 m at the ROM coal stockpile;
- three dump trucks located on the route between pit and ROM coal stockpile, on the out-of-pit spoil stockpiles and within the pit at 2 m;
- rockdrill at a source height of 2 m; and
- shovel or dragline within pit with source height near natural ground level.

For the IIPP modelling cases, it was conservatively assumed that all noise sources operated continuously. This was a modelling assumption to obtain worst-case operating conditions, but may not actually occur in this way for all hours. For instance, it should be noted that the rail loader and front end loader at the ROM only operate for a few hours each day, and mobile sources such as the haul and dump trucks operate in a complex cycle comprising low-load and high-load conditions at various positions along the route.

9.6.1 Noise Calculations

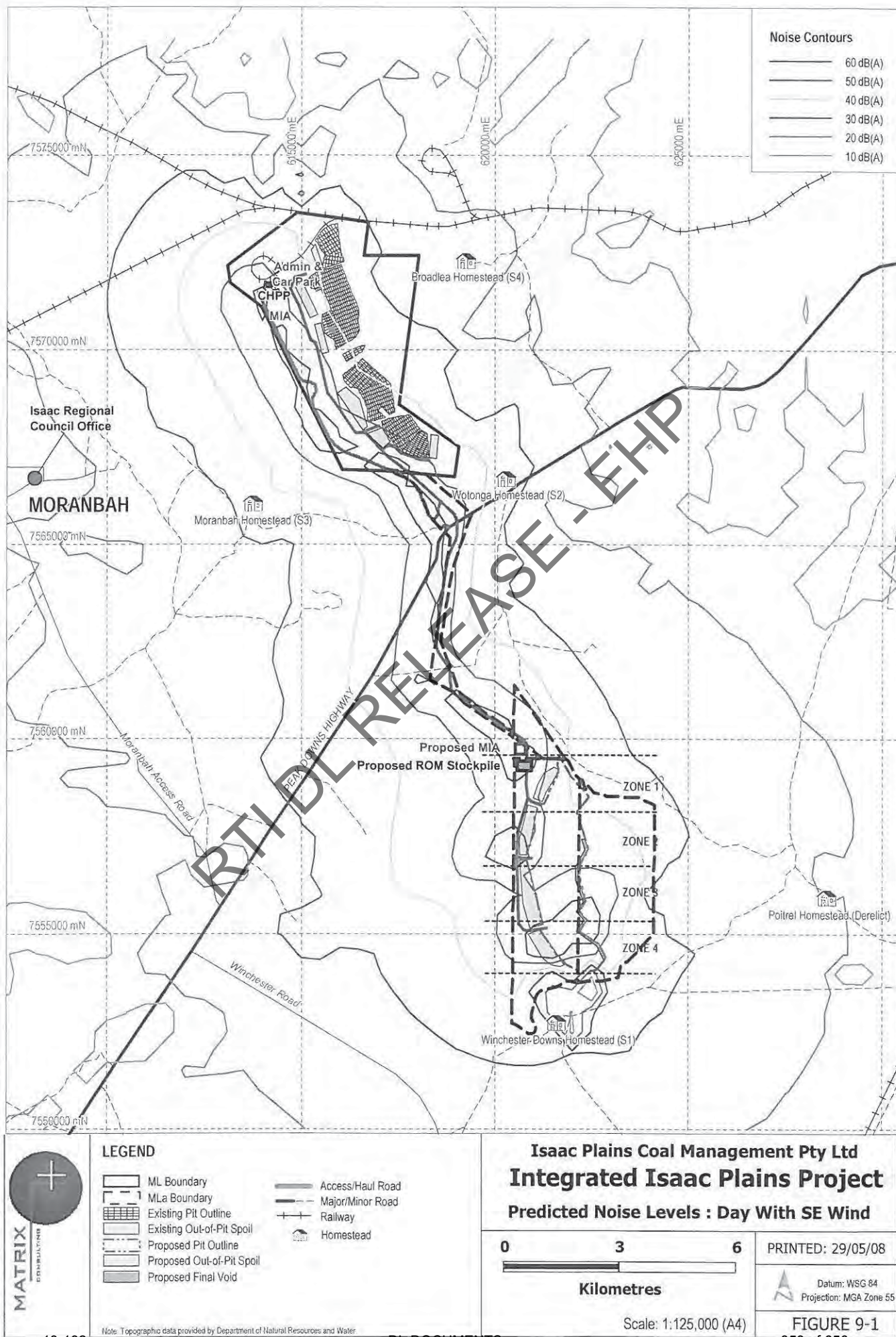
9.6.1.1 Meteorological Conditions

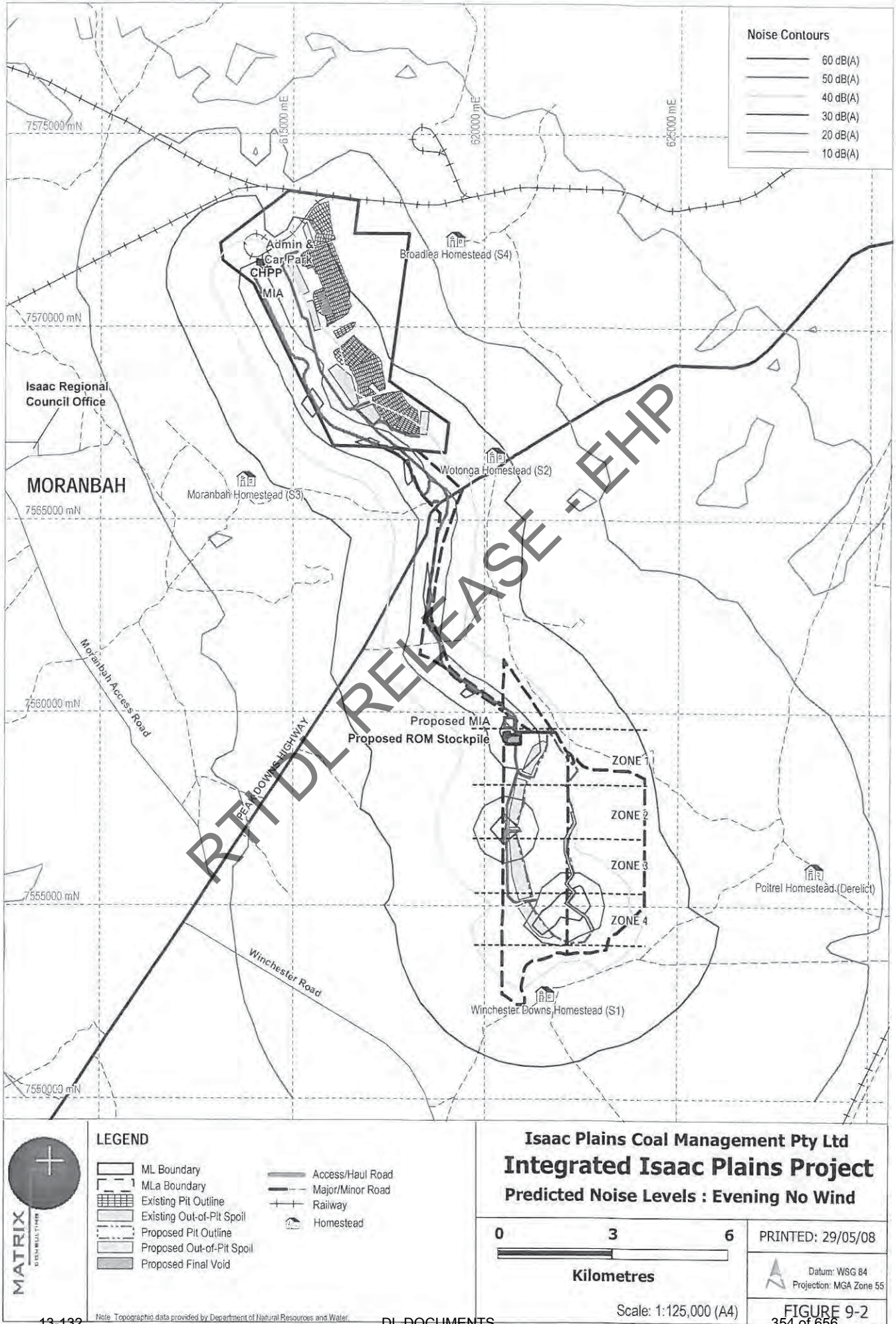
The adverse weather conditions likely to lead to the elevated noise levels during each of the relevant time periods have also been modelled. The meteorological cases that are likely to occur on a regular basis are presented in **Table 9-15** below.

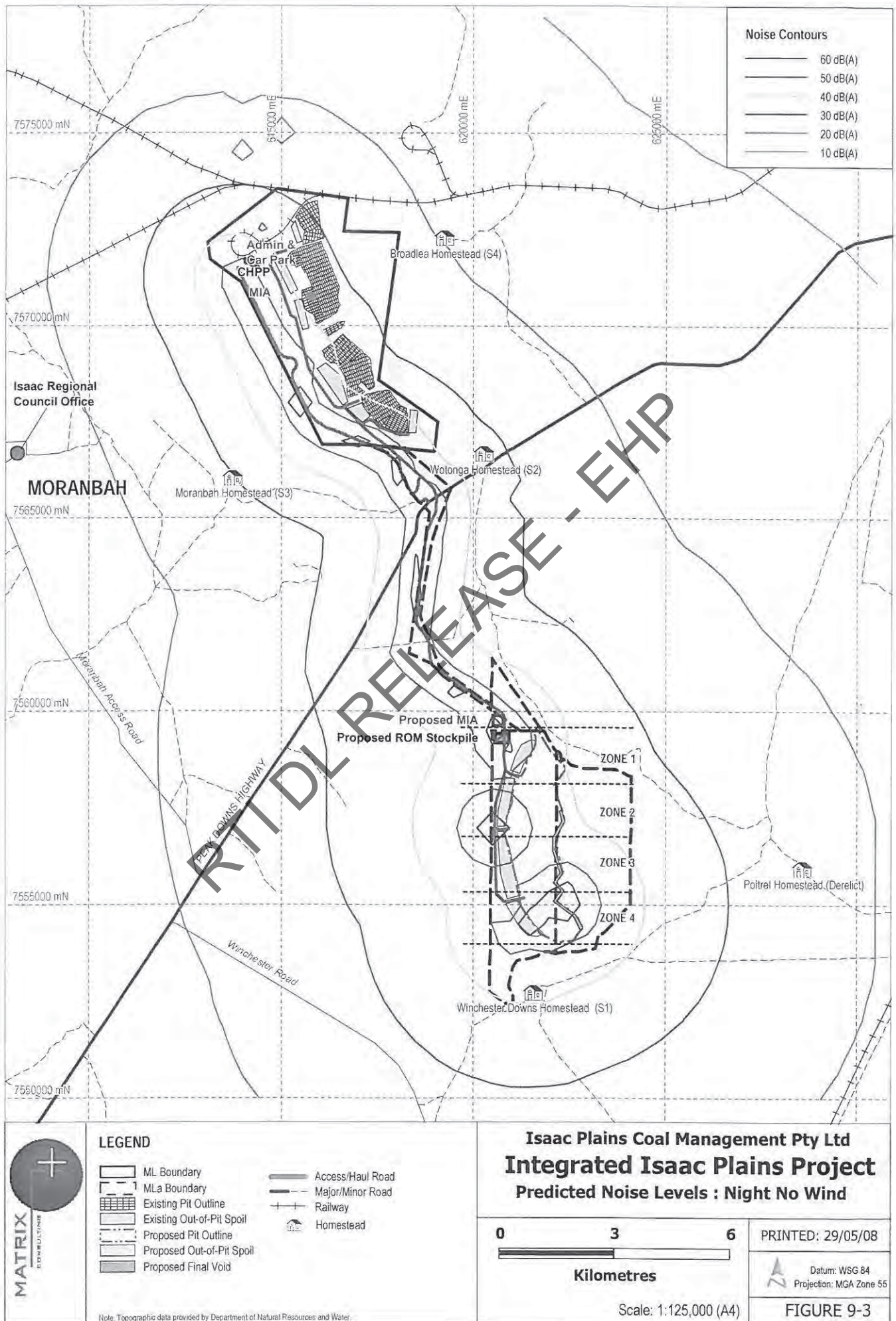
Table 9-15 Meteorological Cases Considered

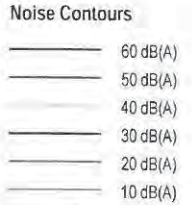
Period	Wind Direction and Speed (m/s)	Vertical Temperature Gradient (°C/100m)	Air Temperature (°C)
Day	SE wind (4)	-2	25
Evening	No wind	0	25
Night (with breeze)	SE wind (2.8)	3	5
Night (calm)	No wind	3	5

The predicted noise levels for the four meteorological cases are shown in **Figure 9-1**, **Figure 9-2**, **Figure 9-3** and **Figure 9-4**, for the day with a south-easterly wind, evening with no wind, and night with no wind and wind respectively.





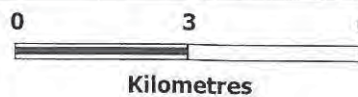




LEGEND

- | | | | |
|--|---------------------------|--|------------------|
| | ML Boundary | | Access/Haul Road |
| | MLa Boundary | | Major/Minor Road |
| | Existing Pit Outline | | Railway |
| | Existing Out-of-Pit Spoil | | Homestead |
| | Proposed Pit Outline | | |
| | Proposed Out-of-Pit Spoil | | |
| | Proposed Final Void | | |

**Isaac Plains Coal Management Pty Ltd
Integrated Isaac Plains Project
Predicted Noise Levels : Night With SE Wind**



PRINTED: 29/05/08

Datum: WSG 84
Projection: MGA Zone 55

Scale: 1:125,000 (A4)

FIGURE 9-4
356 of 656

Note: Topographic data provided by Department of Natural Resources and Water

9.6.2 Noise from Mining Operations

The calculated maximum noise level at each noise sensitive receptor is shown in **Table 9-16** for the truck and shovel operation and **Table 9-17** for the dragline operation. The operations at the IIPP are continuous. Thus, the LAeq noise levels for the pit (either shovel or dragline) are likely to be similar to the maximum noise levels calculated. For the purposes of this assessment, they are assumed to be equivalent. The trucks will travel approximately 18 km from the ROM stockpile in the Expansion Area to the CHPP at the existing Isaac Plains Coal Mine.

While the noise emissions are relatively constant for the trucks as they travel the route, the noise levels are expected to vary considerably when measured at the residences. For instance the range in the calculated maximum (L_{max}) noise levels is approximately 30 decibels at a distance of 300 metres. However, since there are only likely to be between one and two return trips per hour the LAeq due to the haulage operation is approximately 8 decibels below the L_{max}. The potential impacts and mitigation measures of noise caused by dragline, haulage and shovel operation are discussed in **Section 9.7**.

Maximum noise levels have been calculated over the life of the project. The pit in the Expansion Area has been divided into four zones, each section being approximately one quarter of the pit divided along the east-west axis. Thus, Zone 1 is the northern end of the pit and Zone 4 at the southern end (refer to **Figures 9-1 to 9-4**). Zones delineate the distance from the nearest sensitive receptor at the southern end of the proposed Expansion Area.

For the purposes of modelling noise, it is assumed that the out-of-pit spoil dump is almost completed and operations within the pit are close to the natural surface. The modelled operations comprise both truck and shovel and dragline alternatives.

Table 9-16 Calculated Maximum Noise Levels at all Noise Source Sensitive Receptors for Haulage and Shovel Operations

Receptor	Noise Levels from Mining Operations in dB(A) for the Time Period			
	Day	Evening	Night	Night with Breeze
Criteria for S1, S3 and S4*	37	30	28	28
Criteria S2	41	36	28	28
Haul Truck Operations - 2Mtpa^{#2}				
S1	5	11	15	6
S2	36	32	34	39
S3	34	24	29	36
S4	23	18	19	24
Surface & Pit Operations (Shovel) - Zone 1				
S1	<thh	20	21	<thh
S2	12	12	21	24
S3	23	16	17	22
S4	<thh	3	13	19
Surface & Pit Operations (Shovel) - Zone 2				
S1	13	21	23	2
S2	3	5	13	15
S3	15	8	9	15
S4	<thh	<thh	6	12
Surface & Pit Operations (Shovel) - Zone 3				
S1	14	23	30	12
S2	3	5	13	16
S3	16	9	9	15
S4	<thh	<thh	4	9

Noise and Vibration

Receptor	Noise Levels from Mining Operations in dB(A) for the Time Period			
	Day	Evening	Night	Night with Breeze
Surface & Pit Operations (Shovel) – Zone 4				
S1	15	34	39	13
S2	3	14	17	19
S3	17	13	15	18
S4	<thh	3	10	13

Note 1: <thh represents a calculated noise level below the threshold of human hearing.

Note 2: Subtract 8 dB from L_{Amax} to obtain L_{Aeq} for haulage operation.

Note 3: Bold text indicates an exceedance of the criteria.

sch4p3(3) Prejudice the protection of an individuals right to privacy

Table 9-17 Calculated Maximum Noise Levels at all Noise Source Sensitive Receptors for Dragline Operations

Receptor	Noise Levels from Mining Operations in dB(A) for the Time Period			
	Day	Evening	Night	Night with Breeze
Criteria for S1, S3 and S4	37	30	28	28
Criteria S2	41	36	28	28
Surface & Pit Operations (Dragline) - Zone 1				
S1	<thh	21	25	<thh
S2	13	12	21	24
S3	24	16	17	23
S4	<thh	3	13	20
Surface & Pit Operations (Dragline) - Zone 2				
S1	16	23	33	12
S2	3	6	16	19
S3	15	8	11	16
S4	<thh	<thh	5	12
Surface & Pit Operations (Dragline) - Zone 3				
S1	5	27	37	2
S2	3	5	14	16
S3	15	8	9	15
S4	<thh	<thh	4	9
Surface & Pit Operations (Dragline) - Zone 4				
S1	11	36	44	18
S2	3	14	18	19
S3	15	11	15	19
S4	10	2	10	14

NB: Bold text indicates an exceedance of the criteria.

The results of the modelling are discussed in **Section 9.7**.

9.6.3 Low Frequency Noise

The calculated external linear noise levels for the four meteorological cases and four zones are shown in **Table 9-18**.

Table 9-18 Calculated External Linear Noise Levels at all Noise Sensitive Receptors (Low Frequency Noise Assessment) for Both Shovel and Dragline

Receptor	Noise Levels from Operations in dB (Linear) for the Time Period			
	Day	Evening	Night	Night with Breeze
Criteria (external)	55	55	55	55
Haul Truck Operations - 2 Mtpa				
S1	22	26	30	23
S2	46	42	43	47
S3	45	36	39	45
S4	37	32	33	38
Surface & Pit Operations - Zone 1				
S1	31	31	35	30
S2	23	23	29	31
S3	34	27	26	30
S4	7	15	23	26
Surface & Pit Operations - Zone 2				
S1	31	38	40	35
S2	28	23	29	30
S3	26	26	26	30
S4	5	14	23	26
Surface & Pit Operations - Zone 3				
S1	39	42	46	40
S2	30	23	29	29
S3	19	24	26	30
S4	3	13	23	26
Surface & Pit Operations - Zone 4				
S1	39	42	48	40
S2	30	23	29	29
S3	19	24	26	30
S4	3	13	23	26

9.6.4 Sleep Disturbance Noise

The maximum noise levels are calculated and shown in **Section 9.6.2, Table 9-16** and **Table 9-17**.

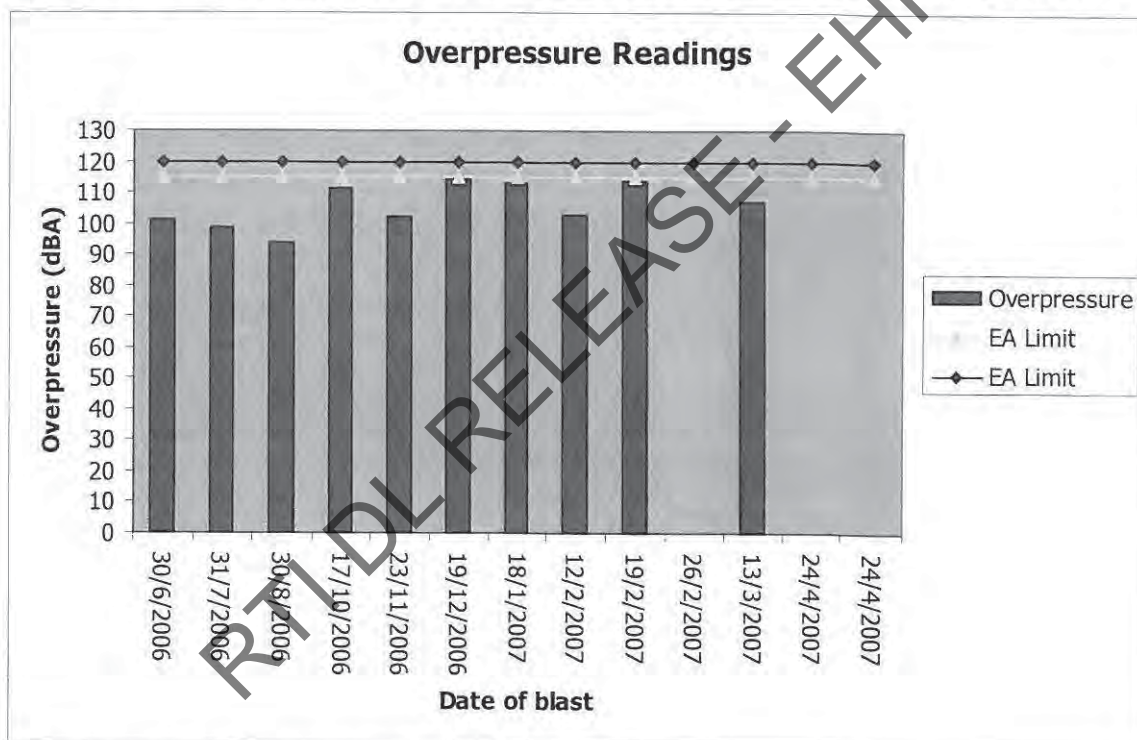
9.6.5 Blasting Noise, Vibration and Timing

The nearest residence to the proposed Expansion Area is approximately 1 km from the closest mining activity. The only relevant sources of vibration from the Expansion Area at this distance from the operations will be blasting. Blasting to break up and remove spoil would typically be carried out between the hours of 9 am and 7 pm Monday to Sunday, as prescribed in the current EA for the existing Isaac Plains Coal Mine.

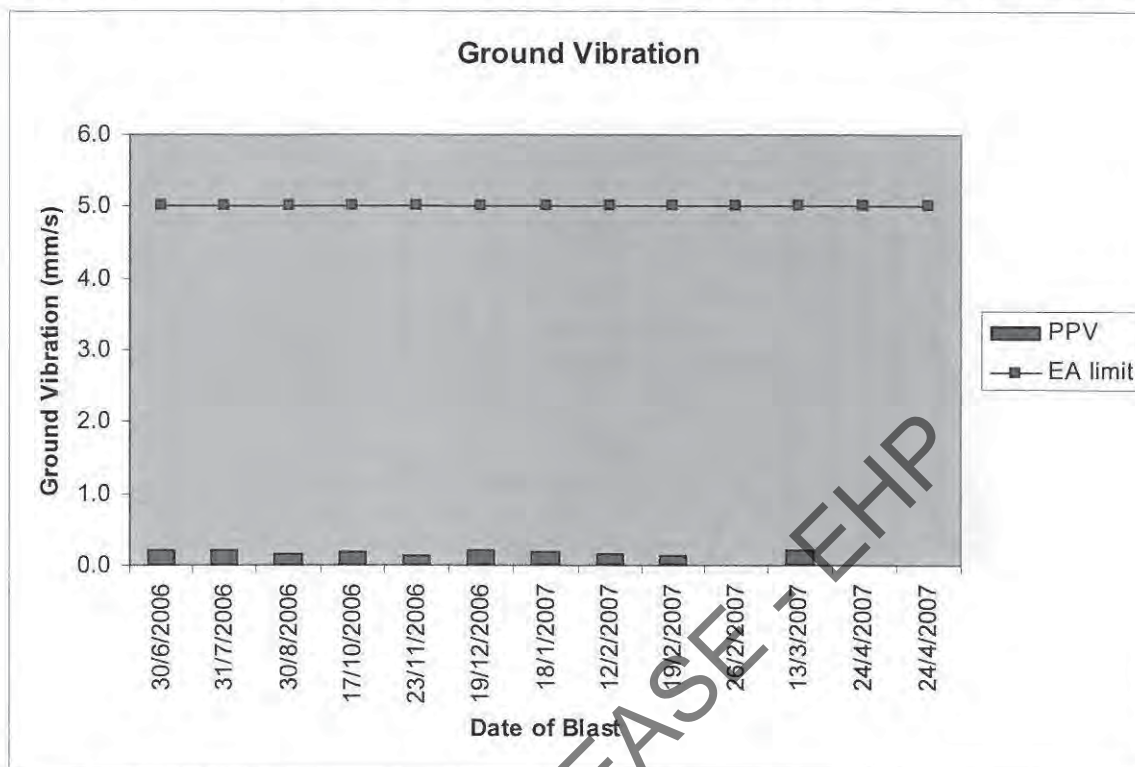
Blasts in close proximity to S1 will usually comprise a maximum instantaneous charge of approximately 100 kg.

Blast monitoring was conducted for the first 10 blasts conducted at the existing Isaac Plains Coal Mine with neither the blast overpressure nor the ground vibration readings being in exceedence of the limits specified in the EA (refer to **Figure 9-5** and **Figure 9-6**). Based on these results it is very unlikely that blasting in the Expansion Area is likely to have impacts which exceed the current EA limits.

Figure 9-5 Blast Overpressure - First 10 blasts at the existing Isaac Plains Coal Mine



1. 4 out of 5 consecutive blasts, maximum limit is 115 - dB(A).
2. No blasts to exceed 120 dB(A)

Figure 9-6 Ground Vibration - First 10 blasts at the existing Isaac Plains Coal Mine

1. PPV – peak particle velocity

The EPA has reviewed blast monitoring results and as a consequence has removed the requirement for blast monitoring at the existing Isaac Plains Coal Mine from the current site EA. However, IPCM continue to monitor overpressure and ground vibration during blasting.

9.6.6 Railway Noise

There will be an increase in the number of trains and/or the length of trains (the increase is consistent with the increase in tonnage dispatched, i.e. from three to six trains per week). There will be no other changes to railway operations. The increase in annual tonnage on the existing railway is relatively small (as the result of the additional trains required for IIPP) and would result in a less than 3 dB(A) increase in noise levels along the railway

9.7 POTENTIAL IMPACTS AND MITIGATION MEASURES

Noise and vibration in the existing environment has been monitored over a number of years. Measurements of the existing noise levels have revealed that traffic noise is the major noise contributor for residences within several hundred metres of the Peak Downs Highway. Although there has been significant development within the vicinity, traffic from the highway is still the principal source of noise at these residences. However, mining and construction noise may be heard at some residences during the quieter periods of the evening and night.

The calculated noise levels from pit and coal haulage operations complies with the noise level criteria during the day at all noise sensitive locations for either shovel or dragline operations.

The calculated noise levels from pit operations complies with the day, evening and night noise level criteria at noise sensitive locations S2, S3 and S4 for either shovel or dragline operations.

However, as the operations progress to the southern half of the Expansion Area pit, the noise levels during the evening and night exceed the noise level criteria at S1, mainly because of haul trucks on top of the out-of-pit spoil. To provide attenuation of 10 dB(A) (111 dB(A)) by the haul truck (in all frequency bands) operational control will be required to allow haul truck operations on the surface or on top of the out-of-pit spoil during the evening and night when mining progresses to Zones 2, 3 and 4. This would enable the noise level criteria to be met for all noise sensitive receptors for all time periods, including both shovel and or dragline operations. In order to achieve the 10 dB(A) reduction, screening of the haul truck by either spoil heap or specially constructed mounds will be implemented as required. This can potentially reduce noise levels by a minimum of 5 dB(A) for a screen that just avoids line of sight to 10 dB(A) or more for a higher mound.

IPCM also intend to implement a shut down procedure (Trigger Action Response Plan (TARP)) in the event of significant and sustained adverse meteorological conditions. These will be established with the specific purpose of protecting noise and air quality amenity for residents within Moranbah and at noise sensitive receptors. The procedure will be implemented at the commencement of mining in the Expansion Area. These shutdown limits will be based on the limits described in this report and the appropriate meteorological conditions will be established following an analysis of the emissions and propagation characteristics of the operational mine. As part of this process, the EM Plan will also be amended to include any additional appropriate dust control and mitigation measures that may be appropriate to reduce emissions during extreme events at sensitive receptors, including Moranbah.

The haulage operations will potentially exceed the night criteria under some conditions (subtract 8 decibels from the calculated maximum noise levels in **Table 9-18** to obtain the LAeq). Since there are likely to be of the order of 40 trips per weekday, these operations will mostly be limited to daytime only and during the period Monday to Friday. In the unlikely event that night operations occur, the exceedence of the night noise level criterion only occurs at S2. S2 is located adjacent to Peak Downs Highway and is currently subjected to much higher noise levels from existing road traffic. Since the haul trucks are road trucks operating on a private road the noise is lower in noise level and virtually indistinguishable from road traffic on Peak Downs Highway. If complaints are received regarding night time haulage, screening of the haul truck by either spoil heap or specially constructed mounds will be implemented as required.

The impact noise from the dragline sheaves has not been specifically included in the noise model. ~~It is recommended that this be addressed prior to commencement in southern pit. Furthermore it was noted in a report by P Mills et al (2001) that while there is still some possibility of impact noise, the dragline operator will be trained to ensure it is operated to avoid impact noise while still maintaining suitable productivity rates. However, the noise level adopted for the IIPP modelling of the dragline was 114 dB(A) which is considerably higher than the 107 dB(A) result that Mills et al (1993) demonstrated for a typical dragline. The modelling of the dragline at 114 dB(A) was only marginally lower than the results from Mills et al of controlled sheaves (116 dB(A)). Therefore the 114 dB(A) noise level used in the prediction model for this EIS is considered to be conservatively high for the site.~~

It is noted that noise levels above 130 dB(A) are possible from a dragline (i.e. noise from drag chains and rope sockets which cannot be coated due to their services conditions), particularly from untrained dragline operators. The minimisation of this noise is managed by the operator. IPCM is committed to conducting ongoing training to ensure operators have the skills to operate the machine in the quietest possible manner while still maintaining productivity rates. Skilled dragline operation, in combination with other noise mitigation measures (including the barrier provided by a large spoil dump located between the township of Moranbah and the existing Isaac Plains Coal Mine) will ensure that as coal mining progresses further away from Moranbah the potential for noise impacts are further minimised.

The modelling of noise levels reveals that the noise level goals may be slightly in exceedence at the ~~the protection of an individual's right to privacy~~ this exceedence mostly due to dump truck operations at night. To comply with environmental noise level goals at all noise sensitive locations, dump trucks should have a sound power level 10 dB lower than that specified in **Table 9-7**. Alternative dump truck models have been considered by IPCM as a potential mitigation measure to avoid exceeding the sound power limit of 111 dB during the operational phase in the Expansion Area. Investigation into alternatives has established that alternative dump trucks are not available other than by specific design and therefore this option is not considered feasible for IPCM. In addition, affected landowners either have or will be compensated by IPCM for impacts resulting from the IIPP.

Noise and Vibration

In the event that the dump truck exceeds this sound power level, it is recommended that acoustic controls are fitted to the dump trucks prior to opening of the southern half of the Expansion Area pit. Other acoustic control measures which may be incorporated into the project include:

- low noise specifications for all plant, equipment and vehicles;
- design work areas to reduce noise generation and minimise the periods of time that mobile plant must reverse;
- designing pit and spoil areas to avoid operating dump trucks in open areas or elevated areas at night;
- limiting the operational characteristics of vehicles (i.e. limit operation of air brakes except in cases of emergency);
- providing temporary local noise barriers (earth berms etc) to reduce noise at noise sensitive receptors;
- using squawker (white noise) reversing alarms or reversing strobe lights;
- developing a program of activities (e.g. hours of work at particular locations); and
- fitting high-performance mufflers and similar measures to vehicles, plant and equipment.

The proposal as described (including abatement measures) complies with:

- the low frequency noise limits;
- blasting noise and vibration limits;
- day and evening noise level goals;
- sleep disturbance limits; and
- railway noise limits.

RTI DL RELEASE - EHP

10

NATURE
CONSERVATION

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

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10 NATURE CONSERVATION

10.1 TERRESTRIAL ECOLOGY

This section describes the existing environmental values for nature conservation that may be affected by the IIPP in the context of environmental values as defined by the EPBC Act, VMA and the NCA. Throughout this section, the term study area is used to describe the existing Isaac Plains Coal Mine ML and the proposed Expansion Area MLs. The term study region comprises the Central Highlands area of the Brigalow Belt North Bioregion, within which the study area is situated.

10.2 METHODOLOGY

Detailed ecological investigations have been undertaken on the existing Isaac Plains Coal Mine and the Expansion Area using desk-based assessments and literature reviews, including aerial photography interpretation and field assessments. Ground-truthing of regional ecosystems (REs) and fauna habitat assessments was undertaken on the existing Isaac Plains Coal Mine in June 2004. During the period of May 2005 and February 2006 three visits to the IIPP site were undertaken to ground-truth REs and undertake fauna habitat assessments within the footprint of the Expansion Area as well as to conduct targeted fauna surveys of the riparian corridors along Smoky Creek, and the waterways known locally as Billy's Gully and Conrock Gully. Ground-truthing of the REs in the area of the access/haul road alignment linking the Expansion Area to the existing Isaac Plains Coal Mine was also conducted in September 2006.

Prior to any field assessments and surveys, an assessment of existing flora and fauna data was conducted. This included reviews of RE mapping from the Queensland Herbarium (QH) (Version 4.0¹ for the existing Isaac Plains Coal Mine. Version 5.0¹ was used for the assessment of the Expansion Area and haul/access road alignment). Reference was also made to records of flora and fauna from the Wildnet, Queensland Museum, and HerbreCs databases and the EPBC Act interactive map search utility. In addition, relevant agencies and experts were consulted to obtain existing information on nature conservation in the study area and study region.

During the field assessments, daytime traverses of the study area were conducted by vehicle and on foot at selected locations. Traverses were conducted throughout representative areas of the array of different vegetation communities apparent on aerial images, and identified on remnant ecosystem mapping. Areas of natural vegetation remaining within the study area such as riparian communities and remnant vegetation patches, and the proposed pit area, were the focus of survey efforts. These assessments were qualitative in nature and comprised:

- a brief description of the structural and floristic composition of the vegetation;
- validation of RE mapping against QH RE mapping; and
- site photographs.

Fauna encountered incidentally during the traverses were noted, and vehicle-based spotlight traverses were undertaken over two nights to provide an overview of the nocturnal fauna utilising the area. The diversity, condition and relative significance of fauna habitat areas and wildlife corridors that may occur within the study area was also assessed.

Detailed fauna species surveys were conducted over an 11 day period from 7 to 17 February 2006. These surveys were conducted along Smoky Creek and Billy's Gully in the existing Isaac Plains Coal Mine area, and Conrock Gully in the Expansion Area. These fauna surveys of selected riparian habitats within the IIPP area followed on from previous fauna assessments undertaken at both the existing Isaac Plains Coal Mine and Expansion Area. The potential habitat and corridor value of the riparian habitats for fauna, and the potential presence of species listed under the EPBC Act and the NCA were identified in the surveys.

¹ Most current version available at the time of the assessment.



The primary driver for conducting the studies was to determine the potential for these areas to be disturbed during mining operations of the IIPP. This background understanding will enable an improvement in the quality and integrity of assessments covering potential impacts on fauna associated with future disturbance of the IIPP. This is particularly relevant for the permanent diversion of Smoky Creek and Conrock Gully.

The fauna survey program was designed to ensure an adequate survey effort for targeted rare and threatened fauna species identified as potentially present during earlier assessments. In particular, rare, threatened or migratory species listed under Commonwealth and State legislation, were considered using a comprehensive survey approach that provided information on the overall vertebrate fauna community utilising each site. Ecological investigations focused on:

- isolating or identifying the biodiversity and general patterns of fauna occurrence;
- presumed or known occurrences of flora and fauna species and ecological communities with conservation significance (as per State and Commonwealth legislation); and
- the values of vegetation communities for species of conservation significance and sources of biodiversity.

Fauna survey activities were undertaken under EPA Scientific Purposes Permit No: WISP03233505. The methodology for the fauna assessment consisted of Elliot trapping, pitfall trapping, hair tubes, spotlight searches, bird searches, herpetofauna searches, Anabat recordings and indirect and incidental observations.

The salient findings of the surveys are provided below. Further details on the ecological surveys and results are provided in the specialist reports provided in **Appendices 11, 12, 13, 14, 15 and 16**.

10.3 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Based on the EPBC Protected Matters Search Tool, there are no World Heritage properties, National Heritage places, Ramsar wetlands, Commonwealth marine areas and Commonwealth land, listed Commonwealth Heritage places or conservation reserves/parks within or adjacent to the IIPP site (including the access/haul road alignment).

Matters of National Environmental Significance (MNES) that have been identified as occurring or likely to occur on the IIPP site include:

- endangered ecological communities (EEC);
- rare, threatened or endangered fauna; and
- migratory, marine and wetland species.

Notwithstanding the above, the IIPP is not a controlled action under the EPBC Act (refer to **Section 1.3.2**).

10.4 VEGETATION

10.4.1 Current Condition of Vegetation

The IIPP area is located within cattle grazing properties and consequently, the majority of the areas within the IIPP to be disturbed are highly modified, i.e. cleared grazing land, parts of which may have been sown to improve pasture, providing limited habitat opportunities for native woodland fauna. These cleared areas generally provide habitat for some native grassland species but do not (or are unlikely to) exhibit the characteristics required for them to qualify as native grassland communities, given the dominance of the introduced pasture species, Buffel grass (*Cenchrus ciliaris*), and the low diversity of other grasses and herbs. Much of the area that has been cleared to accommodate pasture production in the vicinity of the pit areas previously supported stands of Brigalow (*Acacia harpophylla*) and Eucalypt woodland.

Remnant vegetation is restricted largely to relatively robust tracts of riparian and frontage woodland along the Isaac River and Cherwell Creek, a narrow band of riparian vegetation along Conrock Gully, and a riparian corridor along Smoky Creek. There is limited riparian vegetation along Billy's Gully. These remnant areas are in poor-moderate ecological condition. Some dieback of River Red Gum (*Eucalyptus camaldulensis*) and Carabeen (*Corymbia tessellaris*) is evident along Smoky Creek. Remnant vegetation throughout the IIPP site is in poor-moderate ecological condition with the impacts of grazing evident (refer to **Plate 10-1**), i.e. in reduced groundcover and shrub diversity, replacement of the native groundcover flora with Buffel grass in most areas, and replacement of native groundcover along Isaac River with Guinea grass.

Canopy dieback is widespread throughout the Expansion Area, including the access/haul road alignment (refer to **Plate 10-2**). It is especially prolific within the woodland in the southern part of the Expansion Area, i.e. along Conrock Gully (refer to **Plate 10-3**) and adjacent to Cherwell Creek (refer to **Plate 10-4**), and has had a profound effect on the vegetation in some areas where major, and in some cases total, canopy dieback has recently occurred. The woodland along the Isaac River is in the best ecological condition when compared to the remainder of the Expansion Area. Some dieback is evident along the Isaac River but is restricted to isolated trees or groups of trees. The Isaac River habitats retain diversity of canopy, shrubs and, in places, ground flora which provide a greater number of shelter and feeding opportunities for fauna in comparison with the remainder of the IIPP site. The riparian corridor of the Isaac River is especially significant as it provides a continuous vegetated corridor through and beyond the Expansion Area which is likely to provide a regional wildlife corridor function for native fauna. Throughout all woodland areas, ground habitat values are diminished by the virtual monoculture of Buffel grass and the consequent lack of floristic and structural diversity.

Given the limited extent and poor condition of remnant habitats in those components of the Expansion Area to be disturbed, and the areas to be disturbed along Smoky Creek, both of which are highly degraded as described above, it is not anticipated that these areas currently represent any critical habitat.

10.4.2 Regional Ecosystems

10.4.2.1 Expansion Area

During field surveys in the Expansion Area, isolated discrepancies were identified in the land zone type and the floristic composition of the dominant stratum in the QH (Version 5.0) RE mapping that was current at the time, primarily due to the large scale used in the QH mapping. Anomalies with the existing QH (Version 5.0) mapping include the incorrect mapping of 'endangered' (RE 11.4.9 *Acacia harpophylla* – Brigalow) and 'of concern' RE polygons.

Table 10-1 lists REs that were mapped but are not present, mapped and are present, and those that were found but not mapped, including their conservation status under the VMA. Endangered REs were found within the proposed Expansion Area, some of which lie within the footprint of the proposed area of disturbance and some in an area to the south of the disturbance footprint. In addition, some areas of Brigalow, occurring as a mosaic with other vegetation types, will be impacted by infrastructure required as part of the Expansion Area development.

Table 10-1 Mapped REs – Expansion Area

RE	Description	VMA Status	Field Verification of Presence Within the Expansion Area
REs mapped by QH but not present			
11.4.4	<i>Dichanthium</i> spp., <i>Astrebla</i> spp. grassland on Cainozoic clay plains.	<i>Not of concern</i>	This RE is mapped as a mosaic with RE 11.4.9 and 11.5.3. for a small area on the eastern side of the Isaac River. The area was severely eroded and a native grassland was not present.
11.4.8	<i>Eucalyptus cambageana</i> , <i>Acacia harpophylla</i> and/or <i>Acacia argyrodendron</i> woodland on cainozoic clay plains.	<i>Endangered</i>	Three small areas of this RE are mapped in the southern part of the Expansion Area. It is anticipated that this RE did occur within the Expansion Area prior to clearing (based on the presence of regrowth <i>E. cambageana</i>). However, ground-truthing results indicate that there are no remnant areas of this RE left in the Expansion Area.

RE	Description	VMA Status	Field Verification of Presence Within the Expansion Area
REs mapped by QH and found to be present			
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains.	<i>Endangered</i>	This RE is mapped in a mosaic with RE 11.3.37 along Conrock Gully, and with RE 11.3.2 and 11.3.25 along Cherwell Creek. It was not found along Cherwell Creek, but does occur along Conrock Gully and on the western side of the Isaac River.
11.3.2	Woodland to open woodland of <i>Eucalyptus populnea</i> (Poplar Box) on Cainozoic alluvial plains.	<i>Of concern</i>	This RE is mapped in a number of locations as a mosaic with other REs, especially RE 11.3.7. The field survey found a number of these polygons contain only RE 11.3.2, and others comprise a mosaic within the REs.
11.3.7	<i>Corymbia</i> spp. (Bloodwoods) woodland on alluvial plains on sandy soils.	<i>Not of concern</i>	This RE is mapped mainly as a mosaic with RE 11.3.2. Field verification revealed that many of these areas did not contain RE 11.3.7. However, there were some areas where this RE occurred, including as a mosaic with RE 11.3.25 along the banks of the Isaac River and Cherwell Creek, and as a discrete patch on an alluvial bench adjacent to the Isaac River.
11.3.25	<i>E. camaldulensis</i> (River Red Gum), <i>Casuarina cunninghamiana</i> fringing woodland on alluvial plains.	<i>Not of concern</i>	Field inspections confirmed the mapped occurrence of this RE along waterways. However, it occurs predominantly as a mosaic with RE 11.3.7 along the Isaac River, and as a mosaic with RE 11.3.7 and 11.3.2 along Cherwell Creek.
11.4.9	<i>Acacia harpophylla</i> (Brigalow) shrubby open forest to woodland with <i>Terminalia oblongata</i> and <i>Eremophila mitchellii</i> on clay plains or weathered basalt.	<i>Endangered</i>	This RE is mapped in a number of locations throughout the Expansion Area as a sub-dominant RE in a mosaic with RE 11.5.3. Most of these polygons do not support RE 11.4.9. Another area of Brigalow occurring on the southern side of Conrock Gully was mapped for the map amendment but was not allocated a proposed RE code. This is a rather enigmatic area of vegetation that may represent a transitional community between Land Zone 4 and 5. Identification of the correct RE type has been left to the QH. The area may be identified as RE 11.4.9 or another Brigalow RE type. Regardless of the RE type finally assigned, the RE will be endangered due to the presence of Brigalow as a dominant species. Therefore for the purposes of this EIS, this area has been assumed as 11.4.9.
11.5.3	Shrubby woodland with <i>Eucalyptus populnea</i> (Poplar Box) and/or <i>E. melanophloia</i> (Silver Ironbark) and/or <i>Corymbia</i> spp. (Bloodwood) on sand plains.	<i>Not of concern</i>	Field inspections confirmed the occurrence of this RE in most of the currently mapped polygons.
11.7.2	<i>Acacia</i> spp. woodland on lateritic duricrust. Scarp retreat zone.	<i>Not of concern</i>	Occurs on the small escarpment area in the northern part of the Expansion Area, adjacent to the Peak Downs Highway.
REs not mapped by QH but found to be present			
11.3.37	<i>Eucalyptus coolabah</i> fringing woodland on alluvial plains.	<i>Not of concern</i>	This RE has been proposed in the map amendment to reflect the mosaic co-dominance of <i>Eucalyptus coolabah</i> with <i>Acacia harpophylla</i> (RE 11.3.1) along Conrock Gully.

Figure 10-1 illustrates revised RE mapping within the Expansion Area in accordance with field survey results. A map amendment request has been made to the QH to rectify the anomalies in the current QH RE mapping¹. RE mapping amendments for the existing Isaac Plains Coal Mine area, according to the field assessment findings, have been accepted by the QH. **Figure 10-2** illustrates the RE mapping for the existing Isaac Plains Coal Mine incorporating map amendments accepted by the QH.

¹ REs identified in field surveys by specialist consultant. Map amendment yet to be confirmed by QH.



Plate 10-1 Severe erosion in an area of RE 11.3.1 that consequently does not retain remnant status within the Expansion Area

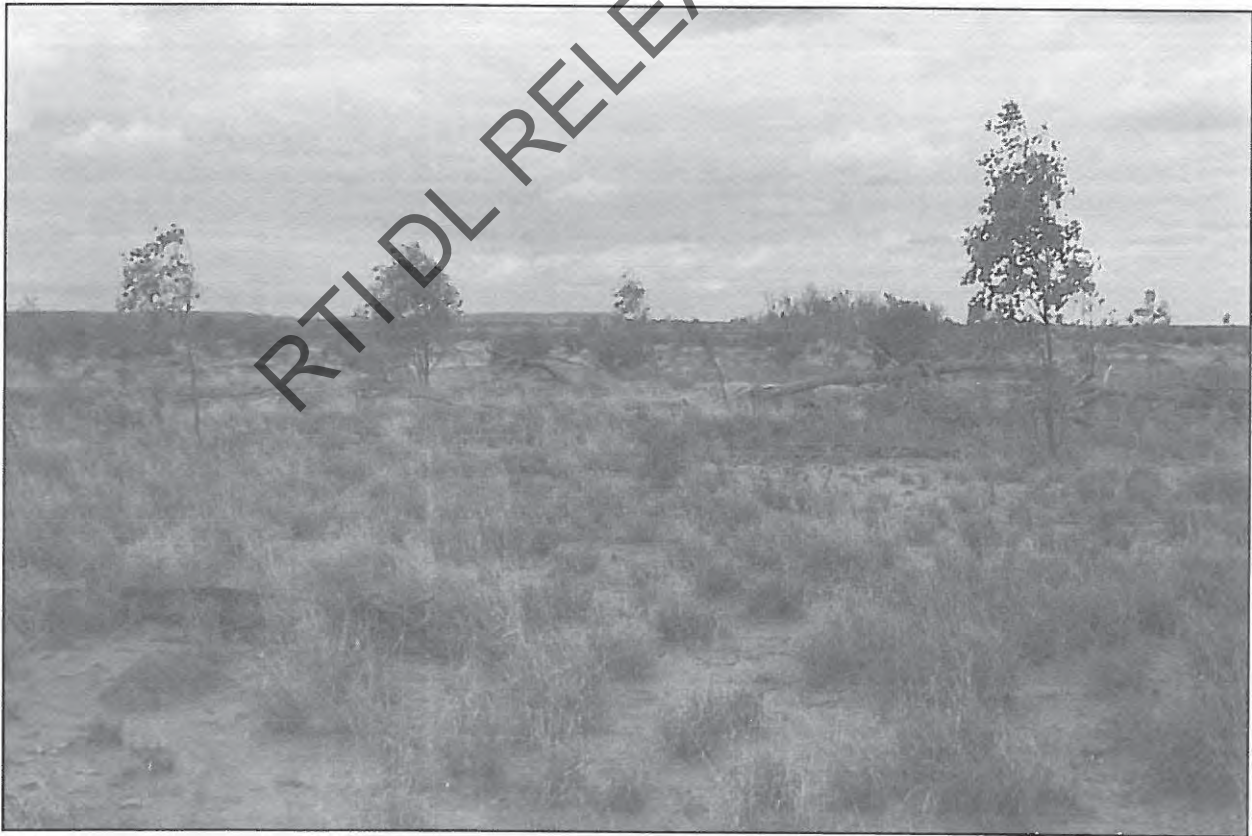


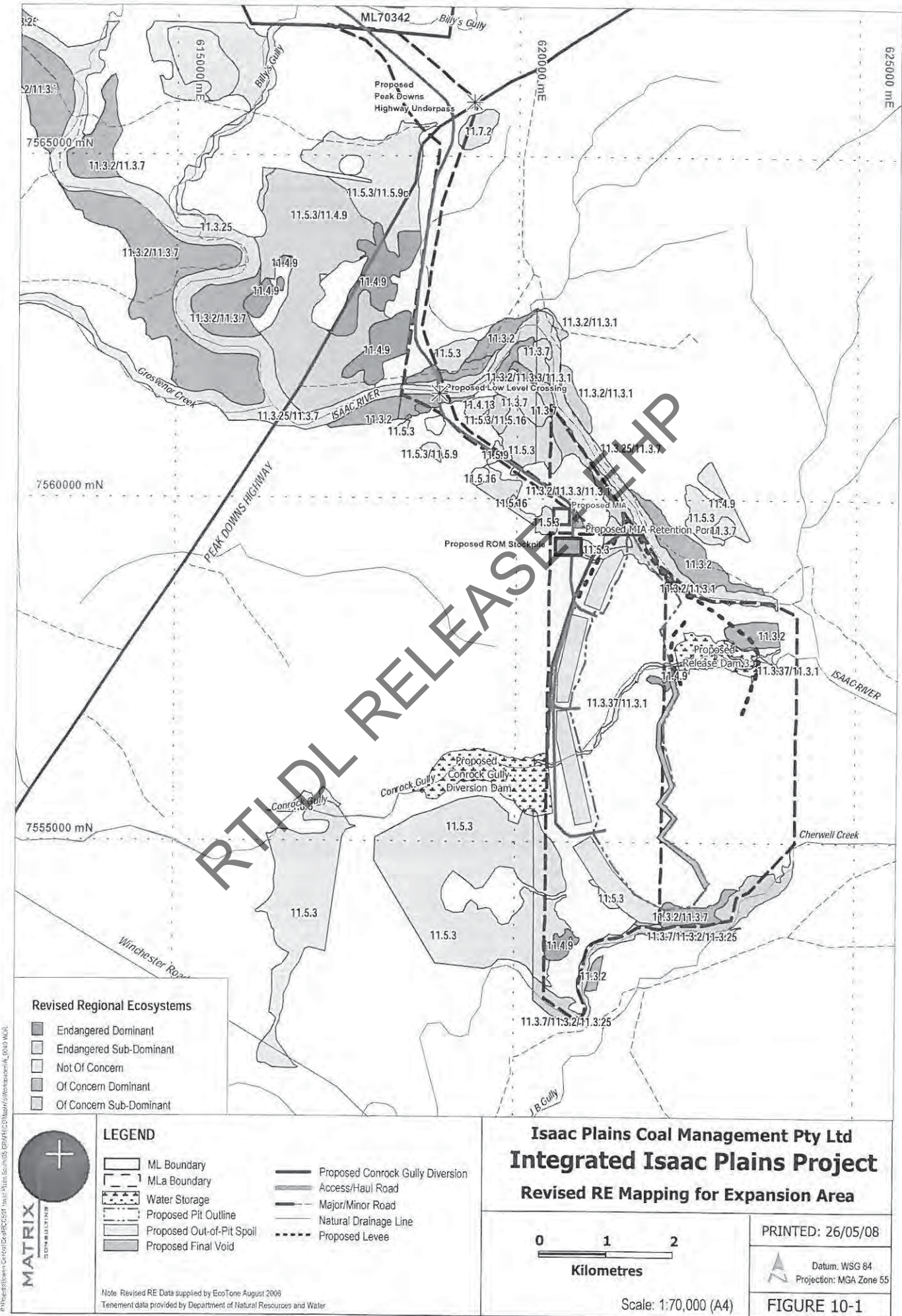
Plate 10-2 Typical vegetation and dieback in the Expansion Area

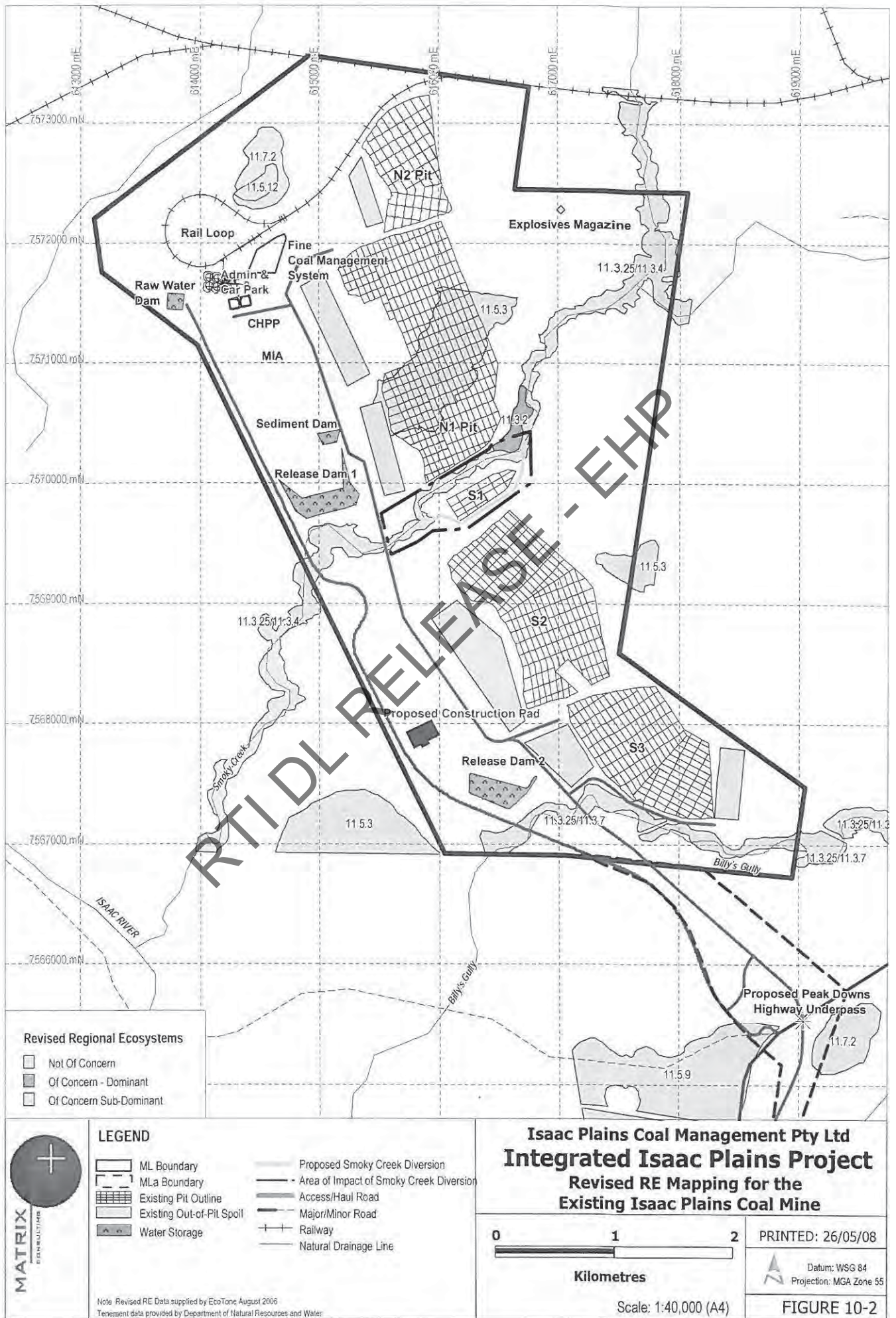


Plate 10-3 Dieback of the RE11.3.1/11.3.37 mosaic along Conrock Gully within the Expansion Area



Plate 10-4 Typical Vegetation and Dieback along Cherwell Creek





10.4.2.2 Existing Isaac Plains Coal Mine

No endangered REs (including Brigalow) were found to occur in the existing Isaac Plains Coal Mine. However, two small 'of concern' REs were identified along Smoky Creek as outlined in **Table 10-2**.

Table 10-2 Mapped REs – Existing Isaac Plains Coal Mine

RE	Description	VMA Status	Field Verification of Presence Within the Isaac Plains Coal Mine Area
REs mapped by QH but not present			
11.4.9	<i>Acacia harpophylla</i> (Brigalow) shrubby open forest to woodland with <i>Terminalia oblongata</i> and <i>Eremophila mitchellii</i> on clay plains or weathered basalt.	<i>Endangered</i>	This RE is mapped as a sub-dominant mosaic on the eastern and southern boundaries of the study area. Field verification revealed that the portions of the polygons within the study area do not include RE 11.4.9. This RE is also mapped as a dominant mosaic with RE 11.8.5 in small areas in the southern part of the area. However, field observations show these polygons to be incorrectly mapped.
11.8.5	<i>Eucalyptus argadophila</i> (Mountain Coolibah) open woodland on igneous rocks.	<i>Not of concern</i>	This RE is mapped as a sub-dominant mosaic with RE 11.4.9 in small areas in the southern part of the study area. Field observations show these polygons to be incorrectly mapped. RE 11.8.5 does not occur in the area.
REs mapped by QH and found to be present			
11.3.2	Woodland to open woodland of <i>E. populnea</i> (Poplar Box) on Cainozoic alluvial plains.	<i>Of concern</i>	This RE is mapped as a mosaic with RE 11.3.7 in a relatively large remnant polygon in the northern central part of the study area. This area is dominated by Poplar Box, however it is Land Zone 5 not LZ3 (alluvium) therefore the RE type assigned to this polygon is incorrect and is more correctly attributed to RE 11.5.3 (<i>not of concern</i>). There is an unmapped area of RE 11.3.2 adjacent to the riparian corridor of Smoky Creek. This area is mapped in the revised RE map.
11.3.7	<i>Corymbia</i> spp. (Bloodwoods) woodland on alluvial plains on sandy soils.	<i>Not of concern</i>	This RE is mapped as a mosaic with RE 11.3.2 in a relatively large remnant polygon in the northern central part of the study area. This area is dominated by Poplar Box on Land Zone 5 not LZ3 (alluvium) and does not contain any RE 11.3.7. This RE type does occur as a mosaic with RE 11.3.25 along the smaller tributary on the southern boundary of the study area. This has been mapped in the revised RE map.
11.3.25	<i>E. camaldulensis</i> (River Red Gum), <i>Casuarina cunninghamiana</i> fringing woodland on alluvial plains.	<i>Not of concern</i>	Field inspections confirmed the mapped occurrence of this RE along waterways; however, it occurs predominantly as a mosaic with RE 11.3.7 and RE 11.3.4 on the narrow alluvial terrace adjacent to the waterways in the area.
11.5.3	Shrubby woodland with <i>E. populnea</i> (Poplar Box) and/or <i>E. melanophloia</i> (Silver Ironbark) and/or <i>Corymbia</i> spp. (Bloodwood) on sand plains.	<i>Not of concern</i>	Field inspections confirmed the occurrence of this RE in polygons mapped as other REs. This RE is also incorrectly mapped as a mosaic with RE 11.4.9 on the southern boundary of the area where the access road enters the site.
11.5.9	<i>Eucalyptus crebra</i> (Narrow leaved Ironbark) and other <i>Corymbia</i> species woodland on sand plains including plateaus and broad crests.	<i>Not of concern</i>	This RE is mapped on the south-western boundary of the study area. However, the portion of the polygon within the area does not include RE 11.5.9. This RE does occur along the southern boundary of the area where the access road enters the site.



Nature Conservation

RE	Description	VMA Status	Field Verification of Presence Within the Isaac Plains Coal Mine Area
REs not mapped by QH but found to be present			
11.3.4	Tall woodland of <i>E. camaldulensis</i> (River Red Gum) on alluvial terraces and plains, with mixed Eucalypts including <i>C. tessellaris</i> (Carabeen), <i>Eucalyptus coolabah</i> (Coolabah), <i>E. populnea</i> (Poplar Box).	Of concern	Occurs as a mosaic with RE 11.3.25 along Smoky Creek.
11.5.12	<i>Corymbia clarksoniana</i> woodland and other <i>Corymbia</i> spp. and <i>Eucalyptus</i> spp. on sand plains/remnant surfaces.	Not of concern	Occurs on the small mesa near the rail loop.
11.7.2	<i>Acacia</i> spp. woodland on lateritic duricrust. Scarp retreat zone.	Not of concern	Occurs on the small mesa near the rail loop.

10.4.2.3 Access/Haul Road Alignment

The QH RE mapping (Version 5.0 current at the time of the survey) identifies a large range of REs occurring on Land Zones 3, and 5 for the haul/access road alignment area. Field surveys verified the presence of most of these REs, but again, a large number of anomalies within the QH mapping were identified with respect to the RE code assigned to individual polygons, but to a lesser extent, the boundary of the RE polygons. **Table 10-3** lists the mapped REs and their conservation status under the VMA that will be affected by the haul/access road construction and the low level crossing of the Isaac River. It should be noted, the initial alignment of the haul road extended north across the Isaac River through areas of endangered Brigalow. This alignment was subsequently revised to minimise impacts on endangered Brigalow whilst also minimising impacts on land use. The current alignment of the haul road now avoids endangered Brigalow.

Table 10-3 Mapped REs – Access/Haul Road Alignment

RE	Description	VMA Status
11.3.2	Woodland to open woodland of <i>E. populnea</i> (Poplar Box) on Cainozoic alluvial plains.	Of concern
11.3.7	<i>Corymbia</i> spp. (Bloodwoods) woodland on alluvial plains on sandy soils.	Of concern
11.3.25	<i>E. camaldulensis</i> (River Red Gum), <i>Casuarina cunninghamiana</i> fringing woodland on alluvial plains.	Not of concern
11.5.3	Shrubby woodland with <i>E. populnea</i> (Poplar Box) and/or <i>E. melanophloia</i> (Silver Ironbark) and/or <i>Corymbia</i> spp. (Bloodwood) on sand plains.	Not of concern
11.5.9	<i>Eucalyptus crebra</i> (Narrow-leaved Ironbark) and other <i>Corymbia</i> species woodland on sand plains including plateaus and broad crests.	Not of concern

10.4.3 Endangered Ecological Communities under the EPBC Act

The EPBC interactive search utility indicates the presence of three Endangered Ecological Communities (EECs) on or in the vicinity of the Expansion Area site, namely:

- bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregion [endangered];
- Brigalow (*Acacia harpophylla* dominant and co-dominant) [endangered]; and
- semi-evergreen vine thickets of the Brigalow Belt and Nandewar Bioregions [endangered].

The field inspections confirmed that neither bluegrass grasslands nor semi-evergreen vine thicket communities occur in the Expansion Area. However, based on field verification, Brigalow communities are present within Expansion Area, as illustrated in **Figure 10-3**.

Field inspections also confirmed that no EECs are present on the existing Isaac Plains Coal Mine.

A referral was lodged for the IIPP on 8 September 2006 under the EPBC Act and deemed by DEWHA (previously DEWR) not to be a controlled action on 6 October 2006.

10.5 FLORA

Detailed surveys of the Expansion Area, Smoky Creek and Billy's Gully were undertaken to detect any rare or threatened flora. Five species were listed under the EPBC Act or the NCA as potentially occurring in the abovementioned survey area; one *possible* and four *unlikely* as follows.

Possible

- *Desmodium macrocarpum* [Fabaceae]

Unlikely

- *Bertya pedicillata* [Euphorbiaceae]
- *Dichanthium queenslandicum* [Poaceae]
- *Digitaria porrecta* [Poaceae]
- *Persoonia amaliae* [Proteaceae]

No rare or threatened flora species listed were detected during the field surveys. One species, *Desmodium macrocarpum*, is known to occur in the poplar box woodland with a shrubby groundcover such as RE 11.5.3, however, given the poor condition of vegetation throughout the IIPP site it is not expected that this species occurs in the area of proposed disturbance.

10.6 FAUNA

10.6.1 Rare and Threatened Fauna

Table 10-4 details the rare or threatened fauna that are known to occur or potentially occur within the IIPP site and surrounding area and provides an assessment of the likely occurrence of each species. The species evaluated were compiled from the results of database searches and include additional species that were regarded as potentially occurring in the study region based on local knowledge. This list includes species scheduled as rare, vulnerable and endangered.

The search of the Queensland Museum database did not identify any rare or threatened fauna specimens within or in the vicinity of the IIPP site. The Wildnet database contained observation records of three rare species, while the EPBC search tool indicated eight species as potentially occurring in the vicinity of the IIPP site.

Assessment of the likely occurrence of each species was based on the known habitat preferences of each species and the availability and condition of potential habitat within the IIPP site. Assessments of the potential presence of species were tempered by the general paucity of published knowledge regarding the distribution and abundance of rare and threatened species in the Queensland Central Highlands. Where a species has been observed, it has been noted as *present*. Other species listed are assessed as being *likely*, *possible* or *unlikely*.

Two rare or threatened fauna species, the Squatter Pigeon (vulnerable) and the Little Pied Bat (rare)², were observed or detected within the IIPP site during the field assessments.

The Squatter Pigeon was observed in riparian woodland adjacent to the Isaac River and is also likely to utilise riparian and non-riparian grassy woodland habitats throughout the Expansion Area. It was also observed foraging along Billy's Gully and is expected to utilise the small alluvial pockets along Smoky Creek.

The Little Pied Bat was detected along Conrock Gully, Smoky Creek and Billy's Gully during Anabat surveys conducted as part of the riparian fauna surveys in these areas. Given the vegetation present, this species is likely to also be present in the general vicinity of the Isaac River.

² It is understood that the EPA is in the process of amending the Nature Conservation Regulation, including the change to the status categories. The rare category will be phased out by 2010 and replaced with a number of different categories. At present, the Little Pied Bat is listed as rare. However, with the changes to the regulation, its status is likely to change to common due to its apparent frequency in the Bowen Basin.

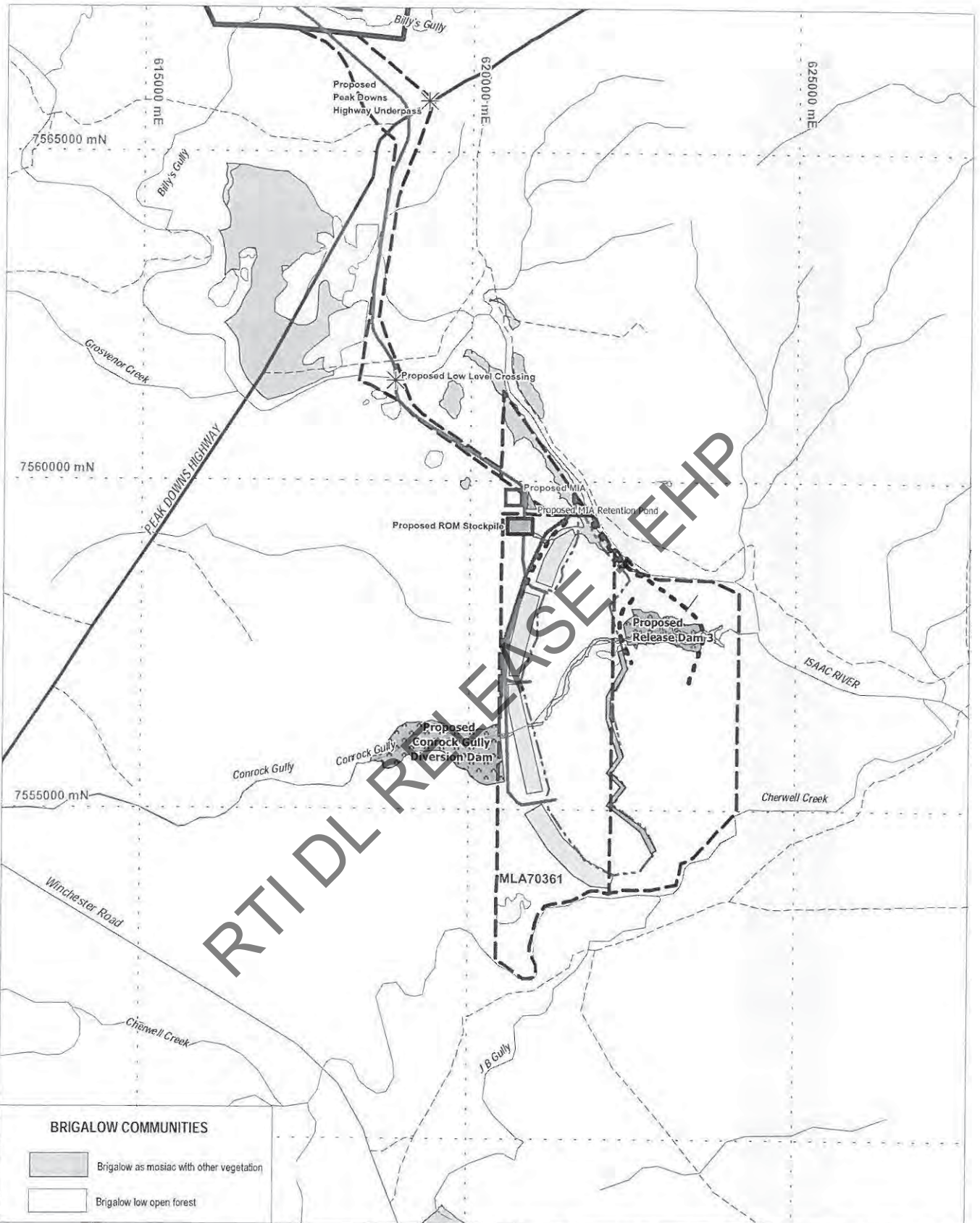
Of the *possible* species, the Grey Goshawk, Red Goshawk and Square-tailed Kite possibly utilise the IIPP site as part of a wider habitat area but are not expected to use it for nesting. Smoky Creek, Billy's Gully, Cherwell Creek and the Isaac River riparian vegetation corridors may represent a significant habitat feature for these species which utilise riparian corridors as foraging areas and movement corridors. The Ornamental snake is known to occur in the Moranbah area and is often associated with moist habitat types such as drainage lines. However the drainage lines in this area are considered to be degraded and therefore unlikely to represent critical habitat for this species.

Three bird species have been identified as unlikely inhabitants of the IIPP site, namely the Black-necked Stork, Star Finch and Australian Painted Snipe. The habitats required for these species do not occur within the area of the IIPP site therefore it is unlikely that they will occur on the site.

Reptile species which are unlikely to occur on the IIPP site include the Short-necked Worm skink, Common Death Adder and the Yakka skink. However, as the observed condition of the woodland habitats is not ideal for supporting any of these species, it is highly unlikely they would occur in these areas. Other reptilian species classed as unlikely to occur on the IIPP site are the Brigalow Scaly-foot and the Fitzroy Tortoise. There are insufficient ground habitat features for the Brigalow Scaly-foot and a lack of suitable aquatic habitat for the Fitzroy tortoise.

The habitat requirements of the Eastern Long-eared Bat, also listed as unlikely, are less well known. Not much is known about this species and it is therefore difficult to confidently predict its occurrence on the IIPP site. Most areas proposed to be cleared are unlikely to represent significant habitat for this species, given the quality of the vegetation in these areas observed during field surveys, but the riparian woodlands areas may provide some potential habitat due to the presence of tree hollows. However, given their predominantly aerial habitat, this species are unlikely to be affected by the condition of the ground habitat, that is, with the exception of their capacity to produce potential prey.

Signs of recent occupation by koalas were detected within the riparian woodland along the Isaac River in the Expansion Area and koalas are likely to routinely utilise River Red Gums (*Eucalyptus camaldulensis*) within the fringing riparian vegetation along both the Isaac River and Cherwell Creek. Based on the findings of the ecological surveys, koalas are not likely to utilise vegetation along Conrock Gully due to its poor condition. The vegetation within ML70342 along Smoky Creek and Billy's Gully is unsuitable for koalas.



BRIGALOW COMMUNITIES

-  Brigalow as mosaic with other vegetation
-  Brigalow low open forest



LEGEND

-  ML Boundary
-  MLa Boundary
-  Water Storage
-  Proposed Pit Outline
-  Proposed Out-of-Pit Spoil
-  Proposed Final Void
-  Proposed Conrock Gully Diversion
-  Access/Haul Road
-  Major/Minor Road
-  Natural Drainage Line
-  Proposed Levee

Note: Revised RE Data supplied by EcoTone August 2006
Tenement data provided by Department of Natural Resources and Water

**Isaac Plains Coal Management Pty Ltd
Integrated Isaac Plains Project
EPBC Listed Brigalow Ecological Communities**



Kilometres

Scale: 1:80,000 (A4)

PRINTED: 26/05/08

 Datum: WGS 84
Projection: MGA Zone 55

FIGURE 10-3

Table 10-4 Rare or Threatened Fauna – IIPP

Species Source of Record	NCA Status	EPBC Status	Key Resources	Habitat	Likelihood of occurrence within the IIPP site
Birds					
<i>Erythrotriorchis radiatus</i> Red Goshawk <i>epbc</i>	E	V	Trees > 20 m high for nesting within 1 km of a waterway or wetland. Abundance of passerine prey.	Coastal and sub-coastal forests and riparian forests.	Possible: the species may utilise the riparian forest along the Isaac River and Cherwell Creek, Smoky Creek and Billy's Gully. However, it is unlikely that the majority of the IIPP site provides significant habitat for the species due to the extent of clearing of adjoining timbered habitats. The Smoky Creek corridor may provide a local movement corridor for the species. Due to the disturbed nature of the study area it is highly unlikely that the species breeds in the local area.
<i>Accipiter novaehollandiae</i> Grey Goshawk <i>epa</i>	R		Availability of prey items.	Closed forest, tall wet forest, and riparian forest amid disturbed areas. Tends to utilise lowland riparian forest during winter.	Possible: as with Red Goshawk this species may utilise the riparian corridors within the IIPP site but the balance of the site provides little habitat values. The Smoky Creek corridor may provide a local movement corridor for the species. Due to the disturbed nature of the study area it is highly unlikely that the species breeds in the local area. Also, this species is seldom encountered west of the coastal ranges.
<i>Ephippiorhynchus asiaticus</i> Black-necked Stork (Jabiru) <i>epa</i>	R		Availability of wetland habitats.	River pools, permanent and ephemeral wetlands, tidal flats.	Unlikely: there do not appear to be any ephemeral wetlands in the study area, and the waterways that are present are relatively small and incised and unlikely to provide accessible habitat for this species.
<i>Lophoictinia isura</i> Square-tailed Kite <i>epa</i>	R		Availability of small passerine prey, including eggs and nestlings. Presence of large wooded areas in close proximity to breeding sites.	Eucalypt forest and woodlands, not generally encountered in more open habitats.	Possible: as with the Goshawks (above) this species may utilise the riparian areas but unlikely to utilise the balance of the site, with the exception of some areas of woodland habitat. Due to the disturbed nature of the study area it is highly unlikely that the species breeds in the local area.



Species Source of Record	NCA Status	EPBC Status	Key Resources	Habitat	Likelihood of occurrence within the IIPP site
<i>G. scripta scripta</i> Squatter Pigeon (southern subsp.) <i>epbc</i>	V	V	Availability of grass seed and grassy groundcover for shelter.	Prefers woodland with a grassy understorey close to water.	Present; observed during the summer survey in the Poplar Box patch to the north of Smoky Creek and observed in grassy woodland adjacent to the Isaac River. Also likely to utilise other grassy areas adjacent to waterways, and Poplar Box woodland in non-riparian areas.
<i>Neochmia ruficauda ruficauda</i> Star Finch (southern subsp.) <i>epbc</i>	E	E	Require proximity to water.	Inhabits grasslands or grassy woodlands close to water. Very few records of the species in recent years.	Unlikely; this species is largely sedentary and in order to successfully inhabit an area requires persistence of suitable habitat throughout the year. The cleared areas within the site, when coupled with consistent grazing pressure, do not provide suitable habitat for the species. There is also a lack of permanent natural surface water on the IIPP site.
<i>Rostratula australis</i> * Australian Painted Snipe <i>epbc</i>	V	V	Vegetated ephemeral wetlands.	Inhabits shallow vegetated ephemeral wetlands in coastal and inland areas.	Unlikely; suitable wetland habitat for the species does not occur within the site.
Mammals					
<i>C. picatus</i> Little Pied Bat <i>*</i>	R		Availability of roost sites including tree cavities, mines and buildings.	Forage in a wide variety of habitats including dry eucalypt open forest, woodland, shrublands and mallee.	Present; recorded along Conrock Gully, Smoky Creek and Billy's Gully and also likely to utilise the riparian woodlands along the Isaac River and Cherwell Creek which provide potential roosting and foraging habitat.
<i>N. timoriensis</i> Eastern Long-eared Bat (South-eastern form) <i>epbc</i>	V	V	Availability of roost sites in tree hollows or under hanging bark on trees.	In the Central Queensland area occurs in drier woodlands and open woodlands. May forage on the ground.	Unlikely; this is a little known species and it is difficult to confidently predict its occurrence in the IIPP site. However, the Expansion Area component of the project is beyond the northern extent of the currently known distribution of the species. There are currently no Wildnet records of the species from Belyando or Nebo Shires. On the basis of a lack of records of the species from the study region, and the failure of the Anabat survey to locate the species, it is not anticipated that the species occurs within the IIPP site.

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Species Source of Record	NCA Status	EPBC Status	Key Resources	Habitat	Likelihood of occurrence within the IIPP site
Reptiles					
<i>Anomalopus brevicollis</i> Short-necked Worm-skink +	R		Availability of leaf litter, rocks and fallen timber for shelter and foraging.	Known from a range of vegetation including dry Eucalypt woodlands, monsoon rainforest and Brigalow scrubs.	Possible; the remnant riparian and Eucalypt woodland habitats provide potential habitat but there is a general paucity of the preferred ground habitat (leaf litter, fallen timber).
<i>Acanthophis antarcticus</i> Common Death Adder +	R		Prefers availability of leaf litter and groundcover such as shrubs and Tussock grass.	Known from a wide range of timbered and treeless habitats including Eucalypt woodland and forest, grasslands and heath.	Possible; the remnant riparian and Eucalypt woodland habitats provide potential habitat but there is a general paucity of the preferred ground habitat (leaf litter, fallen timber).
<i>Denisonia maculata</i> Ornamental snake +	V	V	Feeds almost exclusively on frogs.	Brigalow on sandy and clay soils, and riparian woodland and open forest on levees. Recent records from Moranbah.	Possible; it is possible that the species could be encountered along the drainage lines in the area, however these drainage lines are degraded and therefore it is not anticipated to provide critical or high value habitat for this species.
<i>Egernia rugosa</i> Yakka skink epbc	V	V	Availability of logs or rocks or surface roots of trees on better drained soils.	Occurs in a variety of habitat types including Acacia shrublands, and Eucalypt forest and woodlands on sandy plains.	Possible; the remnant riparian and eucalypt woodland habitats provide potential habitat but there is a general paucity of the preferred ground habitat (leaf litter, fallen timber).
<i>Paradelma orientalis</i> Brigalow Scaly-foot epbc	V	V	Availability of ground habitats for shelter including rock slabs, rocky outcrops, bark and fallen timber.	Known from Eucalypt woodlands, vine thicket and Brigalow.	Unlikely; the study area does not provide sufficient amounts of the ground habitat features typically utilised by this species. Also, the IIPP site is beyond the northern limit of the currently known distribution of this species.
<i>Rheodytes leukops</i> Fitzroy Tortoise epbc	V	V	Availability of permanent aquatic habitat.	Prefers shallow, clear, fast flowing sections of rivers and creeks that are connected to large deep pools.	Unlikely; suitable aquatic habitat is not available within or adjacent to the IIPP site. The IIPP site is outside of the known distribution of this species.



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* The schedules of the NCA list this species as *Rostratula benghalensis* rather than the recently proposed species *R. australis*, formerly considered as a subspecies of *R. benghalensis*.

Key to Source of Record codes:

- epbc* Potential species from the EPBC database
- epa* Recorded observations from the Wildnet database (Environmental Protection Agency, 2004)
- ** Assessed as potentially present based on known distribution and available habitats

Key to Status:

- E Endangered
- V Vulnerable
- R Rare

Key to Likelihood:

- Present** Recorded in databases and observed during surveys
- Likely** Suitable habitat; found in the local area
- Possible** Suitable habitat; not recorded in local area/region OR sub-optimal habitat; may use infrequently
- Unlikely** No suitable habitat present; not noted in the local area/region

RTI DL RELEASE - EHP

10.6.2 Migratory and EPBC Species

Assessments of migratory species against Commonwealth significant species (other than vulnerable or endangered species) known from the region have been undertaken by compiling a list of species and undertaking an assessment of the likely occurrence of each species within the IIPP site. This list includes:

- species covered by migratory provisions of the EPBC Act comprising species listed under China and Australia Migratory Birds Agreement (CAMBA) and/or Japan and Australia Migratory Birds Agreement (JAMBA); and
- species covered by marine and wetland provisions of the EPBC Act.

Table 10-5 lists the migratory and other Commonwealth significant species known within the study region and provides an assessment of the likely occurrence of each species within the IIPP site.

The assessment of the likely status of each of the species is based on their known habitats, the occurrence of the habitat within the IIPP site and the condition of the habitat, if/where it occurs, within the IIPP site. Other studies conducted in the region and database searches were also used in the assessment of species presence/absence. Where a species has been observed, it has been noted as *present*. Other species listed are assessed as being *likely*, *possible* or *unlikely*.

The Rainbow Bee-eater, which was observed to be present, utilises a wide range of habitats for foraging including both riparian and non-riparian habitats and was observed in both the Smoky Creek and Billy's Gully riparian corridors. The riparian corridors within the IIPP site are not regarded as especially significant habitat for the species and extensive areas of feeding habitat occur in the study region. This is a highly mobile species that will not be impacted by disturbance of the riparian areas.

The Cattle Egret, which is likely to occur but was not observed, utilises open grazing areas in association with cattle, while the White-throated Needletail forages well above the ground and tree canopy on insect swarms and has only a tenuous linkage with the habitat above which it feeds.

The Little Curlew utilise open grassland areas, and the Black-faced Monarch and Satin Flycatcher possibly utilise the riparian woodland along the Isaac River. The White-bellied Sea-eagle may intermittently use the riparian habitats within the areas during the wet season.

Based on the ecological assessments conducted and given the limited extent and poor condition of remnant habitats, the IIPP site and surrounding area is not likely to represent especially significant feeding or breeding habitat for any of the migratory or other EPBC listed species regarded as likely or possible inhabitants.

Table 10-5 Migratory, Marine and Wetland EPBC Act Species – IIPP

Species Common Name EPBC Status Source of Record	Key Resources	Habitat	Likelihood of occurrence within the IIPP site
<i>Nettapus coromandelianus albigularis</i> Cotton Pygmy-goose w, m epbc	Deep water with vegetation.	Deep lagoons, wetlands and dams with floating macrophytes.	Unlikely; suitable deep water habitat does not occur within the IIPP site.
<i>Anseranas semipalmata</i> Magpie Goose m epbc	Availability of required wetland habitats.	Rush and sedge dominated swamps and floodplains. Predominantly coastal distribution but may appear further inland.	Unlikely; suitable wetland habitats do not occur within the IIPP site.
<i>Ardea ibis</i> Cattle Egret m +	Availability of habitats.	Pasture especially among cattle, occasionally wetlands.	Likely; the open grazing lands in the IIPP site provide suitable habitat for the species.
<i>Gallinago hardwickii</i> Latham's Snipe w, m epbc	Availability of preferred habitats.	Wetland grasses, open, wooded swamps, ephemerally inundated grasslands.	Unlikely; suitable ephemeral wetland habitats are unlikely to occur within the IIPP site.
<i>Numenius minutus</i> Little Curlew m, w epbc	Availability of preferred habitats.	Habitats include open plains and grasslands.	Possible; may utilise the cleared open grassy areas within the IIPP site.
<i>Rostratula benghalensis s. lat.</i> Painted Snipe w, m epbc	Vegetated ephemeral wetlands.	Inhabits shallow vegetated ephemeral wetlands in coastal and inland areas.	Unlikely; suitable natural wetland habitat for the species does not occur within the IIPP site.

Species Common Name EPBC Status Source of Record	Key Resources	Habitat	Likelihood of occurrence within the IIPP site
<i>Haliaeetus leucogaster</i> White-bellied Sea-eagle t, m epbc	Availability of prey and nesting sites.	Large rivers including inland, fresh and saline lakes, coastal seas and shoreline, islands.	Possible; may intermittently utilise the riparian habitats within the IIPP site, particularly during the wet season.
<i>Merops ornatus</i> Rainbow Bee-eater m +	Availability of habitat.	Most habitats apart from closed forest.	Present; observed in riparian habitats of the IIPP site.
<i>Monarcha melanopsis</i> Black-faced Monarch t, m epbc	Availability of forest habitat.	Forest habitats including riparian forest. Predominantly coastal and sub-coastal distribution.	Possible; may utilise the riparian woodlands within the IIPP site but at the western extent of its range.
<i>Myiagra cyanoleuca</i> Satin Flycatcher t, m epbc	Availability of habitat.	Tall forests, riparian forest, and woodland. Not usually encountered to the west of the Great Dividing Range in Qld.	Possible; may utilise the riparian woodlands within the IIPP site but at the western extent of its range.
<i>Hirundapus caudacutus</i> White-throated Needletail t, m epbc	Availability of high-flying insect swarms.	Aerial habitat over coastal habitats and mountain ranges.	Likely; to intermittently forage over the IIPP site.

Key to Status:

- w wetland species covered by migratory provisions of EPBC
 m species covered by marine provisions of EPBC
 t terrestrial species covered by migratory provisions of EPBC

Key to Source of Records:

- epbc EPBC database search records for the study region
 + Assessed as potentially present based on known distribution

Key to Likelihood:

- Present** Recorded in databases; observed during surveys
Likely Suitable habitat; found in the local area
Possible Suitable habitat; not recorded in local area/region OR sub-optimal habitat; may use infrequently
Unlikely No suitable habitat present; not noted in the local area/region

10.7 POTENTIAL IMPACTS

10.7.1 Potential Impacts on Flora and Fauna - General

The areas of disturbance within the Expansion Area and access/haul road will largely avoid the remnant vegetation along the Isaac River, i.e. the vegetation in the best ecological condition within the Expansion Area. The majority of the pit and spoil dump areas in the Expansion Area are to be located within highly modified non-remnant grazing lands. However, some small areas of remnant vegetation will be disturbed under the currently proposed mine layout. Remnant areas that will be disturbed comprise:

- woodland areas adjacent to Cherwell Creek that may be disturbed by spoil dumps;
- sub-dominant Brigalow comprising the riparian corridor of Conrock Gully that lies within the footprint of the pits/dumps;
- the area of dominant Brigalow to the south of Conrock Gully which is likely to be impacted by spoil dumps; and
- small areas of woodland adjacent to the Isaac River that will be disturbed by the northern end of the pit, spoil dumps and the ROM stockpile.

In addition, the diversion of Smoky Creek and Conrock Gully will require the removal of riparian corridor vegetation to access the identified coal reserves.

Approximately 67.7 ha of remnant vegetation will be affected by the IIPP, representing approximately 23.8 % of the total estimated area of disturbance within the IIPP (refer to **Table 10-6**). Approximately 24.9 ha of Brigalow is likely to be affected (both dominant and sub-dominant), which represents approximately 8.7 % of the remnant vegetation to be disturbed within the IIPP (this figure includes the 12.6 ha to be cleared for the waterway diversions) (refer to **Table 10-6**).

Table 10-6 below provides a list of all RE areas impacted by the IIPP including the access/haul road and the Conrock Gully and Smoky Creek diversions. Although riparian vegetation along Smoky Creek, consisting of 3.2 ha of 'of concern' RE and 8.6 ha of 'not of concern' RE will be cleared, the new alignment for the Smoky Creek diversion abuts the southern side of Pit S1 and thus will not result in any further vegetation clearing.

Although the alignment of the haul/access road which links the Expansion Area and the existing Isaac Plains Coal Mine was developed to avoid impacts on remnant vegetation where possible, noise, lighting and vehicles may have the potential to impact on fauna. However, it is not anticipated that these factors will substantially affect the overall native fauna biodiversity supported in habitat areas within the Expansion Area. Depending on the final location of major mine infrastructure, mitigation of mine site noise may not be required.

10.7.2 Potential Impacts on Regional Ecosystems under the VMA

Areas of endangered Brigalow, both sub-dominant RE 11.3.1 and dominant RE 11.4.9, occur within the disturbance zone of the proposed Expansion Area. Some Brigalow, both dominant and sub-dominant, lies within the proposed pit and cannot be avoided. Consequently, no mitigation measures are possible, apart from the provision of compensatory habitat. An area of endangered sub-dominant RE 11.3.1 and endangered dominant RE 11.4.9 will be disturbed along, and adjacent to, Conrock Gully. This vegetation is in very poor condition and continues to decline under the effects of serious canopy dieback. It is anticipated that under the current rate of decline, the majority of the area will slip from remnant status within the next five years. As it is not anticipated that the vegetation will recover naturally, an area of habitat will be designated as compensation for this loss.

An area of RE 11.3.2 (Woodland to open woodland of *Eucalyptus populnea* (Poplar Box) on Cainozoic alluvial plains) adjacent to Cherwell Creek will be disturbed by the spoil dumps. This RE is currently listed as 'of concern' under the VMA and has been identified by the DNRW as a threshold RE. Threshold REs comprise REs which have been cleared to the extent that further clearing will cause a change in their conservation status, meaning that RE 11.3.2 is close to becoming an endangered RE.

Table 10-6 Area of RE to be cleared within the IIPP site and as a result of the access/haul road construction and the Conrock Gully diversion

RE	Status		Total Area of RE within the IIPP* (ha)	RE Area to be cleared for mine infrastructure** (ha)	Area of RE to be cleared for haul/access road (ha)	Area of RE to be cleared for Conrock Gully and Smoky Creek Diversions (ha)	Total area of RE to be cleared (ha)
	EPBC	VMA					
11.3.2 & 11.3.2/11.3.7	-	<i>Of concern</i>	62.0	0.8	15.9	3.2	19.9
11.5.3	-	<i>Not of concern</i>	89.4	0.8	1.2	0	2
11.3.7	-	<i>Not of concern</i>	0	0	2.8	0	2.8
11.4.9 (Brigalow dominant)	<i>Endangered</i>	<i>Endangered</i>	18.2	4.7	0	0	4.7
11.3.1 (Brigalow sub-dominant) mixed with 11.3.2, 11.3.7	<i>Endangered</i>	<i>Endangered</i>	73.5	19.4	0	0.8	20.2
11.3.25/11.3.7		<i>Not of concern</i>	10.9	0	8.2	8.6	16.8
11.3.7/11.3.2/11.3.25		<i>Not of concern</i>	29.9	0	0	0	0
11.5.9		<i>Not of concern</i>	0	0	1.3	0	1.3
Total			283.9	25.7	29.4	12.6	67.7

* Figures relate to Expansion Area only.

**This includes the vegetation cleared for the haul/access road within the MLa.



10.7.3 Potential Impacts on Endangered Ecological Communities under the EPBC Act

No EECs will be impacted as a result of the diversion of Smoky Creek or from other activities at the existing Isaac Plains Coal Mine site as no EECs were identified in this area. Field surveys have confirmed the occurrence of approximately 91.7 ha of the Brigalow EEC within the Expansion Area (none occurs within the existing mine) (refer to **Figure 10-3**). These remnant areas are in poor to moderate ecological condition, with the impacts of grazing evident as reduced groundcover and shrub diversity. Furthermore, the replacement of the native groundcover flora with Buffel grass in most areas, and the occurrence of Guinea grass along the Isaac River, has further degraded the condition of the EEC. Severe canopy dieback occurs within the woodland in the southern part of the Expansion Area, i.e. along Conrock Gully and Cherwell Creek.

On the basis of the DEWHA MNES assessment guidelines, the impacts on the Brigalow EEC would be regarded as significant as the IIPP will "...reduce the extent of a community..." even though the Brigalow communities occurring along Conrock Gully within the footprint of the pit area are in very poor condition because of dieback. The dieback of Brigalow was previously thought to remove its remnant status, however, recent precedents from the QH indicate that dieback in Brigalow is considered a natural process, and unless proven to be from anthropogenic causes, Brigalow with dieback, is still considered remnant under the VMA. Therefore contrary to earlier assessments in the Brigalow subject to dieback is still subject to the EPBC Act.

Notwithstanding the above, if the degraded areas were being considered for listing in accordance with the new approach set out in the relevant fact sheet and the report entitled "Ecological Communities: A Way Forward" of September 2004, it is unlikely that they would be protected. This approach takes into account the impacts of degradation and regional variation in widespread ecological communities. Significantly degraded (low condition) areas, such as areas of Brigalow EEC along Conrock Gully and at the northern edge of the pit and spoil dumps, would not be regarded as part of an ecological community. The assessment provided in the EIS and which formed the basis of the EPBC Act referral, remains the same.

The IIPP was referred to the DEWHA under the EPBC Act who deemed the project not to be a controlled action on 6 October 2006, i.e. impacts on EECs are not regarded as significant at a Commonwealth level.

A total of approximately 20.2 ha of RE 11.3.1 and 4.7 ha of RE 11.4.9 are likely to be cleared within the Expansion Area and as a result of the access/haul road construction and waterway diversion. **Table 10-7** provides a comparison of the area of Brigalow to be disturbed within the IIPP to those mapped within the bioregion and sub-region.

Table 10-7 Brigalow Occurring vs Proposed Clearing

RE	Area (ha) occurring in the IIPP (MLa) site	Area (ha) of Brigalow RE to be cleared	Approx % of Brigalow RE occurring within the IIPP site to be cleared	Area (ha) remaining in Bioregion (Brigalow Belt)	Approx % of RE to be cleared of that remaining in the Bioregion	Area (ha) remaining in sub-region (Northern Bowen Basin)	Approx % of RE to be cleared of that remaining in the sub-region
RE 11.3.1 - occurs as sub-dominant along the periphery of Conrock Gully and the Isaac River	73.5	20.2	27.4%	79,364	0.025 %	7,400	0.27%
RE 11.4.9 - occurs adjacent to the southern side of Conrock Gully	18.2	4.7	25.8%	100,830	0.0047 %	10,603	0.044 %

Source: Accad, A. *et al.* 2006 (utilising 2003 remnant vegetation statistics).



10.7.4 Potential Impacts on Regionally Significant Wildlife Corridor (Isaac River Corridor)

The vegetation associated with the Isaac River forms part of a regionally significant wildlife corridor, which comprises remnant riparian vegetation immediately adjacent to the river and woodland on alluvial/flood plains further from the river. The corridor vegetation will be impacted by clearing for the proposed low level crossing, the mine pit and the construction of the levee, and the alteration of the natural flood regime once the levee is constructed (flood of 100 year ARI). The location of the levee will prevent the natural flood cycle from reaching remnant REs which would have the potential to result in long-term decline in the vegetation and dependant biota. **Figure 10-4** illustrates these potential impacts within the Expansion Area. In addition, it also illustrates that these areas of impacted vegetation are required to be cleared for mining activities in any case. Areas requiring clearing are previously stated in this section of the EIS.

10.7.5 Potential Impacts on NCA Listed Rare and Threatened Flora

Impacts on any rare or threatened flora listed under the NCA are not anticipated.

Only one flora species listed under the NCA, *Desmodium macrocarpum* (rare) is a possible inhabitant of the Expansion Area. Targeted field surveys did not locate the species and, based on the poor condition of these habitats, it is anticipated that it is not present. Consequently, it is not anticipated that *Desmodium macrocarpum* will be affected by the proposed activities.

No rare or threatened flora was identified during field assessments at the existing Isaac Plains Coal Mine.

10.7.6 Potential Impacts on EPBC Listed Threatened Flora

Impacts on threatened flora listed under the EPBC Act are not anticipated with no suitable habitat for any of the threatened flora potentially occurring in the Expansion Area or on the existing Isaac Plains Coal Mine.

10.7.7 Potential Impacts on NCA and EPBC Listed Fauna

Table 10-8 outlines the potential impacts on those NCA and EPBC species which use and are likely to use the habitats within the IIPP site. Based on the surveys conducted, the potential for impacts from the IIPP activities on those species listed as unlikely or possible has been assessed as negligible.

Table 10-8 Potential Impacts on Present and Likely NCA/EPBC Fauna Species - IIPP

Species	Comments
Rare and Threatened Species	
Squatter Pigeon (southern subsp.) <i>Geophaps scripta scripta</i> (Present)	<p>The occurrence of this species in the areas affected by the IIPP was confirmed by field surveys. The squatter pigeon prefers open grassy habitats for foraging and requires access to free water.</p> <p>Impacts to the species in the IIPP area are likely to be limited given the already impacted grasslands throughout the IIPP site.</p> <p>Disturbance of the Smoky Creek riparian corridor is unlikely to impact significantly on this species. The Squatter Pigeon prefers open grassy habitats for foraging and requires access to free water. The closed riparian habitat along Smoky Creek does not provide favoured foraging habitat for this species and there are no permanent waterholes within the reach to be disturbed. Riparian corridors are not required by this species for movement through foraging habitat, and it is not anticipated that this species nests in the vicinity of Smoky Creek due to the disturbance provided by high cattle activity in the area.</p> <p>Any potential disturbance of the Billy's Gully riparian corridor is not anticipated to result in a significant impact on this species, but does represent an incremental loss of its potential habitat for this species. The riparian corridor along Billy's Gully constitutes the favoured foraging habitat for this species, i.e. grassy woodland on alluvial terraces, although the tributary does not support permanent waterholes.</p> <p>There are, however, extensive tracts of this habitat in the surrounding area and Billy's Gully is not anticipated to provide especially significant habitat for this species.</p>

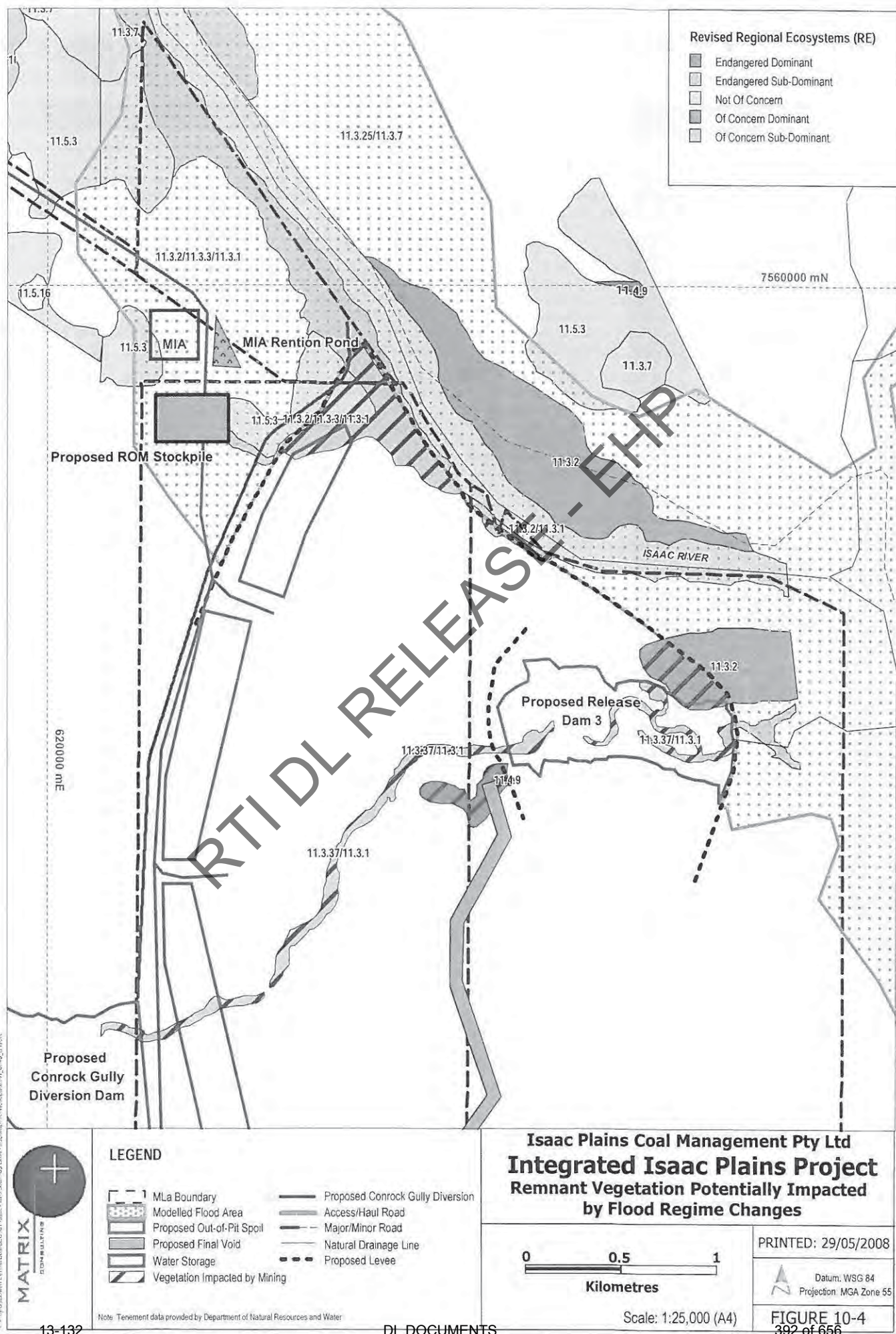
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Species	Comments
	<p>Approximately 125 ha of the potential woodland habitat of this species will be removed from within the Expansion Area. However, more extensive areas of potential woodland habitat occur in the surrounding area, particularly the broad band of riparian woodlands along the Isaac River upstream and downstream of the IIPP site. When viewed in the context of the surrounding areas available for this species, the area to be removed is relatively small.</p> <p>This species is not expected to nest in the IIPP site due to disturbance by cattle.</p>
Little Pied Bat <i>Chalinolobus picatus</i> (Present)	<p>The Little Pied Bat is known to inhabit the IIPP site having been observed along Smoky Creek and Billy's Gully. The suitable woodland habitat within the IIPP site, including the continuous riparian woodland along the Isaac River and Cherwell Creek, is unlikely to be affected by the proposed expansion. When viewed in the context of the surrounding habitat areas available for the species, the area of habitat to be removed is relatively very small, constituting a very small contribution to an ongoing incremental loss of grassy woodland habitat within the region.</p> <p>The Little Pied Bat is likely to preferentially forage amongst the riparian woodland habitats, although other woodland areas would be used on a seasonal basis when invertebrate populations peak in response to rainfall or flowering periods of plants. The species is likely to utilise the riparian corridors for both foraging and roosting. Tree hollows within both the Smoky Creek and Billy's Gully riparian corridors provide potential roost habitat for the species. Disturbance of the riparian corridors will reduce the availability of foraging habitat for the species however, extensive foraging habitat occurs upstream and downstream of the IIPP site, and in association with the nearby Isaac River.</p> <p>Disturbance of the riparian corridor is not anticipated to result in a significant impact on the species, but does represent some loss of potential habitat for the species.</p>
Migratory, Marine and Wetland species	
Rainbow Bee-eater <i>Merops ornatus</i> (Present)	<p>This species was observed in the riparian areas of Smoky Creek, Billy's Gully and Conrock Gully but is a highly mobile species that will not be impacted by disturbance of the areas within the IIPP site. It utilises a wide range of habitats for foraging including both riparian and non-riparian areas. The woodland habitats of the study area provide potential habitat for this species, especially riparian woodlands along the Isaac River and Cherwell Creek. While approximately 145 ha of woodland will be removed, none of the main riparian habitats will be significantly disturbed. Given the small area of habitat to be disturbed, significant impacts on the Rainbow Bee-eater are not anticipated.</p>
Cattle Egret <i>Ardea ibis</i> (Likely)	<p>The Cattle Egret is most strongly associated with the areas of improved pasture (Buffel grass) adjacent to the riparian corridors. Disturbance of the riparian corridors will not significantly impact on this species. This species is likely to make extensive use of the open grazing lands within the study area. The loss of this habitat within the study area is not expected to result in significant impacts on the species given the extensive areas of open grazing land in the region.</p>
White-throated Needletail <i>Hirundapus caudacutus</i> (Likely)	<p>Disturbance of the riparian corridors will not significantly affect the foraging opportunities for this species as it is an aerial feeder that forages high above terrestrial habitats.</p>

Given the minimal proposed disturbance to remnant habitats, the poor condition of habitats within the proposed extent of disturbance within the Expansion Area, and the area of disturbance compared to available habitats in the study region, it is not anticipated that the IIPP will lead to significant impacts on rare, threatened or migratory species, communities or populations listed under the NCA or EPBC Act.





10.8 MITIGATION MEASURES

A number of mitigation measures are proposed to limit the extent and magnitude of potential impacts from the IIPP on flora and fauna. These are listed below.

- Areas of remnant vegetation (approximately 67.7 ha) that are proposed to be cleared and are classified as Of Concern or Endangered will potentially be offset to meet the objects of the VMA. Areas to be offset will be identified as part of the rehabilitation plan to be developed for the IIPP as a requirement of the PoO, and will be based on the DNRW documented as part of the IPP will be offset in accordance with the requirements of the DNRW document Policy for Vegetation Management Offsets, 28 September 2007. IPCM is committed to providing an offset of 67.7 ha of remnant vegetation, with the required offset designed to:
 - maintain ecological processes at a subregional level, including interrelationships of natural values, species distributions and movements;
 - be geographically close to the areas proposed to be cleared as is reasonably achievable ensuring that localised environmental effects of clearing are mitigated and ecological equivalence achieved;
 - recreate similar habitats to the surrounding area; and
 - be a pre-clearing regional ecosystem that has the same or higher conservation value as the area proposed to be cleared and should ideally be on the same land zone as the regional ecosystem(s) being cleared.

The offset area will be an area that is large enough to be mapped as remnant vegetation in accordance with the current version of the EPA's "Methodology for Survey and mapping of Regional Ecosystems and Vegetation Communities in Queensland" and will be developed to become ecologically equivalent to the area being cleared.

As part of the application for the proposed offset covenant, IPCM will develop and submit a management plan which will specify how the offset will be managed to ensure the offset achieves or maintains remnant regional ecosystems status and ecological equivalence. As part of the management plan, IPCM will commit to ensuring the offset is legally secured for the life of the IIPP and for protection, and management as required during operations and post-mining. Post-mining management decisions will include consultation with landholders.

IPCM will organise to meet formally with the DNRW Vegetation Management Officers in the relevant district to discuss offset requirements prior to making a formal covenant application. This will be conducted prior to an application being formally submitted. In addition, IPCM will ensure that it has offset covenant approval prior to works commencing for the IIPP.

- Areas of vegetation that are proposed to be cleared and are classified as Of Concern or Endangered will potentially be offset to meet the objects of the VMA. Areas to be offset will be identified as part of the rehabilitation plan to be developed for the IIPP as a requirement of the PoO, and will be based on the DNRW documented Policy for Vegetation Management Offsets, 28 September 2007.
- Levees located between the pits and waterways will provide some attenuation of noise generated by mining to riparian areas which may provide habitat to fauna.
- A buffer zone of 50 m will be maintained between the high bank of the Isaac River and the proposed levee at the northern end of the Expansion Area mine pit. This buffer will ensure the preservation of vegetation in the vicinity of the river bank. In addition, a minimum total buffer distance between the top of the highbank and the crest of the mining excavation of 100 m will be maintained
 - This buffer will be maintained as a vegetated area. Revegetation of this area will assist with connectivity and assist with sediment control and protect the water quality of the Isaac River. Prior to the revegetation of the levee, it is proposed to fence off the area and allow for natural regeneration. Should

regeneration not be naturally forthcoming, using the results of soil/substrate assessment, direct seeding etc will be implemented in accordance with substrate/soil types in the buffer area and consistent with the vegetation on the northern side of the river.

- Establishment of vegetation on the levee wall. It is proposed to establish predominantly 'spreader type' grasses rather than bladed grass which will provide better stabilisation and dissipate the energy of rainfall which can lead to erosion. Specific species will be determined based on the substrate used in levee construction. No trees or shrubs will be planted on the levee. Although it will not intentionally be seeded, it is likely that in this region, buffel grass will compete with and dominate most native species. Local fauna species such as the squatter pigeon have adapted to foreign species such as buffel grass.
- Both the buffer area and levee will be fenced off from grazing impacts for the life of the mine;
- Both the buffer area and levee will be included into the weed monitoring program for the ML areas within the Expansion Area; and
- No mine roads/access roads will be located within the buffer area.
- Lighting will be installed in such a way as to avoid direct illumination of riparian and woodland habitat areas, or where necessary, shading devices will be fitted to lights to restrict illumination of these areas.
- The water management system for the IIPP will capture, contain and treat mine water ensuring that impacts on downstream beneficial water uses are minimised, including use by fauna (refer to **Section 6**).
- During the operational phase, control of Parthenium in the works area will be undertaken to prevent vehicles coming into contact with the plant. Any vehicles that traverse areas where Parthenium remains (the majority of the property) will need to be thoroughly washed down prior to leaving the property.
- The out-of-pit spoil dump will be designed to avoid or minimise the disturbance of the area of Brigalow and RE 11.3.2 adjacent to Cherwell Creek.
- Non-remnant areas and 'not of concern' remnant vegetation areas will be preferentially used where possible prior to disturbing any areas of remnant vegetation.
- 24.9 ha (equivalent to the area of Brigalow to be disturbed) which is not required for mining will be fenced to allow for the natural regeneration of Brigalow. Dependant on the location of this area consent may be required from the landowner prior to implementation of this strategy.

Mitigation measures are further detailed in the EM Plan for the IIPP (refer to **Section 20**).

10.9 WEEDS

Environmental weeds, including introduced pasture species, are abundant in the remnant vegetation areas and have displaced natural groundcover species within the study area. Buffel grass (*Cenchrus* spp.) is particularly widespread, being the main pasture species established in the area. Throughout the entire IIPP site, ground habitat values have been diminished by the virtual monoculture of Buffel grass and the consequent lack of floristic and structural diversity (refer to **Section 10.4.1**).

Three declared plant species under the *Land Protection (Pest and Stock Route Management) Act 2002* (LPA) were detected in the study area, including Parthenium (*Parthenium hysterophorus*) which is widespread throughout the study area, and the wider study region. A list of all pest plants occurring in the study area is provided in **Table 10-9**. None of the other declared pest species were present in significant densities.

Noogoora Burr (*Xanthium pungens*) and Prickly Acacia (*Acacia nilotica*) also occur sporadically along the waterways of the study area. Although the Noogoora Burr is not a declared species under the LPA as a pest species, it is listed under the Nebo and Belyando local government control requirements.

The Belyando Shire Pest Management Plan 2005-2009 (which was prepared under the requirements of the LPA) classifies weed species as either eradication target species or control target species. The Nebo Shire Pest Management Plan 2005-2009, also developed in line with the LPA, classifies weed species as particular priority species with specific levels of control for each listed species. In both Shires, eradication of target species must be undertaken wherever they occur and control targets will be removed from strategic areas in a phased control program. **Table 10-9** lists those species identified in the IIPP area, pest status under the LPA and local council status. IPCM, in consultation with landholders and Councils, will develop a property pest management plan for the MLs.

Table 10-9 Declared Pest Plant Species Occurring in the Study Area

Scientific Name	Common Name	Pest Status under LPA	Belyando Shire Council Status	Nebo Shire Council Priority Status
<i>P. hysterophorus</i>	Parthenium weed	C2	Control target	Medium
<i>Harrisia</i> sp.	Harrisia cactus	C2	Control target	Medium
<i>Opuntia</i> sp.	Prickly Pear	C2	Not listed	Medium
<i>Acacia nilotica</i>	Prickly Acacia	C2	Eradication target	High
<i>Xanthium pungens</i>	Noogoora Burr	C2	C2	Medium

Note: The DNRW defines Class 2 pests as those pests established in Queensland that have, or could have, an adverse economic, environmental or social impact. The management of these pests requires co-ordination and they are subject to programs led by local government, community or landowners. Landowners are required to take reasonable steps to keep land free of Class 2 pests.

10.9.1 Potential Impacts and Mitigation Measures

There is the potential for weeds/pest plant species to be spread, both throughout the IIPP site and off site, to neighboring properties or regions through vehicle movements associated with mining activities.

During the construction and operation of the IIPP, all vehicles will undergo a thorough wash-down, prior to entering and leaving the IIPP.

The management of pest plant species will comprise of measures such as vehicle wash-down and regular site inspections for known pest plant species. IPCM are committed to adhering to the requirements of both the Belyando Shire Pest Management Plan 2005-2009 and the Nebo Shire Pest Management Plan 2005-2009. Mitigation measures are outlined in the EM Plan for the IIPP in **Section 20**.

10.10 FERAL ANIMALS

Five introduced species were recorded during the surveys, namely:

- feral cat (*Felis catus*), listed as a Class 2 pest under the LPA;
- feral pig (*Sus scrofa*); listed as a Class 2 pest under the LPA;
- European rabbit (domestic and wild breeds) (*Oryctolagus cuniculus*), listed as a Class 2 pest under the LPA;
- Cane toad (*Bufo marinus*), not a declared pest³ in Queensland⁴; and

³ A non-declared pest may include: mammals commonly kept for commercial or social benefit; and non-native mammals, reptiles or amphibians that are widespread but have minimal negative commercial, environmental or social impacts; and/or there are no cost-effective broad scale control measures available.

⁴ The cane toad is currently not a declared pest in Queensland therefore there is no legal requirement to control them despite

- Brown hare (*Lepus capensis*), not a declared pest in Queensland.

Although not observed during the field surveys conducted in the study area, observations of both wild dog/dingo⁵ (*Canis familiaris*), listed as a Class 2 pest under the LPA, and the house mouse (*Mus musculus*), not a declared species in Queensland, have been made in the study region. All of the above listed species are commonly encountered throughout the Central Highlands area. Both the Nebo and Belyando Pest Management Plans address Class 2 pests.

The Plans provide a legal and administrative framework for the enforcement and removal of declared animals from private property. As for weed control, Councils, in consultation with landholders, develop property pest management plans for their specific areas/properties.

10.10.1 Potential Impacts and Mitigation Measures

Feral animals have the potential to disturb the natural physical landscape and impact on native fauna populations. IPCM is committed to adhering to the requirements of both the Belyando Shire Pest Management Plan 2005-2009 and the Nebo Shire Pest Management Plan 2005-2009 in order to further enhance the control and eradication of feral animals within the IIPP site and Nebo and Belyando shires as a whole. Mitigation measures are outlined in the EM Plan for the IIPP in **Section 20**.

10.11 AQUATIC FLORA AND FAUNA

A one-off aquatic survey was conducted of waterways within the IIPP area where pooled water was present. Aquatic flora (macrophytes only) and aquatic fauna (macroinvertebrates, freshwater fish, platypus and turtles) were chosen as biodiversity indicators. All field sampling was conducted from the 30 April 2007 to 2 May 2007, with the exception of the fish surveys, which were conducted on the 29 May and 30 May 2007.

The survey program was achieved through a combination of desktop literature searches and on-site field investigations.

10.11.1 Desktop Assessment

The desktop assessment of the study region surrounding the IIPP was conducted using Queensland on-line databases, including:

- Queensland Environmental Protection Agency;
- Queensland Parks and Wildlife Service; and
- Queensland Museum Ichthyology.

The area defined in the search was 21° 45' to 22° 20' and 147° 55' to 148° 25', which covered the southern Kerlong and Carborough Ranges down through the IIPP project area and the northern Cherwell and Harrow Ranges.

National and international databases were also interrogated for the determination of threatened species and their conservation status, including:

- the International Union for the Conservation of Nature and Natural Resources (IUCN) red list;
- NCA; and
- EPBC Act.

increased concerns about their contribution to detrimental environmental effects.

⁵ The term "wild dog" collectively refers to purebred dingoes, dingo hybrids and domestic dogs that have escaped or deliberately been released.

In addition to on-line searches, unsuccessful attempts were made to contact a number of local interest groups for information on the aquatic flora and fauna of the region, including:

- Department of Primary Industries – Rockhampton;
- EPA – Emerald;
- Queensland Parks and Wildlife Service – Emerald;
- Sunfish (Queensland) – Mackay Regional Branch;
- Clermont Fish Stocking Group Inc.;
- Emerald Fish Stocking Group Inc.; and
- MacKenzie River Fish Stocking Association Inc.

10.11.1.1 Limitations of Desktop Assessment

As the EPA is still in the process of collating and vetting wildlife data, it is possible the information given is not complete. The absence of a species from the list does not mean that it does not occur there, but only that records are not held within the EPA wildlife database. Similarly the State of Queensland makes no statements, representations or warranties about the accuracy, reliability, completeness or suitability of any information contained in their product.

10.11.2 Field Assessment

10.11.2.1 Sites Surveyed

Due to a lack of water only three sites out of eight candidate sites identified during the desktop assessment were sampled (refer to **Table 10-10**). Substrate at these sites was dominated by highly mobile sand, typical of ephemeral streams in central Queensland (refer to **Plate 10-5**). Pool habitats, where water persisted in April/May, contained a high percentage of fine silt and clay overlaying the sand. **Figure 10-5** illustrates the locations with respect to the IIPP.

Table 10-10 Descriptions and Locations of Aquatic Flora and Fauna Assessment Sites for the IIPP

Site Code	Site Description	Latitude	Longitude	Comments
IR1	Isaac River upstream under train lines	21.96460	148.04595	Site dry
IR2	Isaac River at Peak Downs Highway	22.04896	148.13031	Site dry
IR3	Isaac River downstream Cherwell Creek confluence	22.11640	148.27684	Site dry
Smok1	Smoky Creek at confluence with Burton Coal emergency evacuation point	21.94321	148.16483	Isolated pool
Bill1	Billy's Gully at Haul Road	21.99678	148.13061	Site dry
Gros1	Grosvenor Creek upstream of Isaac River confluence	22.04901	148.12914	Isolated pool
Con1	Conrock Gully at farm dam	22.09997	148.14794	Isolated pool and farm dam
Cher1	Cherwell Creek at Winchester Road	22.14122	148.14325	Site dry

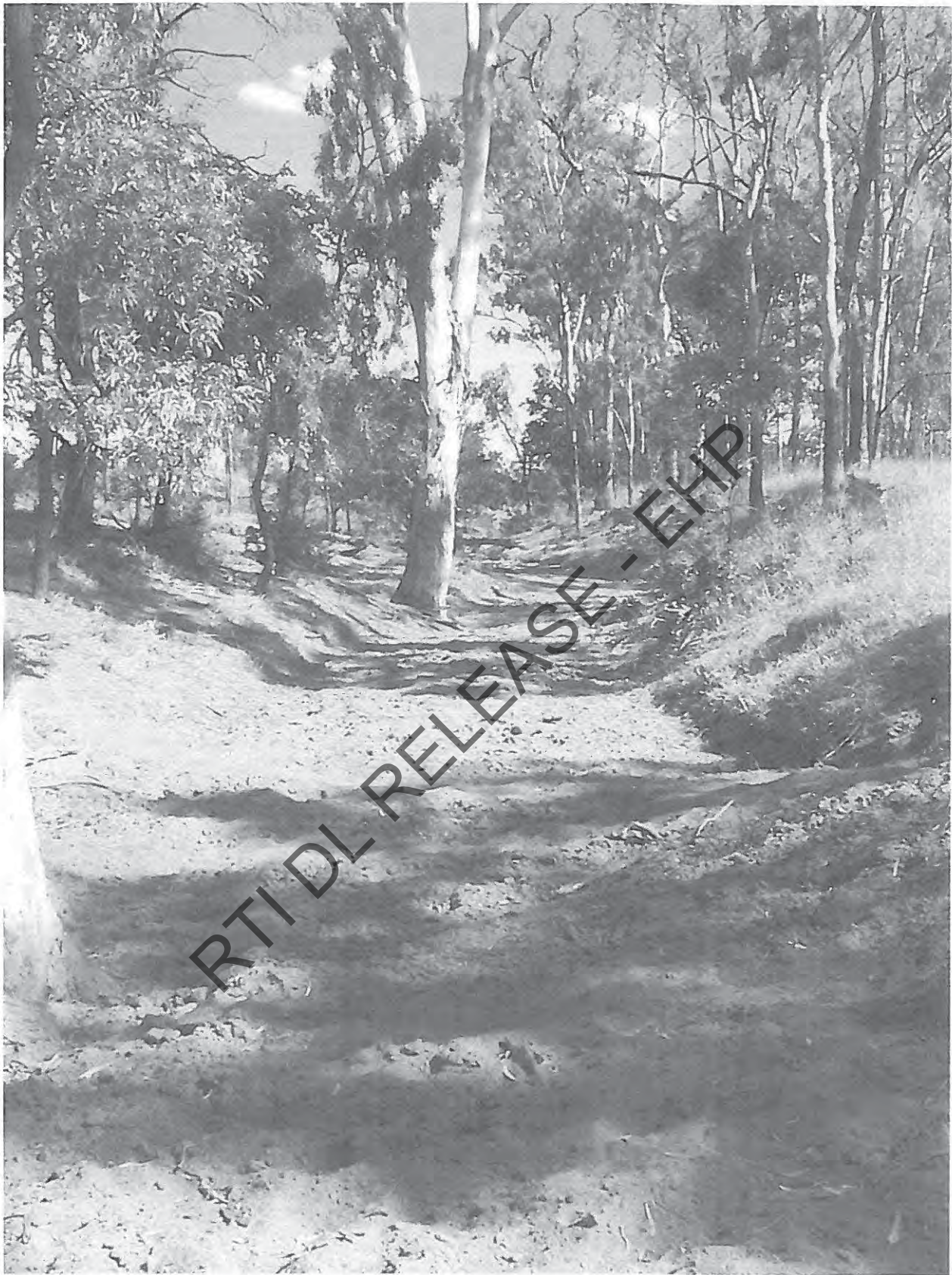
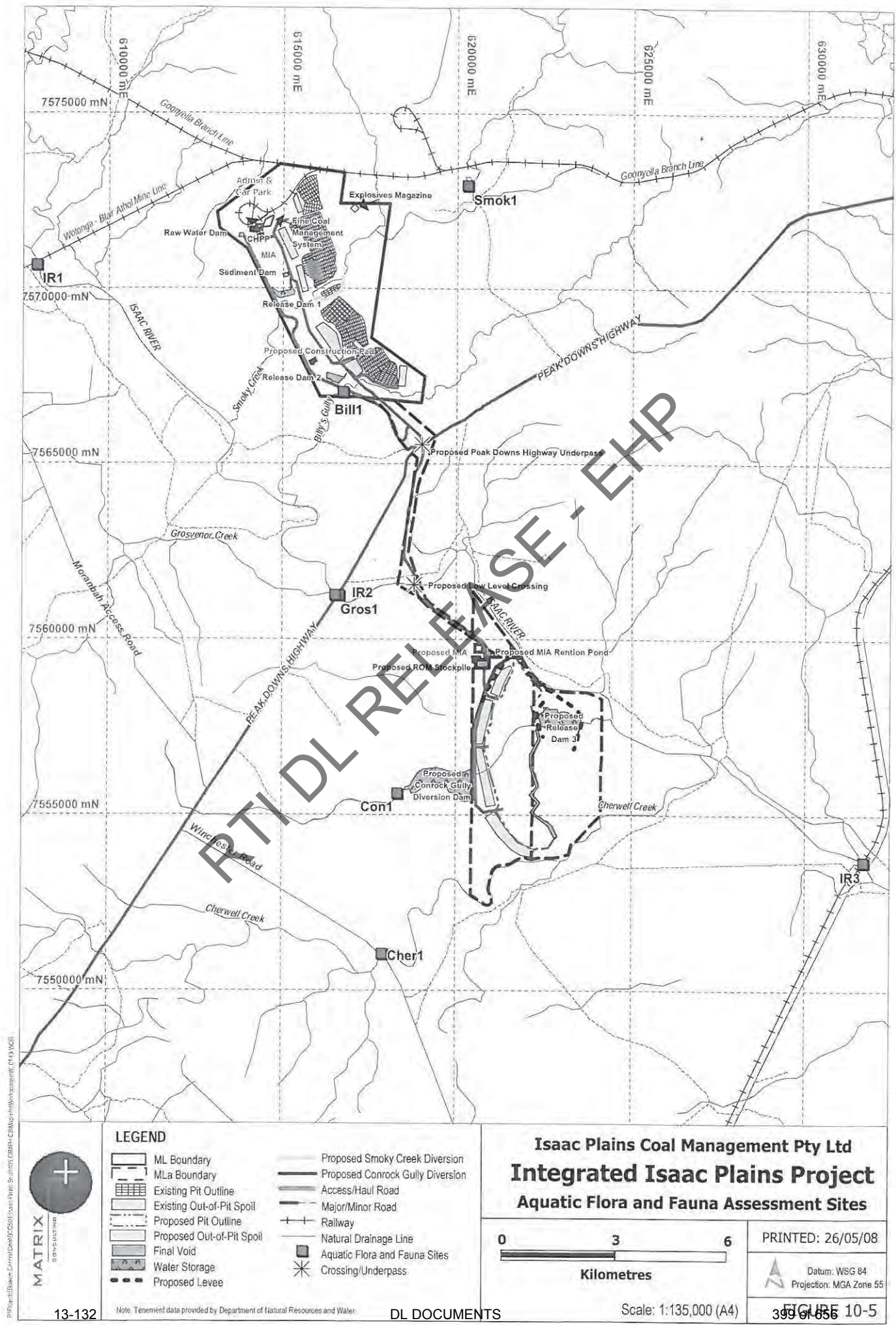


Plate 10-5 Billy's Gully is an ephemeral stream located downstream of Isaac Plains Coal haul road.





PROJECT: Isaac Plains Coal Management Pty Ltd Integrated Isaac Plains Project Aquatic Flora and Fauna Assessment Sites
DATE: 26/05/08
SCALE: 1:135,000 (A4)
399 61 656



MATRIX CONSULTING

LEGEND

	ML Boundary		Proposed Smoky Creek Diversion
	MLa Boundary		Proposed Concock Gully Diversion
	Existing Pit Outline		Access/Haul Road
	Existing Out-of-Pit Spoil		Major/Minor Road
	Proposed Pit Outline		Railway
	Proposed Out-of-Pit Spoil		Natural Drainage Line
	Final Void		Aquatic Flora and Fauna Sites
	Water Storage		Crossing/Underpass
	Proposed Levee		

Isaac Plains Coal Management Pty Ltd

Integrated Isaac Plains Project

Aquatic Flora and Fauna Assessment Sites

0 3 6

Kilometres

PRINTED: 26/05/08

Datum: WGS 84
Projection: MGA Zone 55

10.11.2.2 *Physical Habitat Description*

At each site, riparian vegetation and in-stream habitat were assessed using categorical standards described in NR&M (2001). Descriptions were based on visual estimates of characteristics such as streambed composition (percentage of total for each substrate category), aquatic and bank side vegetation percentage cover, amount of instream organic material, area of aquatic habitats and overhanging canopy cover. The mean width (wetted width in metres), mean depth and sample depth were also determined.

10.11.2.3 *Aquatic Flora*

Aquatic macrophyte data was collected by observing all species within the available reach of the waterbody and identifying them to species level (where possible) using appropriate reference material (Sainty and Jacobs, 2003; Stephens and Dowling, 2002). Additional notes on macrophyte condition were recorded including notes regarding health, state of growth and habitat quality. Macrophytes in the stream bed and on banks were considered in the assessment. Aquatic macrophyte taxa unable to be identified in the field were taken back to the laboratory for detailed taxonomic analysis.

10.11.2.4 *Aquatic Fauna*

Macroinvertebrates

Sample Collection

Macroinvertebrate sampling involved identifying and sampling all available aquatic habitats using a standard rapid bioassessment (RBA) protocol defined in the River Bioassessment Manual (MRHI, 1994; NR&M, 2001), with minor modifications to suit this study. A qualitative RBA method was used to consistently sample the widest diversity of macroinvertebrates at a site in a reasonable timeframe. All sampling was undertaken with ISO DIS/7828 250 µm mesh nets (ISO, 1983). Nets were washed thoroughly between sampling sites to remove any invertebrates retained on them. A composite sample from all available habitats present was collected at each site, including around the edge, pool bed, sticks and logs, and detritus.

At each site, the contents of the net were emptied into a white sorting tray where animals were collected using forceps or wide mouthed pipettes. An attempt was made to collect a representative specimen of every taxa present at each site. Samples were preserved in 96% ethanol for identification in the laboratory.

Laboratory Processing

Macroinvertebrates were identified to species level, or genus level where species level was not possible. Immature or damaged specimens were identified to the lowest taxonomic level possible, usually family level.

Data was stored on a specialised zoological database to allow for data manipulation and analysis in addition to secure and safe storage.

Freshwater Fish

All fish surveys were conducted under the *Fisheries Act 1994* General Fisheries Permit number 89465. The personnel that conducted the assessment were accredited to conduct backpack electrofishing under the Australian Code of Electrofishing practice (1997).

Backpack Electrofishing

A Smith-Root Backpack Electrofisher model LR-24 was used for the survey. All habitats within the pools were electrofished (usually restricted only by water depth) to collect the widest diversity of fish species as possible (refer to **Plate 10-6**).

Once a site had been surveyed, all fish were identified to species level then returned to their point of capture, or in the case of noxious species, euthanased using Aquil-S at a concentration of 15-25 mg/L and buried as per field personnel's Ethics Approval Permit (CA 2007/04/186).

Electrofishing continued until the entire pool was surveyed. This method was designed to capture a representation of every fish species present in the water body.

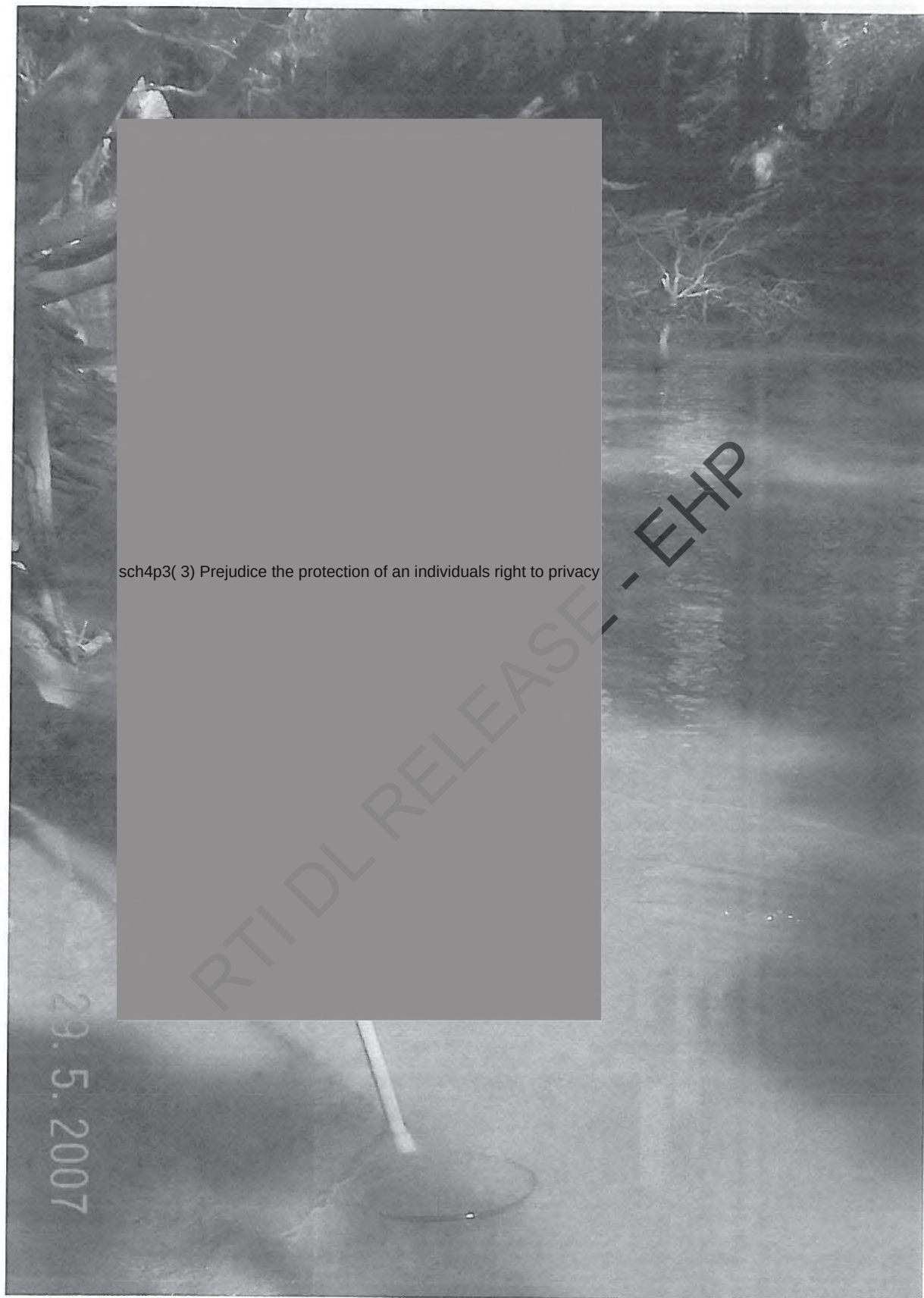


Plate 10-6 Backpack electrofisher in operation at Smoky Creek



Bait Traps

Nylon bait traps with 2 mm mesh were used to target smaller sized fish in littoral areas. These fish are often hard to capture using backpack electrofishing techniques. A total of 10 traps were set at each site (Smoky Creek and Conrock Gully) and carefully positioned in terms of habitat type (logs and sticks) and water depth so as to create the greatest opportunity for capture. Five out of the 10 traps set at each site were baited to enhance the chances of a successful capture.

Bait traps were set in the afternoon and left overnight, and fish were processed the following morning. Once all fish were identified they were returned to their point of capture, or in the case of noxious species, euthanased using the procedure described above.

Turtles and Platypus

A desktop assessment was conducted to determine if platypus had been recorded from past studies undertaken on waterways within the study region and in adjoining waterways immediately outside the study area. In addition, a field survey and habitat assessment of the existing waterholes was undertaken to assess the likelihood of turtle and platypus existence.

For platypus, an assessment of the physical and biological characteristics of platypus habitat can provide a good indication of the overall quality of a site for platypus, whilst searches for platypus burrows can provide an indication of the value and potential of a particular site to sustain platypus populations. Where sites contained isolated pools, an extensive search of the banks was undertaken to detect any evidence of burrows, scratch marks or slide impressions. Additionally, where sites were dry, an extensive area of the river channel was traversed to assess bank suitability for platypus habitat.

Habitat preferences for turtles in central Queensland typically consist of fast flowing riffle type habitats and macrophyte beds which support a range of food sources such as macroinvertebrate taxa. At each site, the field team searched for areas within the waterways channel which would be considered riffle type environments during flow periods (areas of larger substrate particles such as cobbles and boulders). Searches for macrophyte beds within the surface water pool environments were also undertaken (refer to **Section 3.2.2**). Turtle nesting areas typically include sandy banks above the high watermark, with reduced tree cover (Goodwin and Hopkins, 2005), and searches were made at each site for this type of habitat.

10.11.2.5 *In situ* Water Quality

In situ water quality was measured on each sampling occasion in April and May 2007. A laboratory calibrated Hydrolab 5a multiparameter water quality meter coupled to a Surveyor 4a digital display was used to measure dissolved oxygen (mg/L and % Saturation), pH, Electrical Conductivity, Turbidity and Water Temperature.

10.11.3 Existing Environment

The Isaac River is part of the Isaac-Connors catchment which forms a part of the larger Fitzroy Basin catchment. Burton Gorge Dam is located approximately 50 km upstream of the study area on the Isaac River. The confluence of the Isaac and Connors Rivers is located approximately 140 km downstream of the Isaac Plains study area. Waterways within the Isaac-Connors catchment flow into the Fitzroy River approximately 150 km downstream of the Isaac and Connors Rivers confluence.

The waterways within the IIPP study area, including the proposed Expansion Area, are typical of small temporary streams in central Queensland. Temporary streams are those driven by a climate characterised by a lengthy dry period followed by a shorter wet period. Streams dry up and surface waters disappear during the dry periods only to reappear with associated biological communities following the onset of the next substantial rains. Ephemeral waters are a subset of temporary waters that contain water only after irregular rainfall or flow events. The waterways within the IIPP study generally flow for only a few hours after rain. They are often survived by small surface pools which may remain for up to a few weeks at a time. The aquatic ecology in these systems are driven by the short periods of time that they contain water.



Driven mainly by mining and agriculture, demand for groundwater in the Isaac-Connors catchment is increasing. A prolonged drought and record low water levels in some aquifers have raised concerns that the groundwater resource may be at risk of being overcommitted (DNRW, 2006). DNRW have recently announced that the *Water Resource (Fitzroy Basin) Plan 1999* will be amended to include the Isaac-Connors catchment groundwater resources. The area to which the draft amendment will apply covers the Isaac-Connors catchment within the Fitzroy Basin and will apply to all subartesian artesian water in this area. The draft amendment will seek to identify groundwater dependant ecosystems associated with the alluvial aquifers and determine their water requirements (DNRW, 2006).

10.11.4 Results

10.11.4.1 Physical Habitat Description

Ephemeral waterways receive flows for relatively brief periods of time during and shortly after rain. The defining features of these temporary waterways are the aridity of the environment, alternating with high energy flow in storm events. The aridity also makes them prone to degradation.

Selected sampling sites within the IIPP study area all exhibited similar physical habitat characteristics. Substrate at all sites was dominated by highly mobile sand, typical of ephemeral streams in central Queensland (refer to **Plate 10-5**). Pool habitats, where water persisted in April/May, contained a high percentage of fine silt and clay overlaying the sand.

In-stream habitat was limited with no riffle (lotic) habitat or macrophyte growth observed, and only a limited number of snags, logs and undercut banks present within the creek channel. Some filamentous algae were observed in the shallow wetted areas of Conrock Gully only.

Bank structure at all sites was generally comprised of partially consolidated and unconsolidated sand and gravel, with the exception of Smoky Creek which had a higher percentage of consolidated clay and silt. Generally, the unconsolidated nature of the creeks and river banks would not be suitable for the construction of platypus burrows. Stream bank slope at all sites was observed to be between 60 to 90 degrees and between 1 m to 2.5 m high. Damage to bank structure and stability was evident where cattle had unrestricted access to the surviving pool environments.

The banks of the waterways were characterised by scattered riparian trees, shrubs and grasses with incomplete cover. The riparian vegetation could be generally described as having discontinuous tree canopy cover with better grass cover. The riparian zone was dominated by dense terrestrial grasses up to 1 m high. Scattered small shrubs, and *Eucalyptus* trees up to and greater than 10 m were also represented at all sites. All sites, with the exception of Conrock Gully, recorded a very high percentage of vegetation cover within the riparian zone (approximately 90 %). Conrock Gully is within a grazing paddock, and the riparian vegetation comprised scattered trees to 10 m with little groundcover.

Canopy cover over the waterways channel at Isaac River and Cherwell Creek was low (<10 %), mainly due to the width of these waterways being between 20-50 m wide. Along the narrower streams of Billy's Gully, Smoky Creek and Grosvenor Creek, canopy cover was much greater with approximately 25-50 % shading over the channel, created by coverage from riparian vegetation; however, these waterways averaged less than 10 m wide. Conrock Gully recorded limited canopy coverage with scattered trees within the riparian zone. The farm dam at Conrock Gully had no canopy coverage.

10.11.4.2 Macroinvertebrates

A total of 56 macroinvertebrate taxa were collected from waters within the study area, these taxa are listed in **Table 10-11**. Of these 56 taxa, 11 families were represented with the dominant taxa including *Diptera* (flies - 13 taxa), *Coleoptera* (water beetles - 12 taxa), *Hemiptera* (water bugs - eight taxa) and *Acarina* (mites - eight taxa). From the pollution sensitive PET taxa group (*Plecoptera*, *Ephemeroptera* and *Trichoptera*), only two species of Leptoceridae (*Trichoptera*), one species of Caenidae (*Ephemeroptera*) and two species of Baetidae (*Ephemeroptera*) were collected.

No species collected during this survey were deemed to be of conservation significance, or listed under the NCA, EPBC Act or the IUCN red list. The aquatic macroinvertebrate taxa observed were all considered cosmopolitan species with wide distribution patterns within Queensland and elsewhere.

IIPP Amalgamated Environmental Impact Statement

Nature Conservation

**Table 10-11 Macroinvertebrate Species List**

Family	Genus	Species	Grosvenor Creek	Conrock Gully	Smoky Creek
Arrenuridae	<i>Arrenurus</i>	sp.		•	
Arrenuridae	imm/dam	sp.		•	
Hydromedidae	<i>Hydromed</i>	sp.		•	
Hygrobatidae	<i>Coastalobates</i>	sp.		•	
Limnysiidae	<i>Physolimnesia/Limnesia</i>	sp.		•	
Limnysiidae	imm/dam	sp.		•	
Pionidae	imm/dam	sp.		•	
Unionicolidae	<i>sf Unioncolinae</i>	sp.	•		
Hemicordulidae	<i>Hemicordulia</i>	<i>intermedia</i>	•		
Hemicordulidae	<i>Hemicordulia</i>	<i>tau</i>			
Libellulidae	<i>Zyxomma</i>	<i>elgneri</i>	•		
Libellulidae	<i>Orthetrum</i>	<i>caledonicum</i>		•	
Dytiscidae	<i>Cybister</i>	sp.	•		
Dytiscidae	<i>Eretes</i>	sp.	•		
Dytiscidae	<i>Laccophilus</i>	sp.	•	•	•
Dytiscidae	<i>Sternopriscus</i>	sp.	•		
Dytiscidae	<i>Hyphidrus</i>	sp.		•	
Dytiscidae	<i>Necterosoma</i>	sp.	•	•	•
Gyrinidae	<i>Dineutus</i>	sp.		•	
Halipidae	<i>Halipus</i>	sp.		•	
Hydraenidae	<i>Hydraena</i>	sp.	•	•	•
Hydrochidae	<i>Hydrochus</i>	sp.	•		
Hydrophilidae	<i>Berosus</i>	sp.		•	
Copepoda	imm/dam	sp.	•		
Ostracoda	imm/dam	sp.		•	
Parastacidae	<i>Cherax</i>	imm/dam	•		•
Paelemonidae	<i>Macrobrachium</i>	<i>australiense crassum</i>	•	•	•
Sundathelphusidae	<i>Holthuisana</i>	sp.			•
Ceratopogonidae	imm/dam	sp.		•	
Chironominae	<i>Chironomini</i>	<i>microchironominomus</i>	•		
Chironominae	imm/dam	sp.		•	•
Chironomini	<i>Dicrotendipes</i>	sp.	•	•	
Culicidae	imm/dam	sp.		•	
Ephydriidae	imm/dam	sp.	•	•	
Pseudochironomini	<i>Rietha</i>	sp.	•		
Tabanidae	imm/dam	sp.		•	
Tanypodinae	imm/dam	sp.	•	•	
Tanypodinae	<i>Coelopynia</i>	sp.	•		•
Tanypodinae	<i>Procladius</i>	sp.	•	•	
Tanytarsini	imm/dam	sp.	•		



Family	Genus	Species	Grosvenor Creek	Conrock Gully	Smoky Creek
Tanytarsini	<i>Tanytarsus</i>	<i>bispinosus</i>	•	•	
Baetidae	<i>Cloeon</i>	imm/dam		•	
Baetidae	imm/dam	sp.			•
Caenidae	<i>Tasmonocoenis</i>	imm/dam	•	•	
Corixidae	<i>Micronecta</i>	<i>annae</i>		•	•
Corixidae	<i>Micronecta</i>	imm/dam			•
Gerridae	imm/dam	sp.			•
Hydrametridae	<i>Hydrometra</i>	<i>strigosa</i>	•		
Notonectidae	Anisops	<i>notatus</i>		•	•
Pleidae	<i>Paraplea</i>	<i>brunni</i>		•	•
Velidae	<i>Microvelia</i>	sp.	•		•
Planorbidae	<i>Amerianna</i>	sp.			
Oligochaeta	imm/dam	sp.	•		
Ecnomidae	<i>Ecnomus</i>	<i>veratus</i>	•	•	
Leptoceridae	<i>Oceytis</i>	sp.		•	
Leptoceridae	<i>Triplectides</i>	<i>australis</i>		•	

10.11.4.3 Fish

The field assessment of Conrock Gully produced one species of fish which was collected by backpack electrofishing. Spangled perch (*Leiopotherapon unicolor*) were collected from two small shallow pools and the deeper edge habitats around the farm dam. Two native fish, the Spangled perch and Agassizi's glassfish (*Ambassis agassizii*), were collected in Smoky Creek.

The spangled perch is one of the most widespread of the Australian freshwater species (Merrick *et al*, 1984), and can occur in a wide range of habitats including flowing streams, small billabongs, lakes, dams, drainage channels and bays. It is a remarkably hardy species that may be capable of surviving droughts by aestivating (either as eggs or adults) in wet mud or under moist litter on the bottom of ephemeral waterholes (Allen *et al*, 2003). Spangled Perch can also tolerate a wide range of salinity, pH and temperature levels. This species is not listed on the IUCN red list, NCA, or EPBC threatened species lists.

Agassizi's Glassfish (*Ambassis agassizii*) is distributed throughout coastal drainage systems of Queensland and can be found in rivers, creeks, ponds, reservoirs, drainage channels and swamps (Allen *et al*, 2002). This fish species is usually found in slow flowing or still waters, often near overhanging vegetation or amongst logs, dead branches and boulders. Agassizi's glassfish is listed on the IUCN red list of threatened species as 'rare', however, it is also categorised as 'data deficient'. Queensland appears to be the last stronghold of the species, with the species considered 'extinct' in South Australia (and protected under the South Australian *Fisheries Act 1982*) and Victoria (considered Extinct and listed under the *Victorian FFG Act 1988*) and 'very rare' in NSW (listed as Endangered Populations under the *NSW Fisheries Management Act 1994*). Agassizi's glassfish is considered to be common and not threatened in Queensland.

The species is not listed under any Queensland conservation or protection legislation (*pers comm* Steve Brooks QLD DPI, 2007).

Literature and database searches for freshwater fish from the surrounding waterways of the IIPP using the Queensland EPA databases did not reveal any records of other fish species observed within the study area. The Queensland Museum Ichthyology database, however, did record the presence of six species within the broader study area. These are listed in **Table 10-12**.

Table 10-12 Queensland Museum Fish Species Records for IIPP region

Species	Common Name
<i>Nematalosa erebi</i>	Bony bream
<i>Neosilurus hyrtlil</i>	Hyrtils tandan
<i>Melanotaenia splendida splendida</i>	Eastern rainbowfish
<i>Ambassis agassizii</i>	Agassizi's glassfish
<i>Leiopotherapon unicolor</i>	Spangled perch
<i>Hypseleotris compressus</i>	Empire gudgeon

None of the fish species identified in **Table 10-12** are recorded under the NCA or EPBC threatened species list.

10.11.5 Macrophytes

During the time of the field assessments in April and May 2007, no native or introduced species of aquatic macrophyte was observed at any of the sampling sites.

A desktop assessment of the IIPP study area using the Queensland EPA database generated no relevant information on aquatic macrophytes.

10.11.6 Platypus and Turtles

No turtles or platypus were found during this field investigation. Furthermore the habitat was not assessed to be suitable for either species and, neither of these species was recorded in any of the data files researched for the area.

10.11.7 Summary of Existing Conditions

The gullies and water bodies examined in this study area are identified as ephemeral waterways. These waterways typically flow for short periods following rainfall events.

The aquatic habitats within the waterways are in reasonable condition, although some had been subject to disturbance from land use practices, particularly damage to bank structure and stability where unrestricted cattle had access to the surviving pool environments. The presence of cattle in the water bodies can result in disturbance to the aquatic environment through physical alteration of the channel.

Such waterholes, whilst not permanent, provided temporary refuge for remaining aquatic fauna such as fish. Although fish and macroinvertebrates were recorded from the study sites, none of these aquatic species recorded during this survey, were listed under the EPBC Act, NCA or *Fisheries Act 1994*.

No aquatic flora (macrophytes), turtles or platypus were observed during the study. The absence of macrophyte communities is not unexpected amongst water bodies with ephemeral flow and naturally turbid waters.

10.11.8 Potential Impacts

Based on the current one-off survey conducted in April and May 2007, and on information from literature searches from state, national and international conservation databases, there would appear to be no threatened or endangered aquatic macrophytes or aquatic fauna (macroinvertebrates, fish, turtles, platypus) existing within the waterways of the IIPP area and adjoining waterways outside of the project area.

10.11.9 Impacts on Habitat

Temporary streams are characterised by short lived storms or brief rain periods of varying intensities and distributions. Due to the low density of vegetation, particularly the generally sparse groundcover in these systems, soil particles can be easily eroded and available for transport by stream flow. The implementation of appropriate erosion and dust control measures, including silt fences, revegetation of disturbed areas and dust suppression, will minimise these impacts.

Diversions of Smoky Creek and Conrock Gully have been proposed by IPCM. These diversions will be done with minimal impact to existing habitat and in a way which will cause minimum alteration to flow. The Conrock Gully diversion will result in the loss of 0.8 ha of sub-dominant Brigalow, while the Smoky Creek diversion will be through cleared ground in the pit area and thus will not result in any additional vegetation clearing, i.e. no more than already approved.

10.11.10 Impacts on Aquatic Flora

Aquatic macrophytes are irregular constituents of temporary water ecosystems. Increased turbidity can have a negative effect on aquatic macrophytes and phytoplankton by reducing light penetration in the water column and concomitant photosynthetic capacity. All possible efforts will be made to reduce the amount of erosion and sedimentation during construction and operations.

Existing impacts within the study area on aquatic flora are most likely related to the residence time of the water. The waterways in the study area are typically ephemeral and only remain for several weeks at a time, limiting the growth and development of aquatic plants. Some substrates such as sand, which is dominant in the waterways, can be nutrient poor and may also disadvantage aquatic plants (Moss, 1996). The presence of aquatic macrophytes was not observed from any of the current study sites.

10.11.11 Impacts on Aquatic Fauna

10.11.11.1 Macroinvertebrates

Many macroinvertebrate taxa, particularly *Coleoptera* and *Hemiptera* that commonly occur in temporary waters are air-breathing and have waxy cuticles and/or surface air coatings that minimise water contact toxicant exposure pathways. These macroinvertebrate groups occur widely across the three sampling sites adopted for this survey, whilst aquatic have minimal contact with the water and with water-borne contaminants. The potential for adverse biological consequences from the proposed IIPP where these groups are well represented will be minimal. Highly mobile aquatic macroinvertebrates limit their exposure to potential water column contaminants by emigration without compromising their ability to subsequently recolonise the waterbody. The macroinvertebrate community within the study area is considered to be resilient with many pollution tolerant taxa and detrimental impacts on diversity, abundance and distribution from the proposed construction and operation of the mine are considered highly unlikely.

The maintenance of healthy aquatic macroinvertebrate communities in the surviving surface water pools is, however, considered important as these animals form an important source of food for fish and birdlife in the region.

10.11.11.2 Fish

The importance of streamside vegetation to stream ecosystems cannot be overemphasised. Most instream habitat for fish originates from surrounding vegetation, e.g. fallen trees, logs, wood debris, leaves, bark etc. Combined with aquatic and emergent vegetation, this organic matter forms the major primary source of nutrients for the aquatic food chain (Koehn *et al*, 1990).

Land disturbing activities such as mining operations, road and bridge construction and agricultural practices have the potential for the release of suspended solids in runoff which can be detrimental to fish and their eggs. Blanketing silt settling on substrate fills pools and scour holes, decreases substrate variation and reduces useable habitat (Koehn *et al*, 1990). Implementation of appropriate erosion and dust control measures during construction and operations using industry standard measure will ensure minimal impacts.



10.12 SUMMARY

The IIPP has the potential to directly and indirectly impact upon the aquatic communities in Smoky Creek, Billy's Gully and Conrock Gully, Cherwell Creek and Isaac River.

Diversions of Smoky Creek and Conrock Gully involve the removal of these water channels and their associated riparian zone. Complete removal of these sections of habitat, if water is present, will result in the loss of any aquatic communities present (e.g. macroinvertebrates, fish). If water is not present, the impact will be confined to those fish and macroinvertebrates that aestivate during dry periods.

As the majority of macroinvertebrates colonise water through mobile adult oviposition, any diversion is not likely to impact greatly on these communities in the long-term. Short to medium term impacts to aquatic fauna will result from the removal of potential food sources and habitat provided by the riparian zone. In waterways where aquatic plants are absent, an important food and habitat source comes from the riparian zone through inputs such as leaf and twig litter, and terrestrial organisms such as insects. Exposed tree roots, often present on the inside of bends where water tends to pool after scouring flows occur, can also provide important shelter. The riparian zone along Conrock Gully is in very poor condition.

Indirect impacts on aquatic communities have the potential to occur during the diversion works, for example if downstream water quality and habitat diversity is reduced through an increase in sediment or salinity resulting from earthworks. Appropriate erosion and sediment control will be incorporated into the design and construction of the diversions.

Aside from the proposed stream diversions, releases from the mine are designed to only occur when there is sufficient flow in the Isaac River and that the quantity of discharges may only be 1/10th (10 %) of the streamflow. A discharge regime of this nature is likely to have minimal impact on aquatic communities. Furthermore, aquatic communities will be protected during operation by ensuring the proper management of areas used to store fuel, oil and other hazardous substances. There is a low likelihood of this occurring as appropriate controls will be in place.

The diversions will be mostly undertaken during the dry season to minimize the potential impacts to aquatic communities. During the dry season, the majority of species encountered will either relocate to permanent water elsewhere or aestivate within the dry stream channel. Potential impacts from sedimentation will be minimised if high rainfall does not coincide with the proposed works and containment measures are implemented.

The low level crossing of the Isaac River for the haul/access road constructed at, or just above bed level, will have minimal impact on aquatic ecology, as flows will be unimpeded.

10.12.1 Mitigation Measures for Aquatic Flora and Fauna

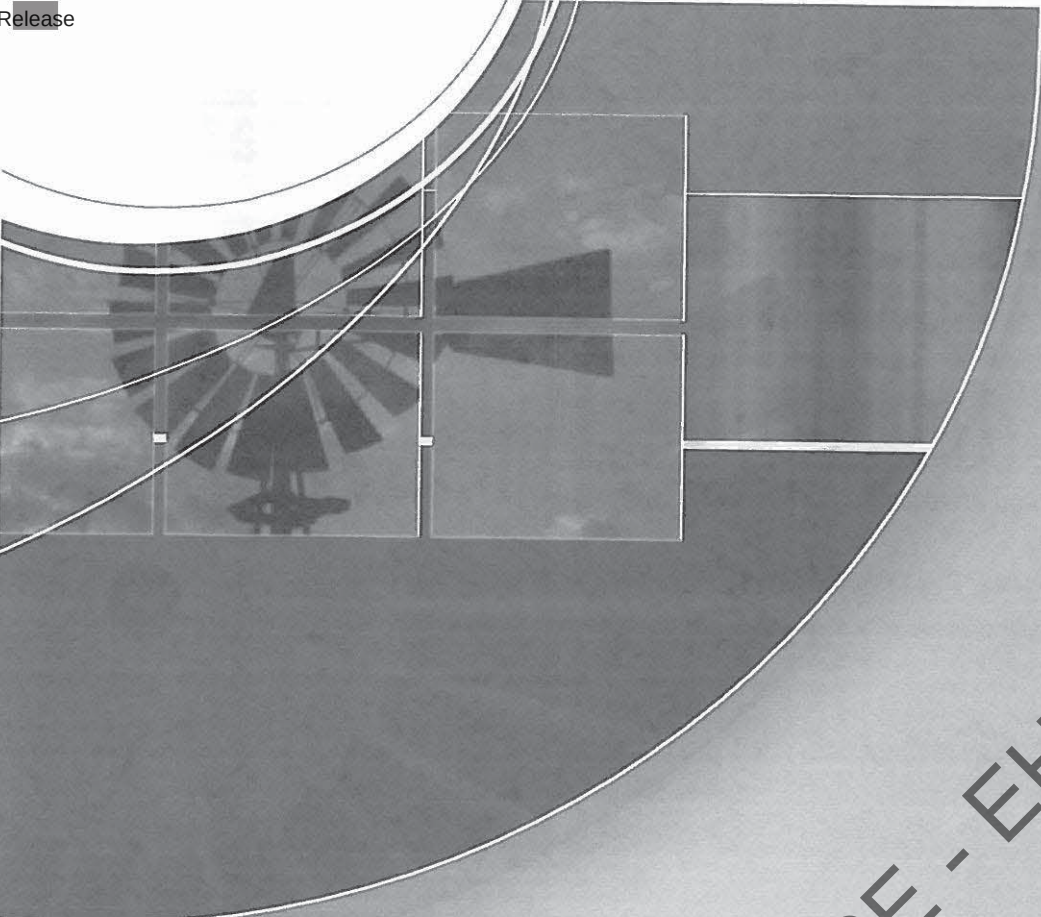
10.12.1.1 Construction

Best practice erosion control measures will be implemented and maintained during the construction of the diversions. This will ensure that minimal impact to downstream aquatic communities occurs from potential sedimentation resulting from surface water run-off. As there are no significant species present within these creeks, translocation of individuals is not deemed necessary. It is recommended that natural colonisation take place over time.

Proposed construction activities both within the IIPP area and downstream of the impact zone could have a detrimental effect on stream health and ecology. Careful management of construction activities, as already proposed by IPCM, will be required to ensure the maintenance of water and aquatic sediment quality, riparian and terrestrial vegetation, and hydrology. Erosion and sedimentation will be minimised and unrestricted fish passage will be maintained.

10.12.2 Operation

Best practice erosion control measures and bunding of fuels, oils and other potential contaminants will be implemented and maintained during the operational phase, especially works near waterways and drainage lines. This will ensure minimal impacts to downstream aquatic communities.



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1 1

CULTURAL
HERITAGE

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

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11 CULTURAL HERITAGE

11.1 ENVIRONMENTAL VALUES

The environmental values to be protected are the Aboriginal cultural heritage and the historic non-indigenous heritage.

11.1.1 Tenure/Native Title

The existing Isaac Plains Coal Mine is located on Lot 3 GV252, Lot 2 RP904445, Lot 4 CP903282 and an unnamed road. Lots 2 and 3 are freehold while Lot 4 is State Leasehold land.

The Expansion Area is located on Lot 5 GV132, Lot 6 SP174999, Lot 9 GV33 and Lot 8 GV196. Lots 5 and 6 are freehold; Lot 9 is reserved for camping, water and roads and Lot 8 is reserve land for a quarry.

A search of the National Native Title Tribunal register indicates that there are two registered native title claims on the IIPP area:

- Barada Barna Kabalbara and Yetimarla People (BBKY) # 3 (Federal Court No. Q6011/01; NNTT No. QC01/13 – registered from 20 April 2001); and
- BBKY # 4 (Federal Court No. Q6023/01; NNTT No. QC01/25 – registered from 5 April 2002).

Figure 11-1 illustrates the current Native Title Claims over the IIPP site.

A native title claim has the effect of triggering a right to negotiate under the *Native Title Act 1993*. If native title is found to have been extinguished then such rights are also extinguished. If native title does exist, the nature and extent of the associated rights will vary with the circumstances of the claim, but may create a compensable interest in favour of the native title holders.

Historical searches show that the quarry area was formally a GHFL under the *Land Act 1962*. The grant of GHFL over the land, that now comprises the quarry area, extinguished native title. Therefore, with the exception of Lot 9 GV33, native title has been extinguished by the prior grant of interests inconsistent with native title.

11.2 NON-INDIGENOUS HERITAGE

A search of the DEWHA Australian Heritage Register and a search of the EPA Queensland Heritage Register did not list any heritage areas of interest within either ML70342 or the Expansion Area MLAs.

11.3 INDIGENOUS CULTURAL HERITAGE

Indigenous Cultural Heritage in Queensland is regulated under the *Aboriginal Cultural Heritage Act 2003*, the purpose of which is to provide effective recognition, protection and conservation of Aboriginal cultural heritage.

A Cultural Heritage Management Plan (CHMP) was not legally required in respect of the existing Isaac Plains Coal Mine, in part because the mine did not require an EIS.

This notwithstanding, a cultural heritage study was undertaken over the area of the existing Isaac Plains Coal Mine during the preparation of the approved EMOS for the site. A CHMP was also developed and executed by IPCM and the BBKY, however was not formally approved under the ACH Act. This was done in part, to send a clear message that IPCM is keen to protect cultural heritage through working in agreement with BBKY.

The development of plans for the mining in the Expansion Area has triggered this EIS. Accordingly, a CHMP will now need to cover the IIPP and be formally approved under the ACH Act. This will be based on the previous CHMP, with amendments to cover the entire IIPP including the Expansion Area, the access/haul road and proposed diversions.

Following discussions with the BBKY for the Expansion Area, a cultural heritage study of the Expansion Area and areas of planned disturbance in ML70342 not previously assessed, was undertaken in November 2006, i.e. in the Smoky Creek area. A number of artefacts were found in the Smoky Creek area which have since been relocated. These have been taken into consideration for the amended CHMP.

Once the CHMP is amended it will be formally registered. The CHMP will:

- provide strategies for addressing the recommendations presented in the various Cultural Heritage Impact Assessments;
- provide guidance to the operators of the IIPP and all site personnel in the identification, protection and management of indigenous cultural heritage during the construction and operational phases of the project;
- provide the basis for site inductions delivered to employees, contractors and sub-contractors;
- provide the necessary information and requirements for recognition of Aboriginal cultural heritage and the respect for Aboriginal knowledge, culture and traditions;
- outline a clear and agreed process between the IIPP and the Aboriginal Parties for the advance clearance of areas to be disturbed, and the identification, salvage and management of items of cultural heritage significance, including previously undiscovered materials (it is envisaged that any salvaged artefacts will be retained by BBKY3 and BBKY4 representatives for the duration of mining and be returned to the original or nearest position once rehabilitation has been deemed as successful. Alternatively, they will be relocated to a designated protected area within the mining lease boundary for storage and preservation;
- outline processes for ongoing effective communication between the IPCM and the Traditional Owners throughout the life of the IIPP;
- include a corrective actions procedure; and
- include an auditing and review process.

A search of the DNRW Cultural Heritage database revealed five Aboriginal cultural heritage sites containing various attributes. **Table 11-1** details the attributes and their locations. **Figure 11-2** illustrates the locations on the IIPP site.

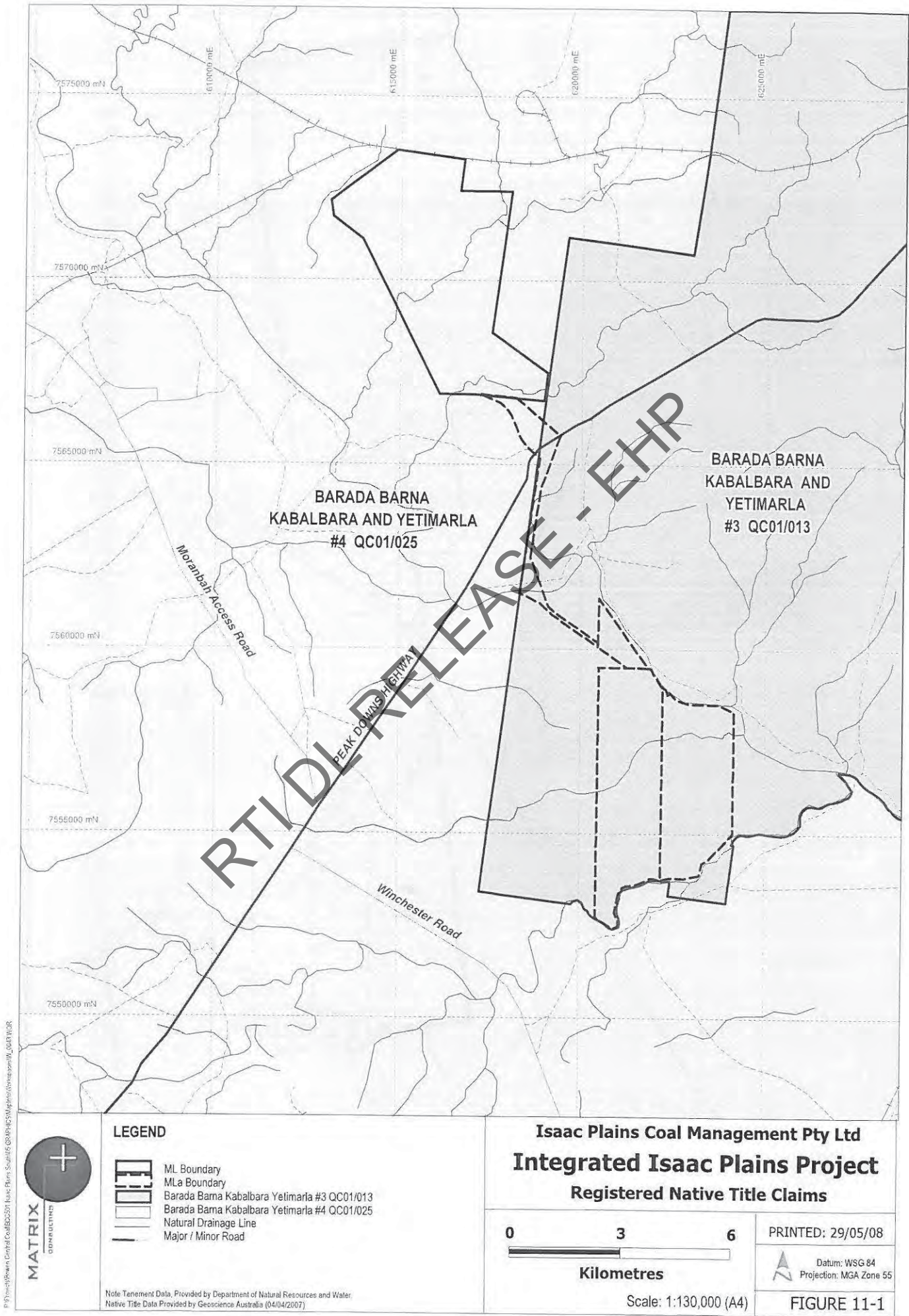
Table 11-1 Aboriginal Cultural Heritage Sites

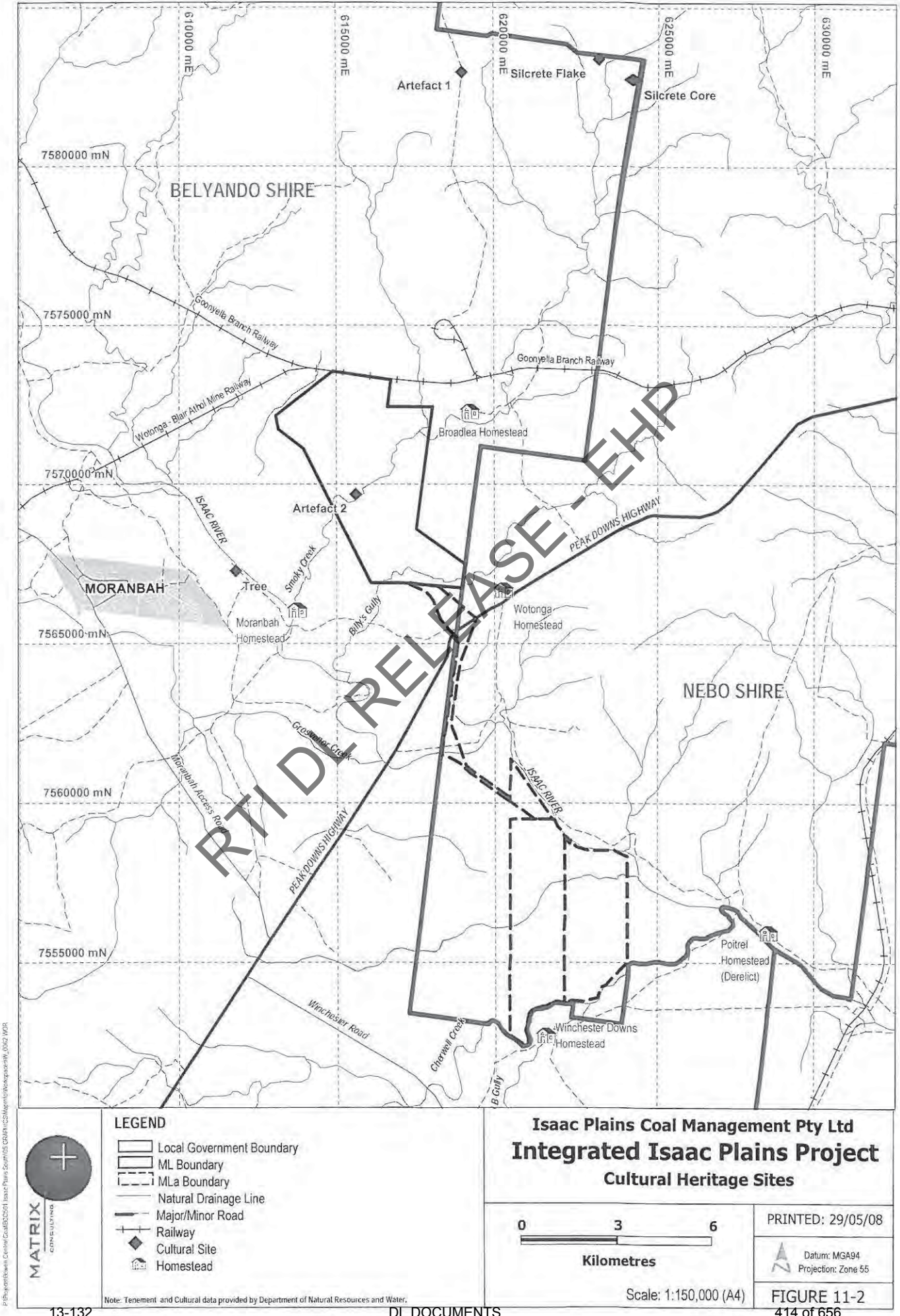
Attribute	Latitude	Longitude
Tree	-21.99545	148.08317
Artefact 1	-21.97353	148.11981
Artefact 2	-21.85317	148.15157
Silcrete Flake	-21.84943	148.19394
Silcrete Core	-21.85513	148.20298

11.4 POTENTIAL IMPACTS AND MITIGATION MEASURES

The potential impacts from direct disturbance as a consequence of the IIPP are high as the Expansion Area, access/haul road and diversions will involve the disturbance of additional land.

Following recent consultation, BBKY have approved the removal of the affected artefacts from along Smoky Creek to be relocated to another cultural heritage retention area. Continued liaison will occur with the BBKY under the CHMP in relation to management of these items and those remaining within the IIPP.





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12

VISUAL
AMENITY

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

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12 VISUAL AMENITY

This section provides an assessment of the visual quality and character of the Expansion Area, including the access/haul road, underpass of the Peak Downs Highway and the surrounding area. Visual amenity at the existing Isaac Plains Coal Mine is not included in this assessment as the only change in construction of this area, apart from an access/haul road, is the diversion of Smoky Creek, which is not likely to have an impact on the visual amenity of the area. Furthermore, no public complaints have been registered by the existing Isaac Plains Coal Mine in regard to visual amenity.

This section addresses the methodology used, the identified landscape and visual characteristics, potential effects and impact generators, and provides an assessment of the visual impact both during the life of the Expansion Area and from a residual perspective.

12.1 ENVIRONMENTAL VALUE

The environmental value to be maintained in this area is the preservation of the area's visual amenity.

12.2 METHODOLOGY

12.2.1 Field Observations

A desktop study was conducted initially and involved an analysis of topographic maps and aerial imagery.

Viewpoints were identified from the desktop analysis, and visited in the field on 15-16 January 2007 and 26 February 2007, and assessed for sensitivity to the proposed development. The weather conditions were favourable for conducting the assessment, characterised by sunshine with very little to no cloud.

Photographs were taken by IPCM personnel from a number of viewpoints nominated by Matrix+. Photographs were taken on 15 January 2007 using an Olympus 720 SW Digital 7.1 Megapixel camera, on 16 February 2007 using a Nikon D50 Digital SLR camera with an 18 mm lens, and on 26 February 2007 using a Panasonic DMC-LC70 digital camera.

12.2.2 Consultations

Both Nebo and Belyando Shire Councils were consulted and a review of published landscape and visual assessments and planning document guidance was conducted. Council officers were consulted to determine if any specific scenic amenity guidelines or published documents were available for the Shire, however, none existed.

12.2.3 Designations

Nebo Shire Council and Belyando Shire Council have advised that the area of the IIPP, and the broader surrounding area, does not form part of any statutory landscape designation. However, under the Planning Scheme for the Shire of Nebo (2000), the two larger parcels of land (Lot 5 on GV132, and Lot 6 on SP174999 formerly Lot 1 on GV155) covering the Expansion Area are designated as Rural Agricultural Protection (RAP) as described in **Section 2**. For land designated RAP, it is Council's intent that the land be maintained in order to encourage its continued use for agricultural purposes. The two other small lots in the Expansion Area, Lot 9 on GV33 and Lot 8 on GV196 are in a Special Purpose Zoning category. In particular, Lot 9 on GV33 straddling Cherwell Creek is designated for Strategic Special Government Use (i.e. reserve land for camping, water and roads).

12.3 LANDSCAPE AND VISUAL ASSESSMENT

12.3.1 Introduction

The term landscape assessment describes the fabric, character and quality of the surrounding area, whereas the term visual assessment relates to the changes that arise in the composition of the available views as a result of changes to the landscape, to peoples' responses to the changes, and to the overall effects with respect to visual amenity or aesthetic condition.

For the purposes of the landscape and visual assessment, visual amenity is assessed for areas both within and peripheral to the Expansion Area.

The characterisation of the Expansion Area, including the proposed access/haul road and its immediate surroundings, has been based on an assessment of natural, cultural, social, aesthetic and perceptual factors as they exist today and are predicted following completion of proposed mining and post-mining rehabilitation activities.

The current landscape and visual assessment involved an assessment of landscape and new infrastructure features that are not part of any previous mine development approval.

12.3.2 Existing Land Use

The Expansion Area is bounded on all sides by grazing land, with grazing also continuing to be undertaken over part of the existing Isaac Plains Coal Mine site during mining, and the Peak Downs Highway bisects EPC755.

The region contains rich thermal and metallurgical coal resources, with a number of open cut mining ventures being located within a distance of 20 km, including the Peak Downs, Broadlea, Carborough Downs, Millennium, Poitrel, Moorvale and Moranbah North mines (refer to **Figure 8-1**).

12.3.3 Natural Factors

The Expansion Area comprises undulating rural land with isolated rocky knolls. In the northern-most part of the proposed Expansion Area irregular-shaped low mesa-like features are found. Elevation in this area ranges up to 280 m AHD. The actual proposed Expansion Area is generally slightly more elevated (200 m to 220 m AHD) than the surrounding area, which is dissected by the Isaac River and its tributary Cherwell Creek.

The site has been extensively cleared for cattle grazing but also retains areas of remnant native vegetation, particularly riparian vegetation along creeks.

12.3.4 Social and Cultural Factors

As discussed previously, the Expansion Area site (including access/haul road) and surrounding area comprises land used for cattle grazing with a number of mines co-existing to the north, south, and east. The Moranbah area supports numerous mines with mines and associated infrastructure located near roads in visible areas.

There is little residential development, apart from town centres, with only isolated homesteads located within the surrounding area: the sch4p3(3) Prejudice the protection of an individuals right to privacy of the proposed Expansion Area site, the sch4p3(3) Prejudice the protection of an individuals right to privacy of the northern boundary of EPC755, Prejudice the protection of an individuals right to privacy of the Expansion Area and east of the township of Moranbah, while a homestead lies further north and is distant from the proposed Expansion Area (refer to **Figure 12-1**).

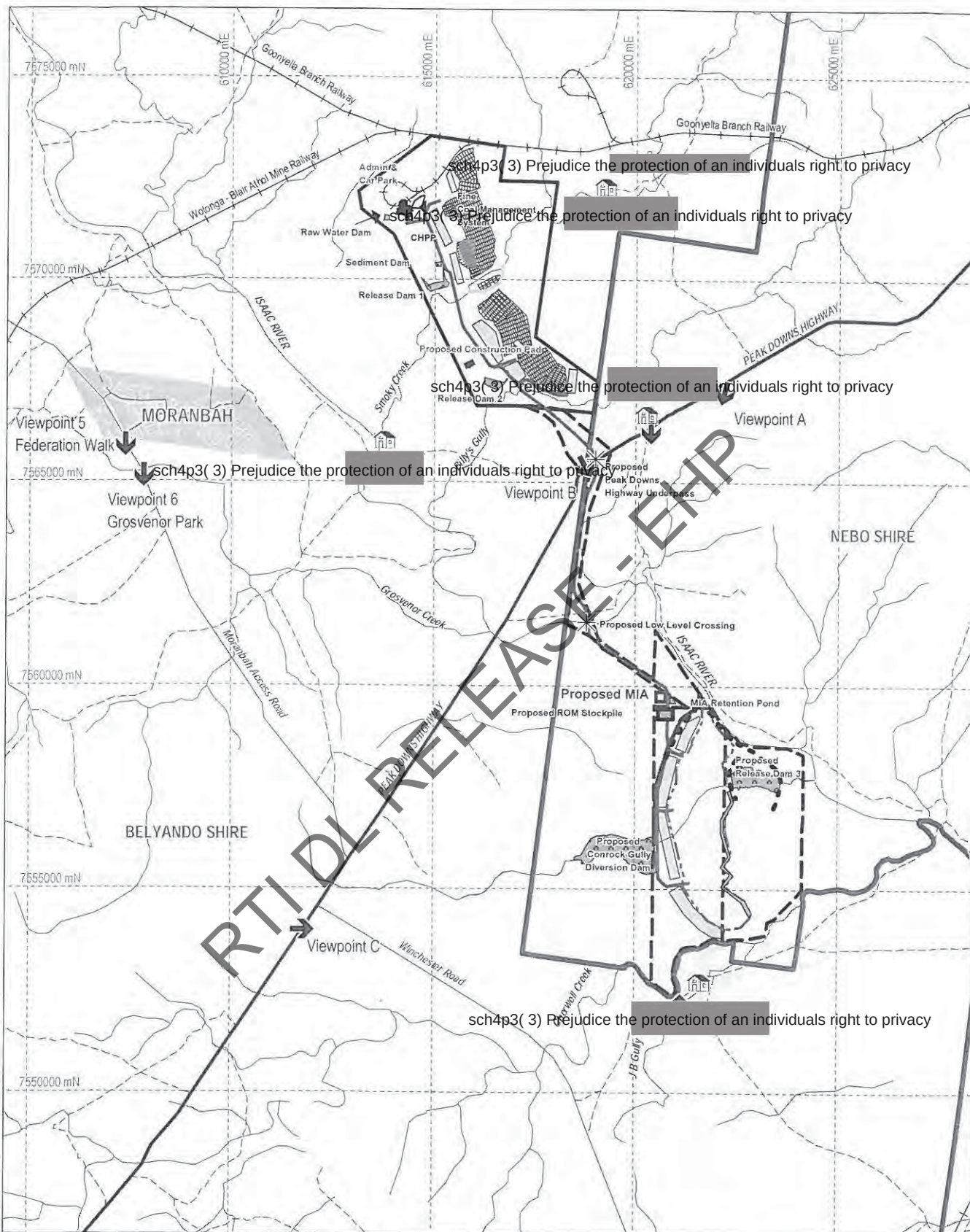
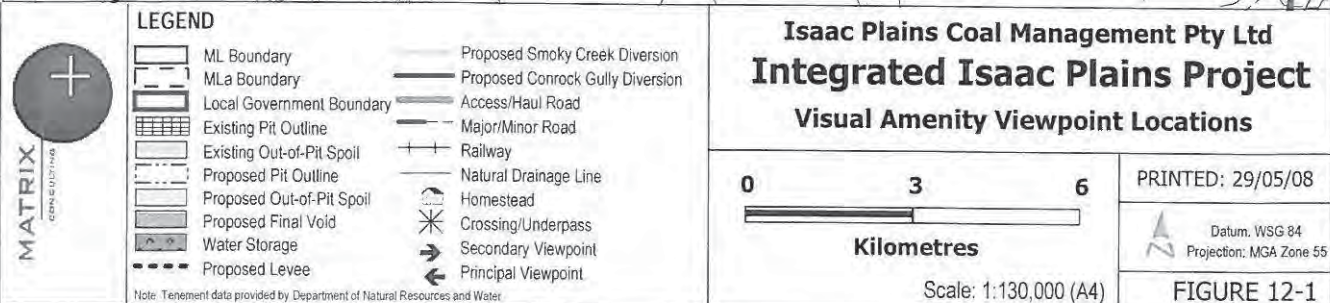
The Peak Downs Highway alignment bisects EPC755.

Cultural heritage and archaeology are discussed in **Section 11**.

12.3.5 Landscape Sensitivity

Landscape sensitivity is categorised as high, medium, low or negligible according to the degree to which a particular landscape or area can accommodate change arising from a particular development without detrimental effects on its character. The classification of sensitivity is based on:

- the existing land use;
- the pattern and scale of the landscape;
- visual enclosure/openness of the views and the distribution of visual receptors;
- scope for mitigation measures which would be in character with the existing landscape; and
- the value placed on the landscape.



The landscape within the vicinity of the Expansion Area is considered to have a low sensitivity to the landscape changes arising from the proposed development given that it primarily supports rural and mining activities. The cumulative impact is considered low for the area, partly because the previously approved Isaac Plains Coal Mine infrastructure is already in place. Mine design for the Expansion Area is yet to be finalised, but it is expected to consist of one continuous pit with mining occurring from west to east (in a north to the south direction) (refer to **Section 3.10**). The Expansion Area also requires out-of-pit spoil dumps, access/haul roads and a ROM coal stockpile and mine infrastructure area, which are to be generally located on land lying between the Isaac River and its tributary, Cherwell Creek. In addition, a low level crossing over the Isaac River and an underpass of the Peak Downs Highway will need to be constructed. Riparian vegetation along the Isaac River and roadside vegetation provide screening of these areas. The access/haul road is likely to be the most visible infrastructure associated with the Expansion Area.

12.3.6 Visual Assessment

Given that the Expansion Area operations will utilise the CHPP facility at the existing Isaac Plains Coal Mine, the main features of the proposed Expansion Area activities that may impact on current visual amenity include:

- open cut pit(s);
- out-of-pit spoil dumps at the western margin of the proposed pit outline, with an average final height of 30 m (maximum 40 m); spoil dumps will be constructed sequentially from north to south as the open pit is developed throughout the mine life;
- access/haul road;
- underpass of the Peak Downs Highway; and
- the ROM coal stockpile, with a likely height of approximately 10 m.

The visibility of these Expansion Area activities would, however, be generally restricted due to:

- the generally low lying nature of the Expansion Area infrastructure within the overall landscape and their distance from publicly accessible vantage points;
- the escarpment immediately south of the Peak Downs Highway, which provides screening from vantage points to the north of the Expansion Area; and
- existing vegetation, which provides partial to full screening of the infrastructure (in particular riparian vegetation along the Isaac River).

12.3.7 Sensitivity of Viewpoints

In general, the closer the viewpoints to a site, the more sensitive they are. Initially, viewpoints that were close to the Expansion Area were selected by desktop assessment to determine the effect the Expansion Area infrastructure would have on visual sensitivity. These included viewpoints that are commonly used by the public such as public roads, nature walks and picnic areas. The main public viewpoint in the area is the Peak Downs Highway. As the Peak Downs Highway is classified as a transport route, views would be transitory and, as a viewpoint, would generally be classified as less sensitive. Viewpoints deemed of cultural significance are those that are included in guidebooks and tourist maps. In the desktop search conducted for the broader area surrounding the Expansion Area, Federation Walk and Grosvenor Park were identified as potential viewpoints of cultural significance for tourism and local amenity. Federation Walk and Grosvenor Park are located on the eastern side, just before entering the township of Moranbah along the Moranbah Access Road. Grosvenor Park is a picnic spot located on Grosvenor Creek (refer to **Figure 12-1**).

12.3.8 Principal Viewpoints

Residential properties are considered as potentially sensitive to visual impacts where the residents are exposed on a regular and/or prolonged basis. The locations of the four closest residential properties are illustrated on **Figure 12-1**. **Plates 12-1 to Plate 12-4** present a series of photographs from the Winchester, Broadlea and Wotonga residences.

An assessment of the Expansion Area from these properties identified that the proposed Expansion Area infrastructure (except for visual impact from the proposed access/haul road seen from homestead, out-of-pit spoil dumps and associated lighting north of the proposed Expansion Area, are generally not likely to be seen from the homestead vantage points due to the nature of the topography and intervening vegetation.

It is not expected that users of the Federation Walk and the Grosvenor Park picnic spot, near the township of Moranbah (refer to **Plate 12-5** and **12-6**), will be visually impacted by the proposed Expansion Area infrastructure.

12.3.9 Secondary Viewpoints

Based on the desktop assessment of the topographic map for the area, three sites (viewpoints labelled Sites A to C – **Figure 12-1**) were initially identified as potential secondary viewpoints. Subsequent field inspections showed it was generally difficult to obtain views to the proposed Expansion Area other than isolated and fleeting glimpses of the proposed infrastructure areas from the Peak Downs Highway due to the screening provided by the roadside vegetation and the presence of undulating intervening terrain in the line of sight. The main secondary vantage viewpoint along the Highway will be the elevated section immediately south of the proposed access/haul road underpass, where views of the proposed Expansion Area infrastructure will be visible during normal driving for a duration of approximately half a minute. These views may be screened more effectively in future assuming that vegetation re-growth inside the fence line along the Highway is allowed to re-establish or a dense line of trees is planted to screen the view. **Plate 12-7** to **Plate 12-9** present typical views from the three sites along the Peak Downs Highway taken in the direction of the proposed Expansion Area infrastructure.

12.3.10 Impact Generators

Due to the extent and nature of the development, i.e. an expansion of an open cut mine operation and additional infrastructure, the visual elements of the Expansion Area that require assessment include:

- open cut pit(s);
- additional ROM coal stockpile; temporary stockpiling for coal destined for existing CHPP;
- out-of-pit spoil dumps (maximum 40 m) at the western margin of the proposed pit outlines;
- access/haul roads;
- Peak Downs Highway underpass; and
- site restoration.

There will be little impacts from these generators as they will primarily be screened by topography and vegetation.

Lighting at night is likely to be noticeable from a limited number of viewpoints. The lighting associated with the Expansion Area mine infrastructure is likely to comprise:

- elevated flood lighting above the ROM coal stockpile;
- flood lighting for active operational areas, e.g. dragline and excavator sites;
- elevated flood lighting in the vicinity of the active spoil dumps;
- along the truck access/haul road; and
- vehicle lights.

The post-mining rehabilitation objective is to rehabilitate above ground disturbance to a stable undulating landform with self-sustaining native vegetation cover. Total residual disturbance will comprise the final voids.

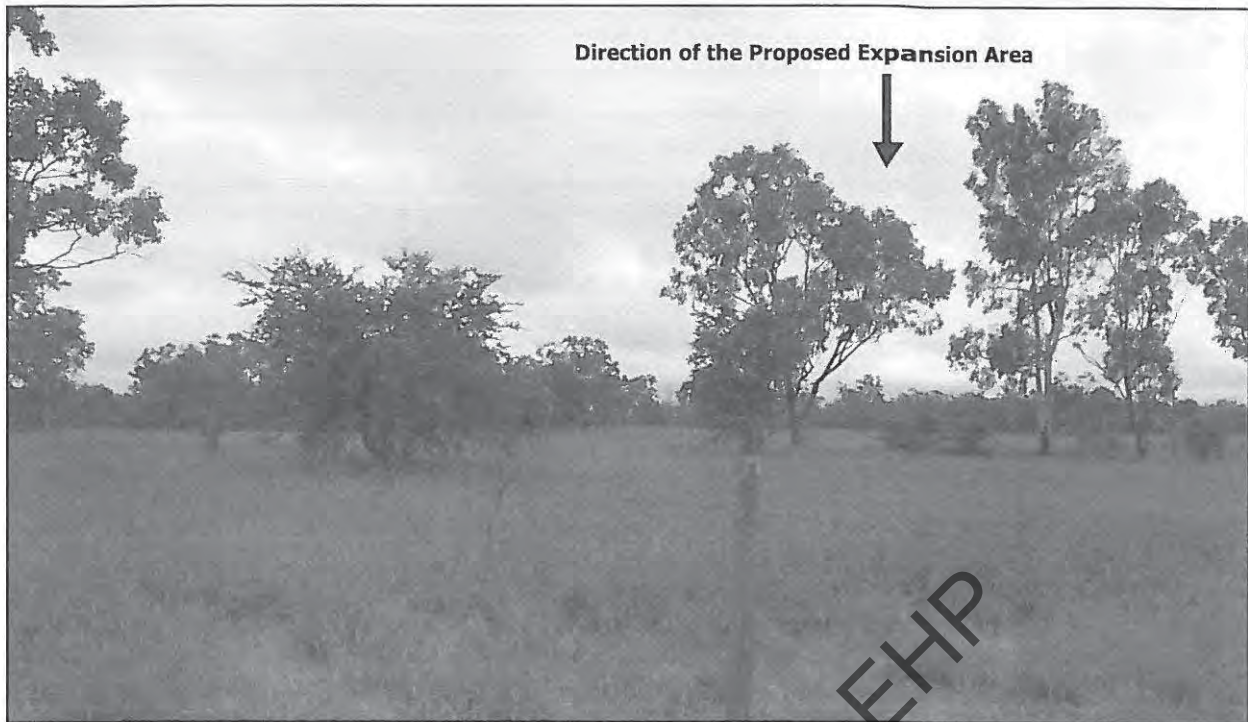


Plate 12-1 Principal Viewpoint 1 (Residence) (Ground Storey View)

Coordinates: 621141, 7552192. Approximately 1.5 km south of southernmost spoil dumps of proposed Expansion Area. Taken approximately 200 m west of the homestead. View north. Views in the direction of the proposed Expansion Area are well screened by established riparian vegetation comprising closely spaced trees.



Plate 12-2 Principal Viewpoint 2 (Residence) (Ground Storey View)

Coordinates: 619306, 7571737. Approximately 13 km north north-west from proposed ROM coal stockpile. The proposed Expansion Area is not expected to be visible due to the extensive screening shown by the undulating terrain in the line of sight, as well as tree cover located closer to the homestead.

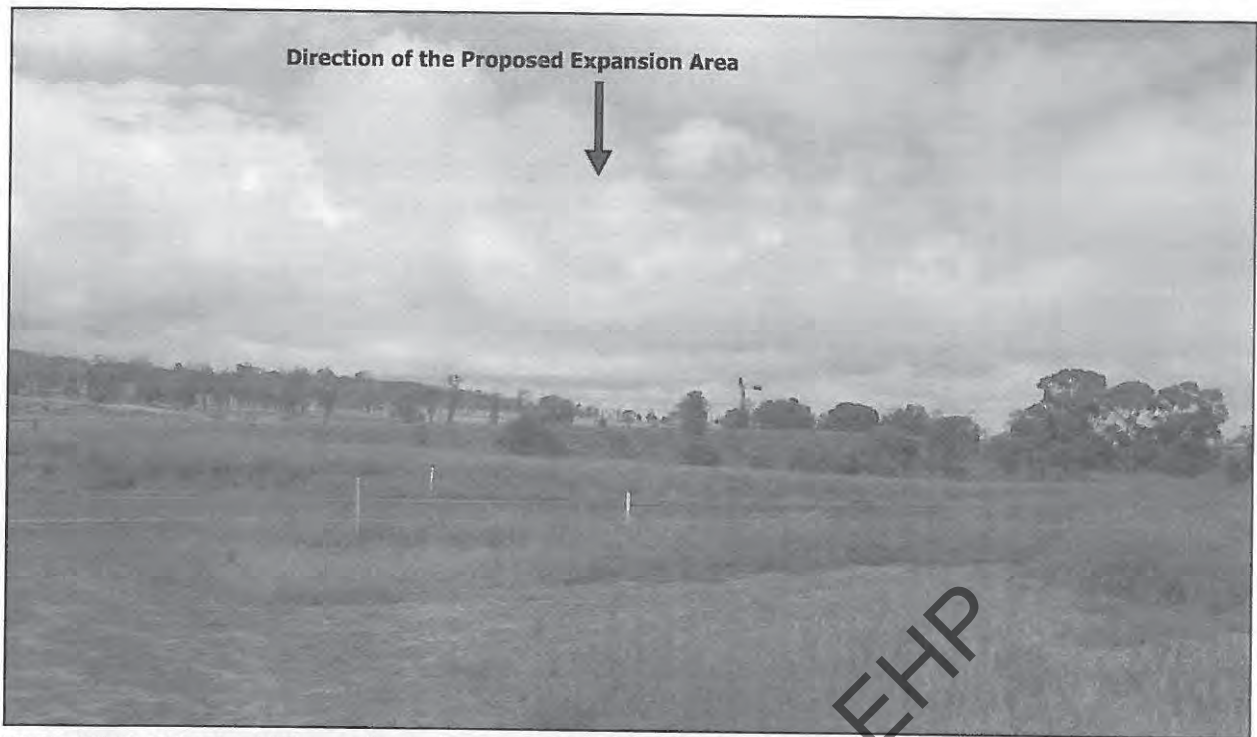


Plate 12-3 Principal Viewpoint 3 - Residence (Ground Storey View)

Coordinates: 620329, 7566302. Approximately 7 km north from proposed ROM coal stockpile. View south. The proposed Expansion Area is not expected to be visible due to the extensive screening shown by the high ground and vegetation cover in the line of sight. Residents would, however, be able to see haulage vehicles and lighting over an estimated 800 m length along the access/haul road, which is to be constructed as the haulage road from the Expansion Area to the existing Isaac Plains Coal Mine.

sch4p3(3) Prejudice the protection of an individuals right to privacy

Plate 12-4 Principal Viewpoint 4 - Entrance to Residence (Ground Storey View)

Approximately 7 km north-west of the Expansion Area, approximately 2 km west of the proposed access/haul road.

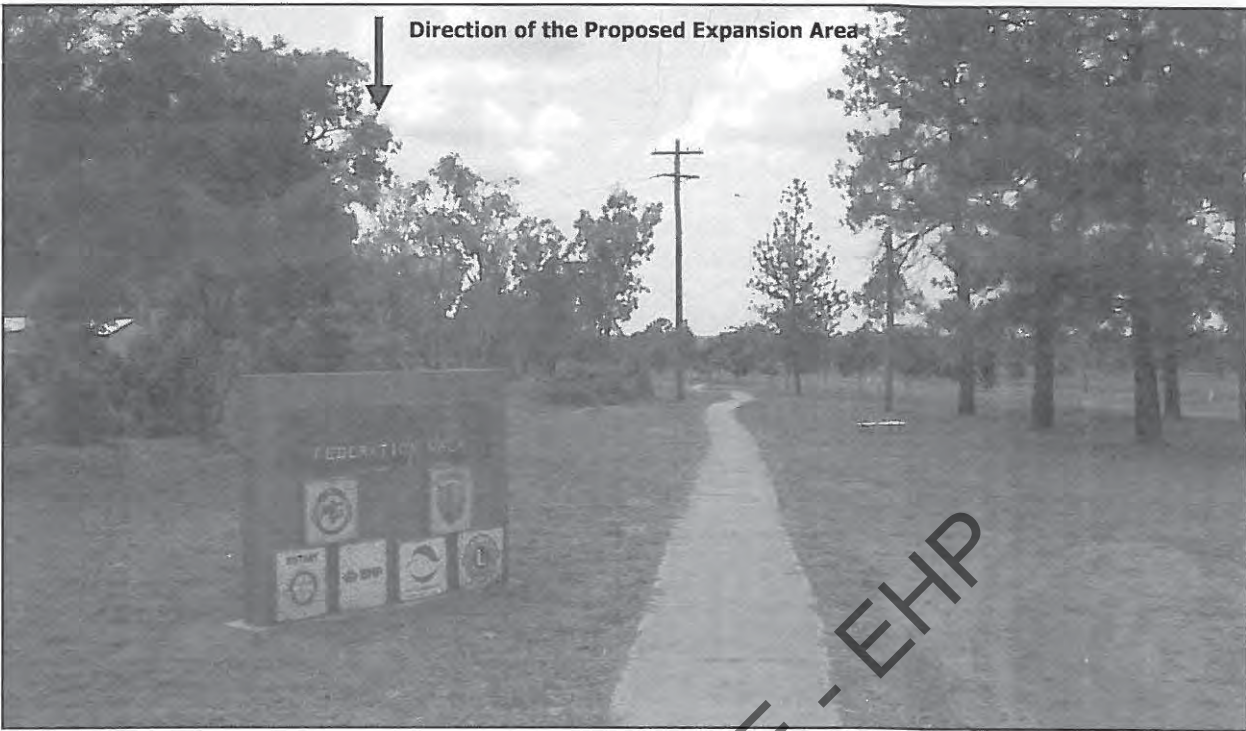


Plate 12-5 Principal Viewpoint 5 - Federation Walk

Coordinates: Plate 12-5 (above) 607324, 7565945. View south. Plate 12-6 (below) 607773 7565195. General view. Approximately 12 km-14 km north-west from proposed ROM coal stockpile. Views from these recreational/ tourist venues near Moranbah township are both well screened in the direction of the proposed Expansion Area by vegetation, undulating terrain and a large separation distance in the line of sight. No visual impact is expected for walkers along the Federation Walk or picnickers at Grosvenor Park.



Plate 12-6 Principal Viewpoint 6 - Grosvenor Park

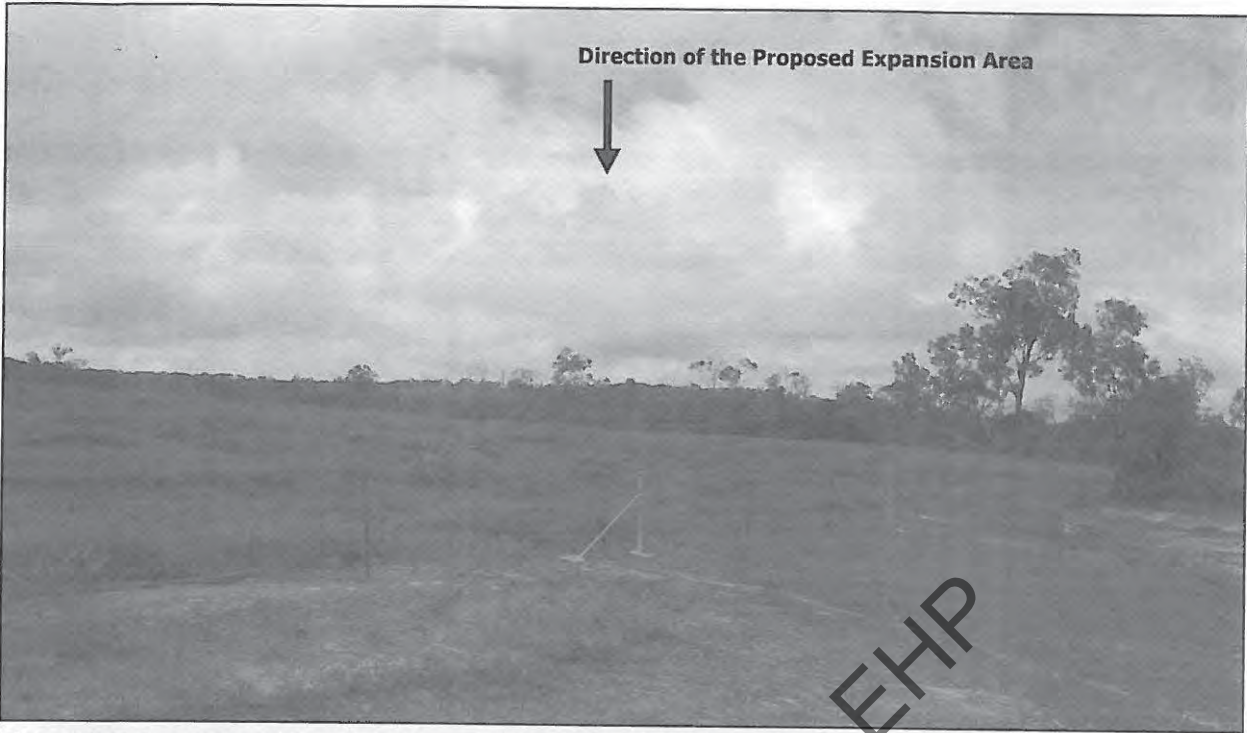


Plate 12-7 Secondary Viewpoint A - Layby on the Peak Downs Highway, 7 km NNE of the proposed Expansion Area (Ground Storey View)

Coordinates: 622068, 7567266. View south-west. The proposed Expansion Area and proposed access/haul road development is not visible due to the presence of extensive intervening high ground.



Plate 12-8 Secondary Viewpoint B - Peak Downs Highway, 6 km NW of the proposed Expansion Area

Coordinates: 618710, 7565436. View south-east. Views of the proposed Expansion Area, access/haul road and underpass would be visible from this elevated location located 50 m south of the access road entrance to the existing Isaac Plains Coal Mine and also over 1 km road distance traveling southwards on the Peak Downs Highway. Views would include visible lights and the glow from lights at night. Views would be partly interrupted along the stretch due to currently sparse irregular vegetative growth. It is proposed that a dense tree line be planted beside the road to obscure views on this section.

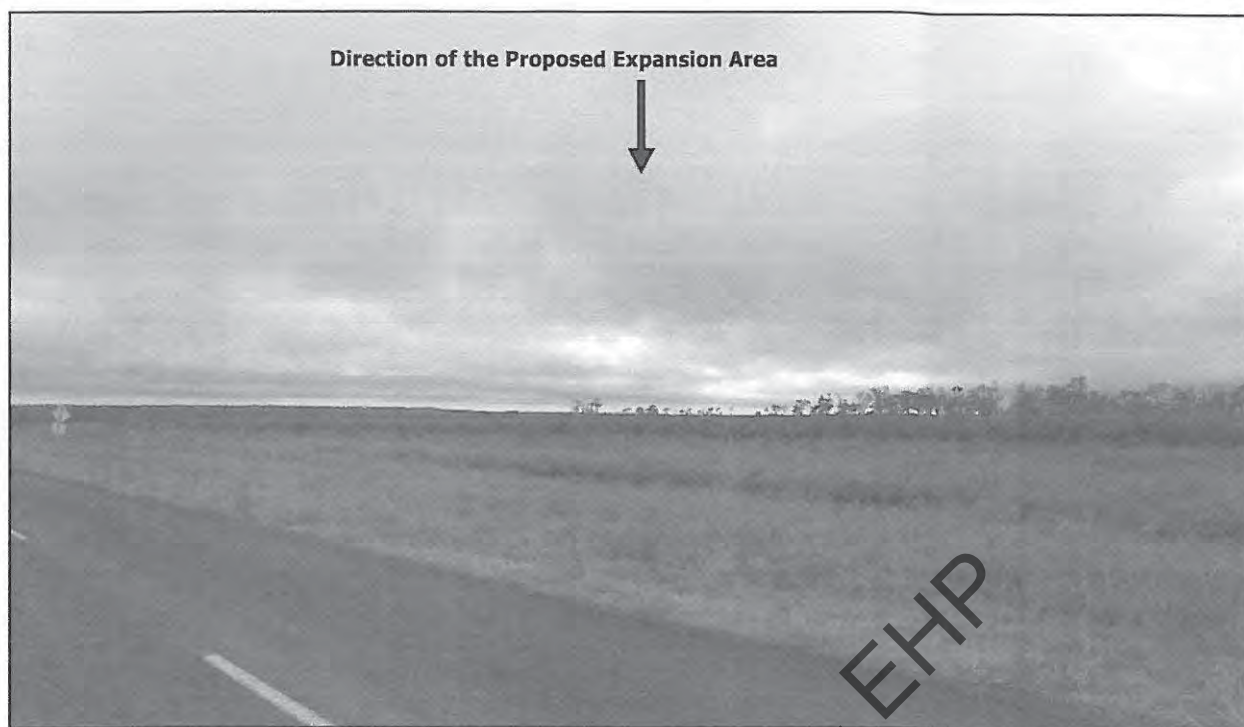


Plate 12-9 Secondary Viewpoint C - Peak Downs Highway, 8 km west of the proposed Expansion Area (Ground Storey View)

Coordinates: 611788, 7553984. View east. Near intersection with Moranbah Access Road. Fleeting views of the southern part of the proposed Expansion Area development are likely. However, these views will be obstructed by vegetation in the line of sight. Magnitude of impacts including visible lights and the glow from lights will be reduced by the significant separation distance from the proposed Expansion Area. The majority of views traveling in this direction will be subject to views of existing mines such as Peak Downs on the landscape.

Although the Expansion Area is visible to a limited extent from the Peak Downs Highway, this will reduce if a vegetation screen is developed along sections of the road. Except for some views of the large road from the protection of an individual's right of privacy, dumps at the southern end of the mine pit at the protection of an individual's right of privacy will not be intrusive. Given the above factors, the overall cumulative visual impact of the Expansion Area and mine roads in the general area is assessed to be low.

Visual exposure relates to the distance of the view, i.e. it is recognised that the impact of an object diminishes at an exponential rate as the distance between the observer increases. The visual sensitivity of most receptors is assessed as being low as the most sensitive receptors considered in this assessment are the residences in the area of the proposed mining activities. Except for **rejudice the protection of an individuals right to privacy** they are located at distances of more than 8 km from the Expansion Area, and the views are screened by vegetation and intervening landforms.

Winchester Downs, the closest residential location to the proposed Expansion Area, lies approximately 1 km from the southern-most limit of the Expansion Area. Due to effective screening from the relatively high riparian vegetation, views would be limited to the out-of-pit spoil dumps at the southern end of the Expansion Area. According to the conceptual mine plan for the Expansion Area, out-of-pit spoil dumps may be up to approximately 40 m higher than the pre-existing ground surface (i.e. average height of out-of-pit spoil dumps is approximately 30 m). Other mine infrastructure would not be visible due to the intervening topography and vegetation. Lighting on the southern out-of-pit spoil dumps will be evident at night but mitigating measures such as use of high pressure sodium lighting, retention of vegetation where possible and screening or louvres attached to light fittings will be introduced to minimise this potential impact. Further mitigation measures are outlined in the EM Plan for the IIPP (refer to **Section 20**).

The conceptual mine plan for the Expansion Area envisages that the current access road from the Peak Downs Highway to the existing Isaac Plains Coal Mine will be upgraded to become a haul road which will be linked to the Expansion Area via an underpass of the Peak Downs Highway. From the underpass, a residential right-of-way will be established, providing views of approximately 800 m of the road to the north of the underpass will be possible from a distance of approximately 2 km. Mining operations in the Expansion Area, as with the existing Isaac Plains Coal Mine, will continue at night, therefore the access/haul road will be illuminated which will result in the access/haul road, and traveling haulage trucks, being visible over a 24 hour period. Mitigating measures, such as retention of vegetation and establishing buffer vegetation between lighting and sensitive receptors, will be introduced to minimise this lighting impact. These measures are further addressed in the IIPP EM Plan (refer to **Section 20**). It is not expected that other elements of the Expansion Area will be seen from this residence due to intervening high and undulating ground in the line of sight to the south.

Views of the proposed Expansion Area operations, including the access/haul road, will be possible to travelers traversing a 1 km elevated section of the Peak Downs Highway, from immediately south of the access/haul road underpass. However, the sizeable distance of approximately 5 km to most of the Expansion Area infrastructure will reduce the visual exposure. Out-of-pit spoil dumps, on average 30 m in height, are likely to be the most obvious elements. Lighting is likely to accentuate the Expansion Area features at night time. As an abatement measure, a dense row of roadside trees will be planted at the commencement of construction to effectively screen the Expansion Area infrastructure and vehicle lights along this section of road.

Based on the information presented above, the assessment of the significance of impact on visual exposure is regarded as low to moderate as impacts would be localised and for a very short duration for travelers on the Peak Downs Highway, and certain mitigating measures would be implemented.

The rehabilitation of the Expansion Area will be progressively undertaken as described in **Section 19** and will likely include the removal of infrastructure on completion of mining. Some infrastructure may remain at the request of landowners, e.g. roads, dams etc. The rehabilitation objective for the site upon decommissioning, is to return areas disturbed by mining activities to a 'self sustaining vegetation community', comprising native vegetation. Areas not disturbed by the mine pit and out-of-pit spoil dumps could be returned to the pre-mine grazing land use. It is proposed that out-of-pit spoil dumps will be reshaped to create a gently undulating landscape with limited ponding. Consequently, residual visual impacts are similarly assessed as low to moderate as not many features in the landscape will change, the proportion of the existing view which will change is very low, and there are no sensitive receptors (residences) which will be affected by the change in the view. Progressive rehabilitation of spoil dumps will also reduce adverse visual impacts.

12.4.5 Conclusions and Mitigation Measures

The magnitude of impact or degree of change as a consequence of the proposed activities within the Expansion Area is expected to be low to moderate due to the presence of limited vantage points which provide views of the Expansion Area infrastructure. The magnitude of impact on decommissioning is regarded as low and beneficial due to vegetative rehabilitation and the creation of a final landform which will conform to the existing undulating landscape and the establishment of native vegetation in an area which is only sparsely vegetated.

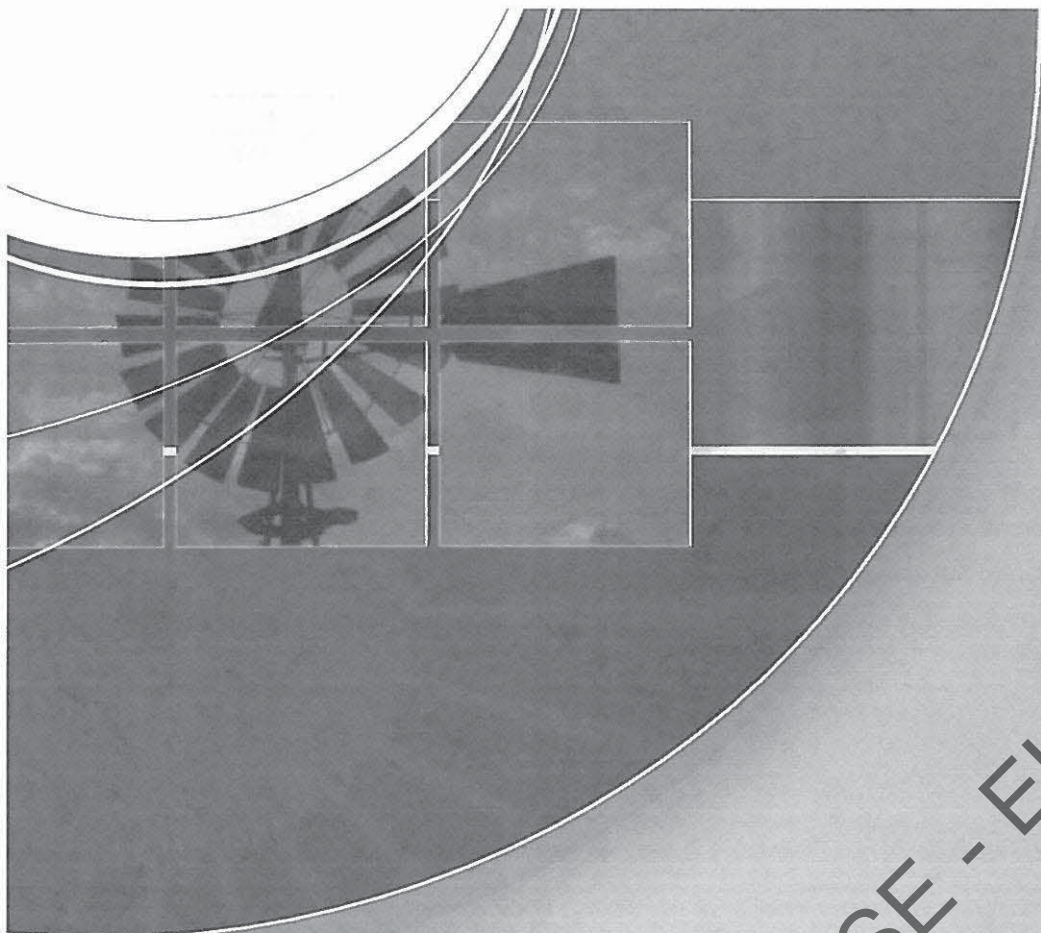
The main indirect impact will be lighting from the proposed mine infrastructure, particularly in the vicinity of the active out-of-pit spoil dumps, the ROM coal stockpile and access/haul roads and the Peak Downs Highway underpass. The negative impact of lighting will be mitigated by installing light fixtures in accordance with the AS4282:1997 Control of the obtrusive effects of outdoor lighting, i.e. light fixtures that provide directed illumination to reduce light spillage beyond the immediate surrounds of the working area. For example, a screen or louvre attached (or close) to the light fitting to control light flux for all angles above 10 degrees below the horizontal would effectively reflect light onto the ground, and improve lighting levels.

Other mitigating measures to reduce impacts on the visual amenity of the area include:

- use of high pressure sodium lights where possible;
- establishment of buffer vegetation between the proposed new surface infrastructure and sensitive receptors; and
- retaining existing vegetation on-site wherever possible.

Based on the above assessment, the Expansion Area is assessed as having a low to moderate visual impact on the surrounding area.

The intent of the Nebo Shire Planning Scheme Strategic plan will also be maintained by encouraging the continued use of the lands not affected by the mine pit, out-of-pit spoil, access/haul road and other mine infrastructure for agricultural purposes, both during mining operations and following site restoration at the completion of mining. The gentle undulating landscape will not inhibit the continued and future use for grazing in these undisturbed parts of the Expansion Area.



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13

WASTE
MANAGEMENT

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

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13 WASTE MANAGEMENT

13.1 INTRODUCTION

Waste management involves the administration and control of all activities involving waste materials. Administration activities include but are not limited to costs, responsibilities and priorities. Other activities include prevention, elimination, reduction, recycling, treatment and disposal of the waste material in this order of preference.

IPCM currently address their responsibilities with regard to waste management at the existing Isaac Plains Coal Mine by detailing processes and procedures for the management of site-generated wastes in an approved EMOS¹. The EMOS includes the associated activities of waste generation, handling, storage and transport of the materials. Wastes generated in association with the IIPP will be managed in accordance with existing practices currently implemented at the Isaac Plains Coal Mine.

Waste management in Queensland is controlled under the EP Act, EPR, EPP Waste, and *Environmental Protection (Waste Management) Regulation 2000* (EP Waste Regulation).

Section 13 of the EP Act defines 'Waste' to include "any thing, other than a resource approved under subsection (4), that is—

- 'left over, or an unwanted by-product, from an industrial, commercial, domestic or other activity; or
- surplus to the industrial, commercial, domestic or other activity generating the waste.'

The EP Regulation defines 'general waste' as waste other than regulated waste. Regulated wastes are defined in Schedule 9 of the EP Regulation as 'non-domestic' waste and are defined by type in Schedule 7 (Regulated Wastes) of the EP Regulation.

The regulated wastes to be generated by the IIPP are discussed in **Section 13.4.1**. In Queensland, the movement of regulated waste, other than as specified in Section 17 of the EP Waste Regulation, is subject to a waste tracking system. At the existing Isaac Plains Coal Mine, waste tracking is undertaken in accordance with the Regulation. This system will be expanded to include the waste generated from the IIPP.

The EM Plan provided in **Section 20** incorporates procedures for disposal of regulated wastes. Any contractor required to treat, store or transport such waste, will need to provide a copy of their EA under the EP Act to IPCM prior to undertaking that activity on the IIPP site.

13.2 ENVIRONMENTAL VALUES

For the IIPP, the environmental value to be protected will be that, during both construction and operational activities, waste will be managed to avoid adverse impacts on any ecological processes and associated ecosystems, the life, health and well-being of people on and immediately adjacent to the mine, and land use capability.

With the addition of the Expansion Area to the existing Isaac Plains Coal Mine, it is anticipated that the wastes currently produced, will increase. The following section addresses the anticipated waste management issues for the IIPP, in terms of identifying and managing the wastes through a system of minimisation, monitoring and reporting.

¹ Now referred to as an EM Plan.

13.3 PRINCIPLES OF WASTE MANAGEMENT AND MINIMISATION

IPCM is committed to minimising the impact of waste on the environment and the community, wherever practicable, through the adoption of the waste management hierarchy principles as per Section 10 of the EPP Waste. In order of preference, IIPP's waste management hierarchy entails:

- waste avoidance;
- waste re-use;
- waste recycling;
- energy recovery from waste; and
- waste disposal.

In addition, IPCM propose to continue to develop strategies involving waste reduction, reuse and resource recovery as the preferred waste management principles for the IIPP.

The objectives, strategies and principles throughout the construction, operation and closure phases of the mine, are included in the EM Plan (refer to **Section 20**).

Waste planning, such as the source separation of components of the waste stream at the generation point, will continue to be implemented for the IIPP, as it provides IPCM with the flexibility to conduct segregation of different waste types during their generation, storage and transportation.

This practice allows for the recovery of reusable or recyclable waste materials which would otherwise be disposed of or destroyed. This waste planning strategy also has the added advantage of reducing the level of risk associated with pollution generation, both on-site and off-site, that may otherwise result from inappropriately managed wastes.

13.4 WASTE MANAGEMENT STRATEGY

Waste management on-site will be conducted in accordance with the principles of ESD and the waste management hierarchy. Subsequently, these same principles require projects to continue to develop new and improved economically viable waste management practices. The IIPP will meet all regulatory requirements, while using continuous improvement as a vehicle to exceed compliance standards where economically feasible.

Cleaner production, pollution prevention and waste minimisation are therefore important components of the overall IIPP waste management strategy. In addition to Queensland's regulatory requirements for waste management, as discussed in **Section 2**, the IIPP will be required to comply with relevant National Environmental Protection Measure (NEPM) developed by the National Environmental Protection Council (NEPC). The relevant NEPM for the IIPP is the NPI in which emissions of pollutants and wastes, on or off-site will now be required to be considered, and reported on, by IPCM for the entire IIPP under the requirements of the NPI.

13.4.1 Regulated Wastes

The EPR is subordinate legislation made under the EP Act. Schedule 7 and Schedule 9 of the EPR list substances and materials regarded as regulated wastes. Regulated waste, as defined by the EPR, is waste that:

- 'contains a significant quantity and concentration of a hazardous contaminant; or
- the hazardous contaminant exhibits hazardous characteristics because of its toxicity, carcinogenicity, mutagenicity, teratogenicity, flammability, corrosivity, reactivity, ignitability or infectiousness, through its physical, chemical or biological characteristics; or
- the waste may cause environmental harm if improperly transported, treated, stored, disposed or otherwise managed.'

Based on this definition and a full appraisal of the waste generating activities anticipated for the IIPP, some of which are already being undertaken at the existing Isaac Plains Coal Mine, the following substances are classified as regulated wastes:

- batteries;
- spilt hydrocarbons/fuel;
- oil interceptor sludge;
- oil water emulsions and mixtures;
- waste oils;
- oily rags;
- treatment tank sludge and residues (including sewage tank sludge and residues);
- tyres; and
- vehicle wash down waters.

The above-listed regulated wastes are currently adequately managed by IPCM at the existing Isaac Plains Coal Mine using acceptable recycling or disposal practices as outlined in this section of the EIS and associated EM Plan (refer to **Section 20**). These management techniques will be implemented over the entire IIPP area and will be constantly reviewed throughout the life of the IIPP.

13.4.2 Cleaner Production

Cleaner production can be achieved through one or a combination of the following techniques:

- production process modification;
- input substitution;
- product reformulation;
- improved operation and maintenance;
- re-use of resources that would otherwise be classified as wastes; and/or
- closed-loop recycling.

Cleaner production refers to the continuous development and implementation of a strategy to prevent waste generation from processes and products, so as to reduce the risks to public health and safety and the environment. Furthermore, a cleaner production approach minimises the energy and materials used and the waste generated in processes, products and services to meet these objectives. IPCM recognises that cleaner production has both economic and environmental benefits and to the extent practicable, has introduced appropriate techniques into the existing Isaac Plains Coal Mine. Similar techniques, including the selection of the re-use of waste water and recycling of waste products generated, will apply to the IIPP, with appropriate refinements on the basis of operational experience.

The applicability of each of these cleaner production techniques to the existing Isaac Plains Coal Mine and the IIPP are discussed below. These include:

- production process modification – the existing CHPP was constructed in 2006 and comprises a state-of-the-art facility which employs best practicable technology in terms of resource recovery and waste minimisation. This includes the use of belt filter presses in the CHPP to minimise water loss and avoid the production of tailings². Coal from the Expansion Area will be processed through this CHPP;
- input substitution – the technique of input substitution is likely to be applied to the IIPP, for example, through consideration of alternative fuel sources;
- product reformulation – the technique of product reformulation is not applicable to the IIPP;

² Should the belt filter press fail completely at any time, a fine coal management system has been developed to capture and process fine coal rejects (refer to **Section 3** for more detail).

- improved operation and maintenance – the improvement of operation and maintenance as a cleaner production technique is applicable to the IIPP and would involve the selection and use of the most appropriate/best practicable fixed and mobile plant and equipment for use in coal extraction, transportation and processing including vehicles, and high levels of maintenance to ensure items are operating efficiently;
- re-use of resources that would otherwise be classified as wastes is the most common cleaner production technique applicable to the IIPP, e.g. rainwater runoff recovery from disturbed areas and its reuse; and
- the technique of closed-loop recycling, i.e. where a product is recycled and used again in the same form, e.g. pallets, is also applicable to the IIPP and discussed in **Section 13.5.2.**

A continuous improvement approach has been implemented for the existing Isaac Plains Coal Mine and will be adopted for the entire IIPP over the life of the mine. This approach will involve reviewing and modifying (as required) processes, materials and operating practices throughout the mine life, as well as through the introduction of techniques such as input substitution, (for example considering alternative fuel sources). The development of quantifiable key performance indicators is currently underway.

13.5 WASTE IDENTIFICATION AND CLASSIFICATION

13.5.1 Mining Waste

The primary mining wastes generated by the IIPP will be:

- overburden from the open cut mining operations; and
- 680,000 tpa of coarse and fine reject material removed during the coal preparation processes (refer to **Section 13.5.5**).

13.5.1.1 Spoil, Rejects and Coal Seam

The primary mining waste generated by the IIPP will be spoil from the open cut mining operations. Waste generated by the IIPP will also include rejects removed during the coal preparation processes which comprises a mixture of non-coal materials, e.g. rocks such as volcanics, shale, siltstone, mudstone or claystone, and sand, silts and clays which either occur naturally within the coal seam or intrude the seam or dilute the coal during mining. With an expected product yield of 83 %, an estimated 0.68 Mtpa of coal rejects will annually be produced from a ROM coal production of 4 Mtpa.

The geochemistry, i.e. chemical characteristics of the spoil, coal seams and coal rejects was assessed by Geo-Environmental Management (GEM) (2007) (refer to **Appendix J**). The investigation focussed on the Expansion Area of the IIPP and included:

- an assessment of the acid forming nature of the spoil and coal rejects;
- chemical composition of the spoil and coal rejects and their water extracts to identify any toxic elements; and
- evaluation of the ARD, salinity and sodicity risks, and potential implications for spoil and coal rejects disposal.

The geochemistry of the spoil, coal seams and coal rejects at the existing Isaac Plains Coal Mine has previously been assessed with results presented as part of the approval application for the mine (submitted to the EPA in March 2005).

13.5.1.2 Spoil

The pH of the spoil samples ranged from 6.2 to 9.7 pH units indicating that the spoil materials are likely to be quasi-neutral to moderately alkaline.

The sulphide sulphur (S) content of these samples was generally low, being <0.01 %S to 0.93 %S with an average value of 0.06 %S. The majority of the samples (90 %) have sulphide sulphur contents of less than 0.1 %S. Based on these results the maximum potential acidity of these samples ranges from 0 to 28 kg H₂SO₄/t with an average of 2 kg H₂SO₄/t. The Acid Neutralising Characteristics (ANC) indicates that these materials have a large range of acid buffering capacity from low to high.

The results indicate that the spoil materials in the Expansion Area are expected to be predominantly non-acid forming (NAF) with a low sulphide (pyrite) content. Some of the carbonaceous materials occurring immediately above and below the Leichhardt Coal Seam may be potentially acid forming (PAF) due to an increased sulphide (pyrite) content.

Although these materials are likely to only have a low capacity to generate acid, they will need to be managed correctly in order to minimise the risk of creating acidic conditions or ARD.

The samples tested also indicate that the materials are generally non-saline to slightly saline and therefore saline conditions or salt release is not expected to be a concern for water quality or revegetation. A significant proportion of the spoil is likely to be moderately sodic and dispersive and if these materials are left exposed for long periods of time, problems with stability, erosion and revegetation may arise. Therefore it is important that they be progressively rehabilitated, as will be the case.

The spoil is likely to contain relatively high concentrations of Arsenic (As), Antimony (Sb) and Selenium (Se), and of these, Se is likely to be relatively soluble. Cobalt (Co) and Molybdenum (Mo) are also relatively soluble, however, these elements were not found to occur in high concentrations in the spoil.

The out-of-pit spoil dumps, containing spoil from the initial box-cuts, are not expected to present an ARD or salinity risk provided the identified low risk PAF material from immediately above and below the Leichhardt Coal Seam is isolated. Post mining, this material will be buried deep within the in-pit spoil dumps to reduce the risk of unacceptable levels of As and Se release and to ensure that there is decreased risk of the material dispersing (due to its moderate sodicity). In addition, for rehabilitation purposes the dumps will:

- not be placed within or on any natural watercourses; and
- require a soil cover designed to adequately protect the spoil from potential wind and surface water erosion, and for long-term vegetation support.

In-pit spoil dumps are not expected to present an ARD or salinity risk provided the identified low risk PAF material from immediately above and below the Leichhardt Coal Seam is buried deep within the dumps. To reduce the risk of unacceptable As and Se release to the environment, and to ensure that the dispersiveness of the material does not increase to an unacceptable level:

- dust suppression (watering) may be required during dump construction; and
- the final landform will incorporate soil covers and drainage works to ensure long-term stability of the soil cover.

The design of the landform, including the size and location of stormwater drains, will be developed as part of a Rehabilitation Plan for the site (a requirement of the existing Plan of Operations).

Due to the possibility of displaying a PAF character, all pit floor waste scrapings will be buried deep within the in-pit spoil dumps where backfilling occurs after mining. The residual void will also fill with water, maintaining anoxic conditions on the floor of the void. The atmospheric exposure times for these materials will need to be kept to a minimum. Field observations and pit water quality monitoring will be implemented in order to identify the potential development of low pH conditions or ARD within the active pits. If low pH conditions are identified, water treatment, e.g. lime dosing prior to release to the surrounding environment may be required during active mining. Refer to **Section 6, Section 7** and the EM Plan provided in **Section 20** for further detail.

Spoil materials at the existing Isaac Plains Coal Mine are also not expected to present an ARD risk with results of the geochemical test work indicating that spoil at the existing Isaac Plains Coal Mine is non-acid forming (NAF) with a low S content (<0.1 %S) and moderate neutralising capacity (average ANC of 33 kg H₂SO₄/t).

13.5.1.3 Coal Seam

The current testing program has established that some of the carbonaceous materials occurring immediately above and below the Leichhardt Coal Seam in the Expansion Area have an increased sulphide (pyrite) content and may be PAF, however with only a relatively low capacity to generate acid. This is based on a limited number of samples (four drill-holes intersecting the Leichhardt Coal Seam). Depending on the proposed management strategy for these materials, additional geochemical testing may be required in order to further evaluate the ARD risk and provide a refined management strategy for these materials. If required, the additional test work would include a sulphur assay, ANC determination and modified NAG testing on additional samples occurring within 1 m of the Leichhardt coal seam. Such samples could be collected and analysed at six-monthly intervals, or whenever rock materials at these levels are exposed during mine operations. Such testing would only need to continue in the long-term if non-systematic or unpredictable variability in the parameters of concern was found at the stratigraphic horizons of interest.

Due to the geochemical variability of the coarse and fine rejects derived from the different coal seams within the Expansion Area, further work will be carried out based on the actual recombined co-disposal material once the Expansion Area is approved and mining commences. The program includes the collection of representative samples of both coarse and fine reject material from the CHPP over a number of days. The samples collected will initially be geochemically characterised using acid-base accounting and further geochemical testing may be required for selected samples, including modified NAG testing and leach column testing. This will enable the evaluation of appropriate management strategies for the disposal and capping of the coarse and fine reject material.

The multi-element scans indicated that Mo and Se were relatively soluble in a number of the samples tested and that Co was readily soluble in one of the samples tested, which gave an exceedance in the short-term and long-term ANZECC irrigation water quality guidelines. Elements As and Sb were detected but not found to be readily soluble. Due to the enrichment of As, Sb and Se in some samples and Zn in one sample, these elements are included in the annual water quality monitoring program in the EM Plan (refer to **Section 20**).

13.5.1.4 Coal Rejects

Using the current system, the coarse and fine coal rejects will be recombined and disposed of in-pit at a moisture content of approximately 30 % at the existing Isaac Plains Coal Mine along with the coal rejects and spoils from the existing Isaac Plains Coal Mine operations. The new fine coal management system will be used as an alternative fine rejects treatment method if the current system fails or if it is planned to recover good quality fine coal from the rejects flow. Drying associated with the fine coal management system is expected to further reduce the moisture content of these fine rejects to approximately 20% prior to disposal as in-pit spoil.

The results from the assessment of samples indicate that some of the coarse and fine rejects from the Expansion Area operations are likely to be PAF. Some of the materials may also be significantly acid consuming.

Due to the expected large variation in the acid forming characteristics of these materials, and the expected occurrence of PAF rejects from the existing Isaac Plains Coal Mine operations, further geochemical testing on the coarse and fine reject materials will be undertaken to further evaluate the acid forming characteristics of the material and to evaluate appropriate management strategies.

Testing found that the coal rejects (coarse and fine) are expected to contain high concentrations of Se compared to the average crustal abundance. The contained Se content is expected to be relatively soluble.

If PAF materials occur in the blended coarse and fine reject material and if these materials are not managed correctly, acid generation and ARD may occur resulting in low pH conditions. If low pH conditions are allowed to occur in these materials, metal solubilities will increase resulting in unacceptable releases of at least As, Co, Fe and Se in surface water runoff and ultimately into Release Dam 1. Water quality monitoring will be conducted, as detailed in the EM Plan (refer to **Section 20**).

13.5.2 Non-Mining Waste

In addition to mining wastes, the nature, projected quantities, sources and management of non-mining wastes to be produced from the IIPP are presented in **Table 13-1** and **Figure 13-1** and have been estimated based on current waste production volumes at the existing Isaac Plains Mine as well as experience from other coal mines in Queensland.

Table 13-1 Estimated Operational Wastes for Existing Mine and Proposed Expansion

Type	Sources	Management	Annual Quantity of Waste
Timber Pallets	Workshop, offices	Those that are recyclable are re-used or returned to the supplier. Any unserviceable pallets are sent to general waste.	<5 t
Tyres	Vehicles	Tyres will either be buried on site or removed off site – both in accordance with the QLD <i>Disposal and Storage of Scrap Tyres at Mine Sites</i> .	Nil waste as tyre maintenance program has the tyre supplier responsible for disposal.
Waste oil	Vehicle and plant maintenance operations	Collected in a bunded tank and taken off-site by registered transporter.	Approximately 74,000 L
Oily sludge, absorbent, grease and oily rags	Workshop	These will be collected on-site before being transported off-site by a licensed regulated waste contractor.	<2 t
Fuel	Refuelling operations and fuel storage areas	Stored in accordance with AS1940.	No waste anticipated.
Paper, glass and plastics	General office and site waste material	Collection and transported off-site by a licensed regulated waste receiver. Recycling is proposed.	<100 t
Coarse and fine rejects material	CHPP	Placement as in-pit spoil as per EA.	680,000 t
Domestic waste	Offices and workshop	Transported to the landfill at Nebo or Moranbah.	<200 t
Waste rock (overburden)	Above coal	Placed during truck and shovel operations and dumped with dragline.	Approximately 25 Mtpa
Batteries	Vehicles	Collected and stored in segregated container. Transported off-site by regulated waste transporter to a licensed receiver for recycling.	30 batteries
Scrap metal	Mine infrastructure area	Segregation and collection on-site. Transportation off-site for recycling.	30 t
Oil filters	Workshop	Drained and placed in separate container to be taken away for recycling by licensed contractor.	1,372 filters
Oil drums	Workshop	Transported off-site by regulated waste transporter to a licensed receiver for recycling.	74 x 1,000 litre pods/bulky bins
Greenhouse gas	Fuel consumption and electricity generation.	Energy efficiency.	Less than 200,000 t CO ₂ -e
Sewage	Washrooms	Existing Isaac Plains Coal Mine – treated sewage to transpiration trenches. Expansion Area – treated sewage pumped to workshop dam.	2.6 m ³ /day (Existing Mine) 2.4 m ³ /day (Expansion Area)

Waste Management Practices

Practices	Construction	Operation	Decommissioning
On-site disposal	Tyres to be buried in pit Organic waste	Tyres to be buried in pit Organic waste	Tyres to be buried in pit Organic waste
Segregated and disposed off-site*	Scrap metal Oil drums Oil filters Waste oil Timber pallets	Domestic waste Paper Cardboard Plastics Glass Batteries Worskop sludge Scrap metal Waste oil Oil drums Oil filters Timber pallets	Scrap metal Concrete Waste oil Oil drums Oil filters
Irrigation	Treated sewage	Treated sewage	Treated sewage
Reject disposal	N/A	Co-disposed with spoil	N/A
Overburden	N/A	Progressive rehabilitation	Complete rehabilitation
Land farm (potential)	Hydrocarbons	Hydrocarbons	Hydrocarbons

*By Licensed Contractors/Facilities or Suppliers



13.5.2.1 Waste Water

As discussed previously, coal is washed at the CHPP. Belt filter presses are used to minimise water use, and avoid the need for the disposal of waste water with fine rejects.

A fine coal management system and supernatant recovery system will be installed adjacent to the CHPP so that if the belt filter press system fails, or if the coal/reject is deemed saleable, the product can be recovered. The fine coal and supernatant recovery system will also efficiently capture supernatant liquid and pump it back to the CHPP for re-use, significantly reducing make up water needs in the CHPP. This system is a closed loop recycling system. Fine coal rejects recovered from the process will then be added to the coarse reject stream and disposed of in-pit as detailed in the current EM Plan (refer to **Section 20**). If the fine coal rejects are of sufficient quality, they will be blended back into the product coal stream.

Water management designs for the existing Isaac Plains Coal Mine and associated infrastructure areas allow for the segregation of clean and dirty water, by ensuring all water, that comes into contact with coal stockpiles, hardstands, workshop areas, spoil waste dumps and haul roads, is directed into an adequately sized sediment dam. This mine water is used for dust suppression on roads and product stockpiles when necessary. All mine affected water is captured in engineered and designed release dams, Release Dam 1 and Release Dam 2. These dams have the capacity to release water in times of abnormal rainfall exceeding 10 % AEP 24 hour events. IPCM uses water stored in the release dams for use in the CHPP and for haul road watering purposes. Rainwater falling on undisturbed areas is classified as clean water and diverted away from disturbed areas by grass and/or rock-lined drainage lines. Water management designs will also be implemented in the Expansion Area using the same philosophy (as detailed in **Section 6**) ensuring the segregation of clean and dirty water.

Other waste water generated at the existing Isaac Plains Coal Mine originates from the sewage system and is managed through a septic tank and transpiration trench. Sewage generated in the Expansion Area will be treated through a similar system. In order to further reduce the volume of waste water created by the sewage system and other sources, the IPCM will consider a range of water minimising strategies that could be implemented at the mine, such as:

- confining potable water for drinking only;
- using clean treated water for domestic use (washrooms, showers, toilets and canteens);
- installing flow control and pressure reducing valves on appropriate plumbing systems;
- installing water efficient shower heads and spray taps in the washrooms;
- installing dual flush controls on toilet systems; and
- installing rainwater tanks on MIA and CHPP buildings to capture rainwater for use on gardens and similar uses.

13.5.2.2 Green Waste

Green wastes constitute all vegetation that will be cleared for the development of the mine, including trees and shrubs (undergrowth). Although grass will also be cleared and should be considered as green waste, it will be removed by scrapers along with the topsoil during pre-stripping operations and stored in stockpiles for revegetation. Rather than being considered as waste, grass will be incorporated into the topsoil to retain the biological activity of the stored topsoil and provide propagules for grass regrowth which will stabilise the stockpiles during storage.

IPCM will implement a sustainable approach for any land clearing, involving pre-clearing surveys to identify any commercially useful plant or timber, and the organisation of a local contractor to remove and make use of any useable vegetation that is not of benefit to the mine. Any vegetation that has no direct commercial value to the mine or a local contractor will be cleared and stockpiled pending placing on the final landform as a natural habitat in line with the proposed final land use. Where it can not be so used, it will be burned under existing site permits.

13.5.2.3 *Transportation Wastes*

Transportation waste, e.g. crates, may be generated through inadequate material transport logistics (supply and delivery of in-coming goods and out-going products and wastes), and through poorly maintained or operated machinery.

Contractors employed by the IPCM will continue to be required to demonstrate environmental efficiency by minimising waste through the effective implementation of optimal vehicle selection, vehicle maintenance, and transport routes to and from the mine site. An example of transport efficiency that will be required by IPCM or their contractors is to ensure, where practicable, that all deliveries and waste removal involves full loads, so as to minimise unnecessary vehicle emissions and fuel usage.

In addition, activities such as reducing unnecessary usage of vehicles to travel short distances on-site, and maintaining strict speed limits in and around the IIPP area will be encouraged. IPCM will use buses seating 20 to 30 people to transport the majority of the workforce to and from the main accommodation site and the operational mine as well as for construction activities.

13.5.3 **Other Operational Wastes**

Other operational wastes will include lubricants and mineral oils, batteries from vehicles, domestic rubbish, detergents, solvents and welding supplies. A waste management system has been implemented for the existing Isaac Plains Coal Mine to minimise and contain these waste products to ensure they remain stored in an appropriate manner for collection by licensed contractors, and pose no risk of leakage to the environment. This waste management system will be duplicated in the Expansion Area. Any spillages that do occur will primarily be within the storage areas of these wastes or within the contained refuelling areas. Sumps within the containment areas will be kept clean and pumped regularly with both liquid and solid fractions stored in separate containers and removed off-site by a licensed hazardous waste management contractor. Fuel and lubrication oil will be stored in an appropriate bunding system as prescribed by AS 1940.

13.5.3.1 *Domestic Wastes*

Employees and contractors on-site will generate food scraps, paper and recyclables on a daily basis from the IIPP staff lunchrooms and administration offices at both the existing Isaac Plains Coal Mine and within the Expansion Area. To manage this waste, source point segregation will be implemented to achieve maximum economic waste recovery, through the provision of separate, colour-coded bins for domestic waste product at waste-generating point sources, along with adequate signage and regular encouragement and education. Segregated domestic waste collected from the IIPP will be removed by a licensed local waste management contractor or local Council on a regular basis.

13.5.3.2 *Organic Materials*

Organic materials include food scraps that will be generated as domestic waste and are normally disposed of to landfill. The economics of alternative disposal methods will be considered for the IIPP. This may involve reduction in the volumes of putrescible wastes that contractors would need to remove from the site for landfill disposal. Care will be taken to prevent any problems with odour or vermin on-site.

13.5.4 **Used Tyres**

Tyres on trucks and associated mining vehicles will need to be replaced on a regular basis throughout the mine life, creating significant volumes of used tyre waste. Tyres will be either buried on-site or removed for off-site disposal, both in accordance with the Queensland's EPA Policy: *Disposal and Storage of Scrap Tyres at Mine Sites*. Any on-site disposal of used tyres will be documented in accordance with the site EM Plan (refer to **Section 20**).

13.5.5 **Blasting**

Blasting is generally undertaken using ammonium nitrate, fuel oil (ANFO) and detonators. The main waste product from blasting is fragments of expired detonating cord. The minimal volumes of this waste product will not require specialist management as most cord is buried during spoil removal and disposal.

13.5.6 Hydrocarbon Wastes

Vehicle maintenance and refueling activities will result in the generation of waste oils and hydrocarbon residues. The management practice adopted for these wastes includes:

- segregation into several categories such as grease, lubricants, oily absorbents, oily rags, contaminated soil, etc.;
- storage in colour-coded and labeled 205 L drums placed within designated areas of workshops and around fuelling depots; and
- removal off-site by an appropriately licensed waste management service provider for either disposal at an appropriately licensed facility, or processing for solvent recovery.

There is a potential for spillage of fuel in other areas of the IIPP from the refuelling of vehicles in the field and from burst hydraulic hoses. Where this occurs, spill kits maintained on-site and/or on vehicles themselves will be used to control spills and assist in cleaning spillages. Clean up wastes will be appropriately stored and removed from site by a regulated waste contractor. Alternatively, a site landfarm to bioremediate hydrocarbon contaminated soil may be considered, which would be constructed in accordance with regulatory requirements. The landfarm would consist of an impermeable clay lined base and sides, automated watering system, groundwater monitoring bores and signed fencing. The landfarm would negate the need to remove hydrocarbon contaminated soils off site, allowing for efficient on-site remediation and a significant cost saving.

The focus of waste management of hydrocarbon waste management will be on the reduction of wastes generated, maximum recovery of wastes (prevention of contamination) and spill clean-up. All hydrocarbons will be stored in accordance with AS1940.

13.5.7 Sewage

Sewage produced on site will be managed on site, i.e. no treated sewage will be required to be transported off site. The existing Isaac Plains Coal Mine currently had the following capacity:

- a septic system at the CHPP administration offices with capacity for 20 EP. The facility has a transpiration trench which is used for the release of treated sewage;
- a septic system with transpiration trench at the train load-out with capacity for 5 EP;
- a septic system with transpiration trench in the mine infrastructure area with capacity for 40 EP; and
- a septic system for the dragline construction area which caters for 100 EP with a treated wastewater pumped to a designated irrigation area. Any solid wastes will be transported and appropriately disposed of by a regulated waste contractor.

Following the completion of dragline construction, the treatment plant will replace the existing septic system currently in place in the mine infrastructure area. This will cater for the increase in staff numbers for the existing operations.

The proposed Expansion Area will have a septic system at the main office/MIA with capacity for 60 EP. As with the system at the existing Isaac Plains Coal Mine, this system will be installed *in lieu* of a package sewage treatment plant. The treated sewage from this system will be pumped out to the workshop dam on a regular basis.

13.6 WASTE IMPACTS

13.6.1 General and Regulated Waste

Impacts from the quantities of liquid and solid waste generated by the IIPP are likely to be very low.

Only licenced contractors will be used to transport general and regulated wastes off-site to currently licenced or registered off-site specialist facilities. Many items such as oil drums, filters and waste oil are removed to processing and recycling facilities in Clermont, Mackay and Townsville.

The release of oily waste has the potential to impact on the environment if inappropriately managed. Such impacts could include leaching to surface and groundwater resources and contamination of soils. There are a number of existing measures for prevention of spills on-site for example; containment of activities within bunded areas, oil-water separator in the site workshop, and these will be applied to the storage of additional fuel and chemicals on-site and additional waste oils on-site. These substances will be stored as per AS1940.

13.6.2 Reject Disposal/Management

As discussed in **Section 3**, a disposal system is employed to manage the coarse and fine rejects produced during the coal preparation (washing) process and involves the use of belt filter presses. Under this system, fine coal rejects recovered from the process will then be added to the coarse reject stream and disposed of in-pit. However, through early operations, IPCM have identified the need to develop an alternative system to manage the fine rejects as if the belt filter presses fail, but also to allow for the recovery of fine rejects from the rejects flow of good quality washed coal. If the filter presses are not operating, the fine rejects will be pumped, via a pipeline from the CHPP, to three cells (refer to **Section 3.5.2**). Once dry, fine rejects will be combined with coarse rejects and hauled by trucks and dumped in the in-pit spoil.

Based on findings from the geochemical characterisation of the rejects material (refer to **Section 13.5.4.2**), the following strategies, partly based on those provided in the Department of Minerals and Energy (1995) "*Technical Guidelines for the Environmental Management for Exploration and Mining in Queensland, Assessment and Management of Acid Drainage*", will be utilised to mitigate any potential impacts from rejects disposal:

- rejects collection and management within the CHPP will be undertaken to ensure blending (and avoid segregation) of coarse and fine fractions;
- analytical characterisation of rejects will be conducted on a six monthly basis to confirm the ongoing NAF nature of the rejects;
- if any PAF material is detected, it will be well buried or covered in order to reduce oxygen diffusion; and
- if pH levels are found to fall below 5.5 together with high metal concentrations, either i) rejects will be mixed with other rejects material of sufficient neutralising capacity, or ii) a suitable quantity of acid neutralising material (i.e. lime) will be mixed with rejects prior to disposal, and the material covered in order to reduce oxygen diffusion. These strategies are outlined in the EM Plan contained in **Section 20**.

Testing of rejects for PAF will be conducted every six months.

13.6.3 Spoil Waste Management

The stockpiled spoil excavated from the pit is expected to present only a very limited ARD or salinity risk. Monitoring will be undertaken during in pit dewatering sumps activities as the remaining coal may produce localised areas of low pH water. Mitigation measures and monitoring has been included in the EM Plan presented in **Section 20**.

13.7 WASTE REPORTING

The NPI is a database designed to provide the community, industry and government with information on the types and amounts of certain substances being emitted to the land, air and water. The main objectives of the NPI are to:

- provide information to industry and government to assist in environmental planning and management;
- satisfy community demand for accessible information on pollutant emissions to the environment; and
- promote waste minimisation, cleaner production and efficient energy and resource use.

Waste Management

The NPI NEPM provides the framework for the establishment of the NPI and sets out the requirements for reporting to the NPI, including how a facility triggers a reporting obligation and what substances are on the reporting list. IPCM is currently engaged in the activity of coal mining, therefore triggering a reporting obligation under the NPI. Consequently, IPCM is required to estimate and report mine emissions to the NPI annually. To date, IPCM has completed one annual NPI report. In future, probably commencing 2008-09, the annual report will include the entire IIPP.

The key activities related to the IIPP are mining, fuel and organic liquid storage; and explosives detonation.

In reporting waste emissions to the NPI, IPCM refer to the Emission Estimation Technique Manual for each of the activities associated with coal mining. This assists staff in estimating NPI-listed substances that trigger a threshold and will be emitted to land, air or water. Currently there are several Industry Handbooks which list the key activities that need to be reported. There are additional activities cited below, associated with the Expansion Area, that will be assessed for reporting obligations, depending on the trigger criteria for these activities and associated substances.

In addition, the following activities may also trigger reporting requirements to the NPI given the increase in mining activities:

- fossil fuel and electric power usage;
- sewerage and wastewater treatment;
- combustion engines;
- fugitive emissions; and
- railway operations.

IPCM will continue to assess the IIPP with respect to those emissions which trigger a reporting requirement under the NPI.

13.8 MONITORING PROGRAM

The purpose of monitoring the activities and outcomes related to waste management include:

- providing baseline data for the continuous development of ameliorative measures as well as forming the basis from which waste management decisions are made throughout the life of the IIPP;
- comparing actual results with predicted impacts and mitigation measures detailed in this EIS; and
- monitoring for potential environmental impacts.

Regulated wastes or material leaving the mining lease for recycling or disposal, including the final destination and method of treatment, will be monitored continually.

The waste monitoring program is included in the EM Plan, provided in **Section 20**. Monitoring will include the recording of wastes generated on-site, by waste type, and waste being transported off site. Records will be maintained in order to determine where large quantities of certain wastes are being produced. Records will be reviewed quarterly and actions formulated to reduce or eliminate waste generation.

Although the identified ARD risk associated with wastes generated from mine pit operations and spoil is low, there may be a risk of acid generation and ARD in the coarse and fine reject materials and therefore the site water quality monitoring program will include monitoring for pH, electrical conductivity, alkalinity, acidity and Sulphate (SO_4) in order to detect processes of sulphide oxidation and acid generation within coal stockpiles, mine pits and spoil dumps. Additionally, due to the potential for the release of As, Co, Fe, Mo and Se from the spoil and/or coarse and fine reject materials under a range of pH conditions, these elements are included in the site water quality monitoring program, and monitored quarterly.

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14

TRANSPORT

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT



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14 TRANSPORT

14.1 ENVIRONMENTAL VALUE

The environmental values relating to transport include road safety and the continued efficiency of the State Controlled Road (SCR) network system.

14.2 BACKGROUND

The IIPP EIS has been prepared to facilitate approval for an increase in the area to be mined and an increase in the rate of run-of-mine (ROM) coal production from the existing approved mining rate of 1.9 Mtpa to approximately 4 Mtpa ROM coal. An increase in coal production will be achieved by increasing the hours of operation of the existing approved CHPP and in turn increasing the throughput of CHPP operations. The workforce will increase to 110 persons (up from 70 operational personnel for the existing Isaac Plains Coal Mine). Mining and associated activities will be undertaken 24 hours per day in two shifts of 12 hours duration, seven days per week. Working hours for administration employees are between 7 am to 5 pm, Monday to Friday.

In addition to employees required for mining operations, a maximum of 40 persons will be required for the construction and/or upgrading of the haul/access roads within and between the Expansion Area and the existing Isaac Plains Coal Mine (including construction of the underpass of the Peak Downs Highway). This workforce will also be required for construction of the low level crossing of the Isaac River and the development of the mine infrastructure area within the Expansion Area. Construction activities will be completed within approximately 12 months.

Assembly of the dragline will also require a peak workforce of up to 100 persons over a 12 month construction phase.

The coal mined from the Expansion Area will be hauled by trucks, on the proposed internal haul roads from the Expansion Area ROM stockpile to the CHPP at the existing Isaac Plains Coal Mine. The proposed access/haul route will also serve as the light vehicle access route to the Expansion Area from the access road to the existing Isaac Plains Coal Mine. The proposed access/haul road from the Expansion Area will require a low level crossing of the Isaac River and the construction of an underpass of the Peak Downs Highway (refer to **Section 3.7**).

This section of the EIS provides the findings of the Traffic and Pavement Impact Assessment completed as part of the IIPP (refer to **Appendix K**). NB: This assessment is a revised version of the assessment conducted for the previous version of the EIS, i.e. Version 3.0.

14.3 EXISTING TRANSPORT NETWORK AND TRAFFIC

Figure 1-1, Section 1, illustrates the existing regional transport network. Much of the existing transport infrastructure links major regional centres, such as Mackay, Emerald and Rockhampton. Both rail and road infrastructure is prominent in the area.

14.3.1 Rail

The main rail trunkline in the IIPP area is known as the Goonyella Branch line (refer to **Figure 1-2**). The IIPP rail spur is linked to this line. Just west of the Isaac Plains turnout, the Goonyella main line splits into two lines which service mines in the Moranbah and Clermont districts.

14.3.2 Roads

The main road to be utilised by the IIPP is the Peak Downs Highway, a SCR under the control of the DMR. The Peak Downs Highway is a two lane, two way, sealed road which originates in Mackay located east of the IIPP. The pavement of this road has been maintained to trafficable standards. The existing speed limit on the Peak Downs Highway is 100 km/hr, except in the vicinity of the townships of Walkerston, Eton and Nebo, where speed limits are reduced to 60 km/hr. Further speed restrictions are enforced in these townships at school start and finish times. Speed limits are also reduced where the Peak Downs Highway crosses the Eton range to the west of Mackay.

Other roads in the area of the IIPP, which can be used when the proposed low level crossing on the Isaac River overtops, include the Moranbah Access Road which branches off the Peak Downs Highway and the Winchester Downs Road.

14.3.3 Traffic

To assist in the quantification of the existing road network operations Peak Downs Highway traffic volumes were obtained from the DMR. The traffic count provided was undertaken for the entire month of January 2005 and covered the section of the Peak Downs Highway between Coppabella and Clermont (west of Moranbah). Data indicates that the 2005 Average Annual Daily Traffic (AADT) volume was in the order of 1,845 vehicles, with traffic volume peak hours occurring on Fridays, between 7:00 am and 8:00 am in the morning and again between 4:00 pm and 5:00 pm in the evening. A compounding background traffic growth rate of 5 % (pers. comm. Mr Patrick Aprile - Principal Engineer, DMR, February and March 2007) was applied to the 2005 AADT volume to estimate a current year (i.e. 2008) equivalent AADT. The application of this growth rate equates to a current year AADT estimate of 2,135 vehicles.

Refer to **Appendix K** for a full assessment of potential traffic and pavement impacts for the IIPP.

14.3.4 Port Facilities

Coal from the IIPP will be railed to the DBCT, near Mackay. DBCT is a port facility which exports metallurgical and thermal coal mined in the Bowen Basin. DBCT's customers include mines owned by some of the world's largest mining companies. The DBCT has a number of long-term take-or-pay contracts in place.

14.3.5 Coal Haulage

Coal from the Expansion Area will be transported by truck to the existing Isaac Plains Coal Mine along the internal access/haul road and therefore will not access or impact on the serviceability of the SCR.

Once coal is processed, it is loaded onto trains for transport to DBCT. Refer to **Section 3** for further details.

14.4 POTENTIAL TRANSPORT AND ROAD IMPACTS AND MITIGATION MEASURES

14.4.1 Traffic Generation

14.4.1.1 Construction Period

It is expected to take approximately 12 months to construct the IIPP. It is anticipated that construction vehicles will travel to and from the area via the Peak Downs Highway and utilise the existing Isaac Plains Coal Mine access intersection. The underpass will be constructed early on in the construction phase of the mine in order to reduce potential impacts on the highway and allow access to the Expansion Area. Following completion of the underpass, traffic associated with the construction of the IIPP will then use the underpass to access the Expansion Area on the southern side of the Peak Downs Highway. The completion of the underpass will direct mine traffic to the internal road network to minimise potential impacts on any existing public transport routes or local roads. Access to the Expansion Area prior to construction will be via Winchester Road.

A review of DMR's *Manual of Uniform Traffic Control Devices* (DMR, 2003) has been undertaken to determine the requirements for traffic control on the Peak Downs Highway at and in the vicinity of the underpass during its construction. This manual specifies which traffic control measures should be applied for varying road conditions (e.g. road type, posted speeds, traffic volume etc), types of construction/maintenance works and expected durations (i.e. short-term or long-term).

From the definitions outlined in the the manual, for the Peak Downs Highway, in the vicinity of the location of the underpass, it can be concluded that the highway is:

- an arterial road (i.e. a main road carrying mostly long distance traffic, as distinct from local traffic);
- a high-speed road (i.e. the posted or general speed limit is above 60 km/h); and
- a high-volume road (i.e. the daily traffic volume is in excess of 1,500 vehicles per day).

Transport

The construction of the underpass is of a significant nature and is expected to take in the order of nine months to construct. From an operational and safety perspective, i.e. both workers and passing traffic, it would be impracticable to accommodate traffic along the existing Peak Downs Highway during the construction of the underpass.

Therefore, it is proposed to provide a side-track to deviate highway traffic past the underpass construction zone. This side-track will be provided to cater for two-way traffic movements and applied in accordance with the requirements of DMR's *Manual of Uniform Traffic Control Devices* (DMR, 2003). A similar arrangement was recently used for the construction of the nearby Carborough Downs Coal Mine underpass.

During the construction period, the existing Isaac Plains Coal Mine will continue to operate. Information with respect to traffic generated by the existing Isaac Plains Coal Mine operation is presented in **Table 14-1**. It is important to note that during the construction period a portion of workers will be transported to and from the Coppabella Camp and to site by minibus. The estimated percentage split of employee related trips by private vehicle and minibus transport modes are also shown in **Table 14-1**.

General assumptions used to calculate trip generation for the existing Isaac Plains Coal Mine operations and the Expansion Area construction include the following:

- a peak hour conversion factor for employee related trip-ends is 50 % of anticipated daily traffic;
- a peak hour conversion factor for all other trips (i.e. visitor trips and service vehicles/deliveries) is 10 % of anticipated daily traffic;
- the vehicle occupancy rate for light vehicles is assumed to be 1.1 persons/car (vehicle occupancy of 1.1 persons is typical for journey to work trips and has been observed in many travel surveys over the years). While the vehicle occupancy rate is based on urban areas, similar survey data for regional areas is not available. Thus, this value has been adopted for estimating employee related private vehicle trips (Pekol, 2007) for rural areas;
- the vehicle occupancy rate for visitor traffic has been assumed to be 1.0 person/car; and
- the vehicle occupancy for a minibus is assumed to be 12 persons/vehicle.

Table 14-1 Summary Statistics – Existing Mining Operations

Description	Existing Mining Operations	Peak Hour Conversion Factor
Employee requirements	70 persons/day	50 %
Mode of travel to work	40% by private vehicle 60% by minibus	-
Average number of visitors (light vehicles)	8 persons/day	10 %
Number of service vehicles/deliveries (heavy vehicles)	5 trucks/day	10 %

Information with respect to the construction of the Expansion Area and the construction of the dragline is included in **Table 14-2**.

Table 14-2 Summary Statistics – Expansion Area Construction Period

Description	Dragline Construction	Expansion Area Construction	Peak Hour Conversion Factor
Employee Requirements	Max – 100 persons/day	Max – 40 persons/day	50%
Expected employee mode of transport to work	60% private vehicle 40% by minibus	60% private vehicle 40% by minibus	-
Expected number of visitors (light vehicles)	12 persons/day	10 persons/day	10%
Expected number of service vehicles/deliveries (heavy vehicles)	8 trucks/day	5 trucks/day	10%

NB: It is proposed by IPCM that a greater % of employees will be transported to site by minibus for the construction and operation of the IIPP.

Based on the details provided in **Table 14-1** and **Table 14-2** and above in this section of the EIS, the anticipated trip generation rates expressed in vehicle trip ends (vte¹) during the construction period are as shown in **Table 14-3** and **Table 14-4**. Detailed trip generation calculations are provided in **Appendix K**.

Table 14-3 Trip Generation (vte) – Construction (Daily)

Vehicle Type	Existing Mining Operations	Dragline Construction	Expansion Area Construction	TOTAL
Light Vehicles				
• employees	51	45	44	140
• visitors	16	24	20	60
Heavy/Other Vehicles				
• service/deliveries	10	16	10	36
• minibus	7	13	4	24
Total	84	98	78	260

*Note: Trip generation rates presented in this table represents round trips (i.e. total daily in: out trips).

Table 14-4 Trip Generation (vte) – Construction (Peak Hour)

Vehicles	Existing Mining Operations	Dragline Construction	Expansion Area Construction	TOTAL
Light Vehicles				
• employee	25	23	22	70
• visitors	2	2	2	6
Heavy/Other Vehicles				
• service/deliveries	1	2	1	4
• minibus	4	6	2	12
Total	32	33	27	92

*Note: Trip generation presented in this table represents round trips (i.e. total peak hour in: out trips).

From the tables presented above, an estimated 200 light vehicles (composed of employee and visitor trips) will enter and exit (i.e. sum of in: out trips) the site on a daily basis during construction. In terms of heavy/other vehicles, an estimated 60 service/deliveries vehicles and minibuses will enter and exit the site daily.

The anticipated trip distribution for traffic accessing the site is as follows:

- 95 % of traffic will be traveling to and from the east (e.g. Coppabella and Mackay); and
- the remainder of 5 % will be traveling to and from the west (e.g. Moranbah).

¹ vte is a single or one-directional vehicle movement with either the origin or destination inside a traffic study site.

Transport

The adopted trip distribution is based on the the likely location of employee accommodation and major distribution centres where construction materials may be sourced.

It is anticipated that the traffic distribution percentages will be the same during construction and full operation.

Some small amounts of traffic may access the Expansion Area via Winchester Road. This will be very limited and not pose significant impact on roads. The assessment conducted was done to assess the worst case scenario, i.e. assess impacts at the most heavily used access to the site.

14.4.1.2 Operational Phase

During the operational phase, trip generation for the subject site will comprise of two primary elements:

- traffic that is generated from operations at the existing Isaac Plains Coal Mine; and
- traffic that is generated from the operations within the Expansion Area.

Information relevant to the future mining operations, i.e. the IIPP, is included in **Table 14-5**.

Table 14-5 Summary Statistics – Future Mining Operations (IIPP)

Description	Expansion Area Operations	Integrated (i.e. Existing Mining Operations + Expansion Area Operations)	Peak Hour Conversion Factor
Employee Requirements	40 personnel/day	110 personnel/day	50%
Expected employee mode of transport to work	40% private vehicle 60% by minibus	40% private vehicle 60% by minibus	-
Expected number of visitors	8 persons/day	16 persons/day	10%
Expected number of service vehicles/deliveries	3 trucks/day	8 trucks/day	10%

It is anticipated that once mining activities are fully operational, approximately 110 employees and up to 16 visitors will travel to and from the IIPP each day. The majority of traffic will be between Coppabella and the site, as the majority of employees will be housed at Coppabella, with some small amounts of traffic expected from Moranbah. Consistent with the assumptions made for existing operations, it has been estimated that 40 % of trips to the site will be made by private vehicles with an assumed vehicle occupancy rate of 1.1 persons/car (NB: assumed visitor occupancy rate of 1.0 person/car). As shown in **Table 14-5**, 60 % of employee related trips will be made by minibuses, which have assumed vehicle occupancy of 12 persons/vehicle.

The trip generation presented in **Table 14-6** and **Table 14-7** is a summary of the likely traffic generation during the operational phase of the IIPP. Detailed trip generation rates are provided in **Appendix K**.

Table 14-6 Trip Generation (vte) – IIPP Operations (Daily)

Vehicles	Existing Mining Operations	Expansion Area Operations	TOTAL (i.e. Operational IIPP)
Light Vehicles			
• employee	51	29	80
• visitors	16	16	32
Heavy Vehicles			
• service/deliveries	10	6	16
• minibus	7	4	11
Total	84	55	139

*Note: Trip generation presented in this table represents round trips (i.e. total daily in: out trips).

Table 14-7 Trip Generation (vte) – IIPP Operations (Peak Hour)

Vehicles	Existing Mining Operations	Expansion Area Operations	TOTAL (i.e. Operational IIPP)
Light Vehicles			
• employee	25	15	40
• visitors	2	2	4
Heavy Vehicles			
• service/deliveries	1	1	2
• minibus	4	2	6
Total	32	20	50

*Note: Trip generation presented in this table represents round trips (i.e. total peak hr in: out trips).

Based on the information presented in **Table 14-6**, the number of trips generated by employees and visitors (excluding service/deliveries) is estimated to be 55 vte/day for the Expansion Area operations (including minibus trips). Taking into account the number of employees (70 persons/day) and visitors (8 persons/day) for the existing Isaac Plains Coal Mine operations, in full operation the IIPP is expected to generate 123 vte/day (for employees and visitors). With the inclusion of service/delivery trips, the total number of vtes expected for the IIPP is 139 vte/day.

The peak conversion factors for the operational period are similar to the assumptions presented for the construction period. As shown in **Table 14-5** these are 50 % for employee related trips and 10 % for all other trips. As illustrated in **Table 14-7** applying these rates equates to an estimated a total peak period flow for the IIPP of approximately 50 vte/hr.

14.4.2 Directional Distribution

The directional distribution of development generated traffic is based on the following:

- the likely location of employee accommodation; and
- major distribution centres where construction materials may be sourced.

Following the assumptions developed by Adam Pekol Consulting in the initial pavement impact assessment for the IIPP (Pekol, 2007), 95% of traffic is assumed to be distributed to the east (primary attractors/generators are Coppabella and Mackay) whilst the remaining 5% will be distributed to the west (primary traffic attractor/generator is Moranbah). These definitions are relevant to both construction and operational phases.

A summary of the directional distribution and its application to the trip generation (refer to **Section 14.4.1.1, Table 14-4** and **Section 14.4.1.2, Table 14-7**) is provided in **Table 14-8**. Directional traffic flow diagrams are provided in **Appendix K**.

Table 14-8 Peak Downs Highway/Mine Access Road – Trip Distribution Operations

Peak Period	Inward Proportion & Movements (vph)			Outward Proportion & Movements (vph)		
	Left Turn	Right Turn	Total Inward	Left Turn	Right Turn	Total Outward
Construction Phase						
AM Peak Hr (7:00AM-8:00AM)	2.5% (2)	47.5% (44)	50% (46)	47.5% (44)	2.5% (2)	50% (46)
PM Peak Hr (4:00PM-5:00PM)	2.5% (2)	47.5% (44)	50% (46)	47.5% (44)	2.5% (2)	50% (46)
Operational Phase						
AM Peak Hr (7:00AM-8:00AM)	2.5% (2)	47.5% (23)	50% (25)	47.5% (23)	2.5% (2)	50% (25)
PM Peak Hr (4:00PM-5:00PM)	2.5% (2)	47.5% (23)	50% (25)	47.5% (23)	2.5% (2)	50% (25)

14.4.3 Access Intersection Lighting

To determine lighting requirements for the intersection of the existing mine access with the Peak Downs Highway an assessment has been conducted against the criteria for Access Intersection Lighting Requirements for SCR in DMR's *Road Planning and Design Manual* (DMR, 2005). The assessment required the comparison of the AADT of the Peak Downs Highway and mine access road for both the construction phase of the Expansion Area and the operational phase of the IIPP against the requirements. This assessment is provided in graphical form in **Figure 14-1**.

The assessment determined that the minimum requirement for lighting is regarded as "category V5 lighting" during both construction and operational phases of the IIPP (refer to **Figure 14-1**). DMR's *Road Planning and Design Manual* (DMR, 2005) indicates that the minimum design of "category V5 lighting" should comprise:

- the lighting of the surface of the carriageway extending at least 10 m beyond the prolongation of the kerb lines (NB: in the case of the subject intersection this would be deemed to be the road shoulder alignment) of the intersecting roads; and
- where raised islands or medians are within the intersection approaches, the lighting to be extended to include these elements.

The provision of "category V5 lighting", where required, will be designed and constructed in accordance with *AS/NZS 1158 Lighting for roads and public spaces series*.

The existing intersection includes painted medians within both approaches of the Peak Downs Highway. It is proposed to retain the existing intersection arrangements for sole access to the mine, including the retention of painted medians.

Street lighting is currently provided within the mine access road approach of the intersection with the Peak Downs Highway (refer to **Plate 14-1**). It is understood that these existing lighting elements are consistent with the aforementioned requirements. The intersection approach within the Peak Downs Highway does not currently include lighting. As such, it is proposed to provide "category V5 lighting" within both approaches of the Peak Downs Highway such that the lighting of the surface of the carriageway extends at least 10 m beyond the extension of the road shoulder alignment.

It is also proposed to ensure that the painted medians and other line marking within the existing intersection is in suitable condition prior to the commencement of construction for the IIPP or dragline (whichever commences first). To augment the intersection's line marking, retro-reflective raised pavement markers (RRPM) will be provided.

The linemarking and RRPMs will be provided in accordance with the requirements of DMR's *Manual of Uniform Traffic Control Devices* (DMR, 2003).

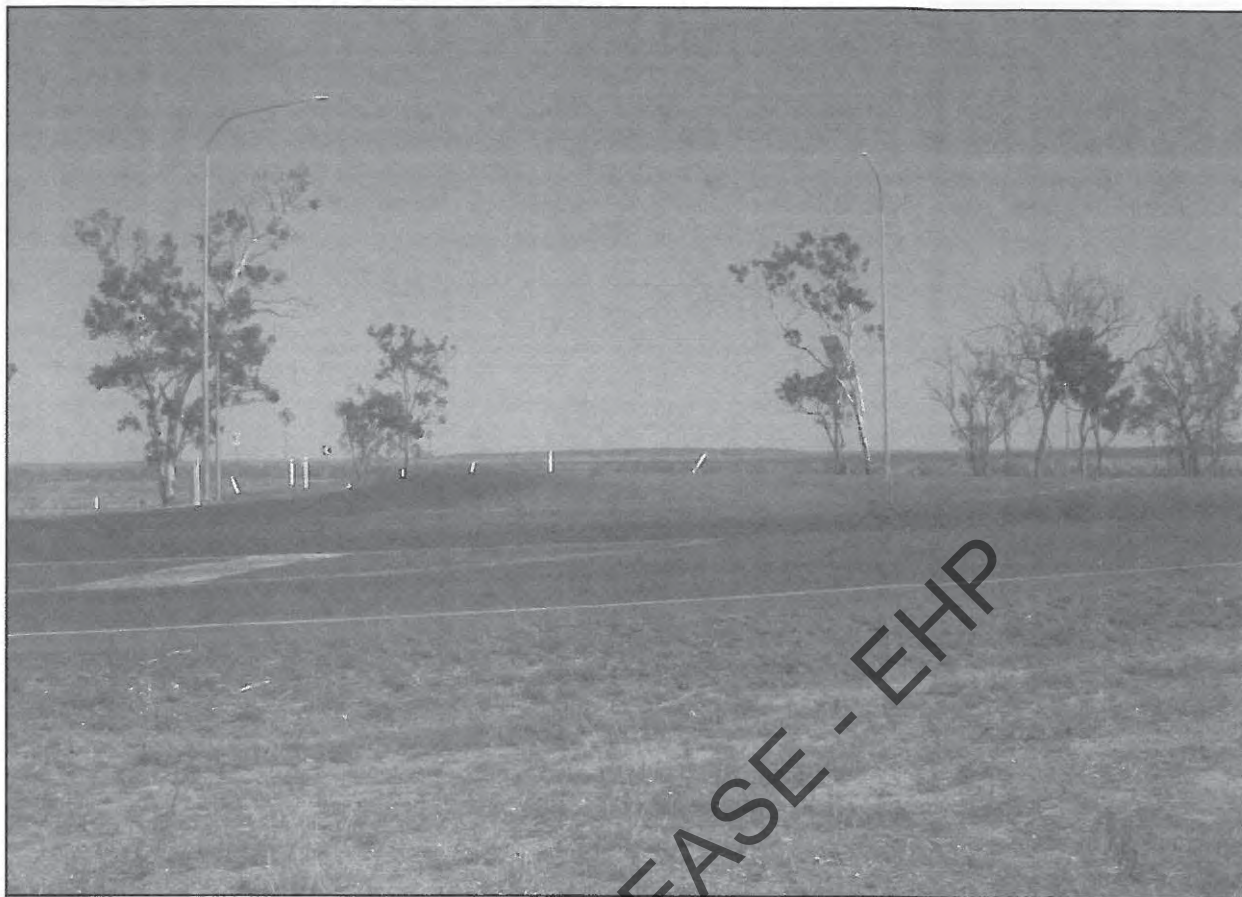
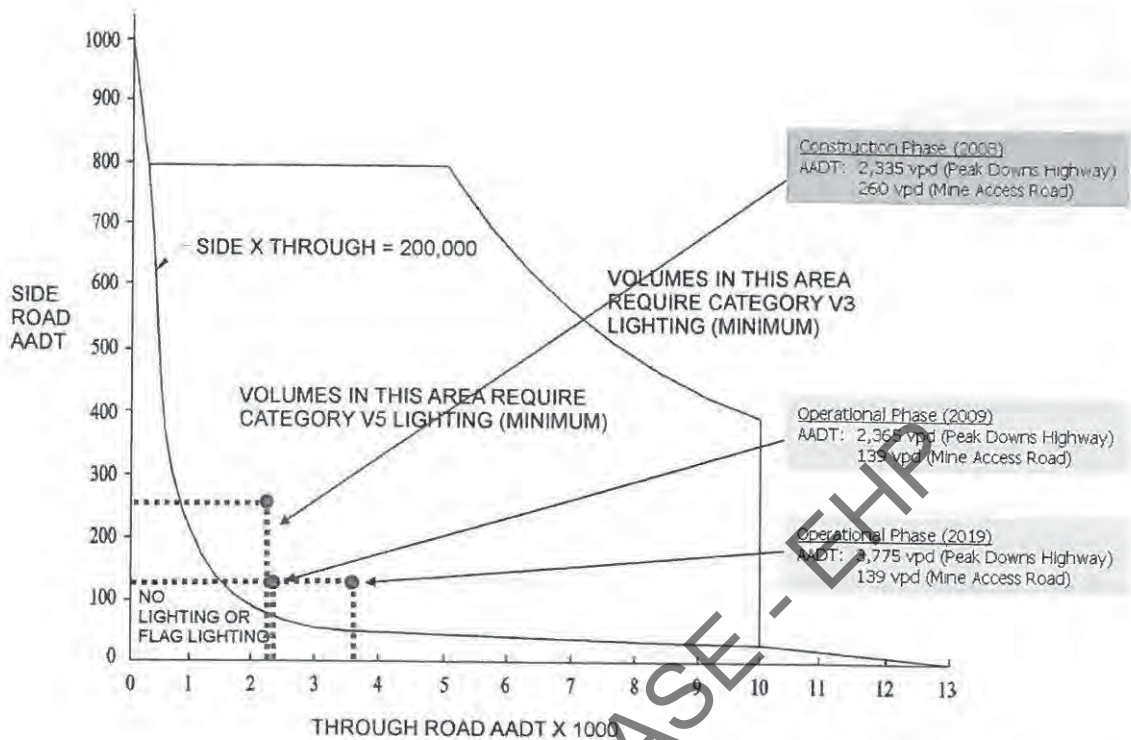


Plate 14-1 Existing T-intersection - Peak Downs Highway/Isaac Plains Coal Mine Access Road





Source: Main Roads "Road Planning and Design Manual"

Figure 14-1 Assessment of Access Intersection Lighting Requirements

14.4.4 Access Intersection Operations

The peak hour traffic volumes on the Peak Downs Highway as well as the estimated peak hour volumes for the proposed Expansion Area development are significantly lower than the maximum traffic volume combinations provided in the AUSTROADS publication, *Guide to Traffic Engineering Practice Part 5, Section 4.4 Unsignalised minor road intersections*, which states:

"..... indicates the maximum traffic volume combinations for uninterrupted flow conditions. It is unnecessary to flare intersection approaches or carry out an intersection analysis when the combinations of major road and minor road volumes are less than those in the table."

The peak hour traffic volumes on the Peak Downs Highway (refer to **Appendix K**) as well as the estimated peak hour volumes for the proposed development are significantly lower than the maximum traffic volume combinations stated in the AUSTROADS Guide for intersection capacity of uninterrupted flow conditions, therefore a detailed analysis has not been conducted. The expected peak hour volumes are 50% to 90% lower than the figures quoted in the AUSTROADS Guide. At intersections carrying light crossing and turning volumes, the capacity figures for uninterrupted flow generally apply for the approach roads. **Table 14-9** indicates the maximum traffic volume combinations for uninterrupted flow conditions. It is unnecessary to flare intersection approaches or carry out an intersection analysis when the combinations of major road and minor road volumes are less than those noted in **Table 14-9**.

Table 14-9 Intersection Capacity – Uninterrupted Flow Conditions

Major Road Type	Major Road Flow (vph)	Minor Road Flow (vph)
Two-lane	400	250
	500	200
	650	100

Source: Table 4.1 AUSTROADS Guide to Traffic Engineering Practice – Part 5: Intersections at Grade.

Table 14-10 provides a comparison of actual traffic volumes and traffic volume combinations stated in the AUSTROADS Guide.

Table 14-10 Peak Downs Highway – Traffic Flow Condition (With Development)

Traffic condition	Major Road Flow (vph) AM peak/PM peak	Minor Road Flow (vph) AM peak/PM peak	Uninterrupted Flow
2008 Construction	196/214	46/46	YES
2009 Operations	182/228	26/26	YES
2019 Operations	280/356	26/26	YES

Traffic flow diagrams are included in **Appendix K**.

Based on a review of the results presented in **Table 14-10** it is considered that the proposed intersection will not raise any significant concerns with regards to the proposed intersection's traffic capacity and therefore it is not necessary to perform further detailed analysis.

For safety reasons the existing Isaac Plains Coal Mine access intersection includes a channelised right turn as per DMR's *Road Planning and Design Manual* (DMR, 2005) (refer to **Plate 14-1**). This access will also be used for the Expansion Area. The increase in traffic using the existing T-intersection, from the addition of the Expansion Area, is unlikely to have adverse impacts on the existing capacity.

14.4.5 Pavement Impacts and Mitigation Measures

An assessment of the impact of the proposed development on the pavement of the Peak Downs Highway has been undertaken. The purpose of the assessment is to determine a monetary contribution to be made for the routine maintenance of the Peak Downs Highway.

Existing equivalent standard axles (ESA) for the Peak Downs Highway has been calculated as shown below, by weighting the AADT in accordance with the proportion of existing commercial vehicles.

- 2008 AADT = 2,135 vpd
- Commercial Vehicles (CV) % = 18 % (from DMR traffic count)
- ESA:CV ratio = 3.2
- 2008 ESA = AADT x CV x 365 days/yr x ESA:CV
= 448,862 ESA/yr

Similarly, the estimated ESA's for the Peak Downs Highway in 2009 (commencement of operations) is as follows:

- 2009 AADT = 2,240 vpd
- Commercial Vehicles (CV) % = 18 % (from DMR traffic count)
- ESA : CV ratio = 3.2
- 2009 ESA = AADT x CV x 365 days/yr x ESA:CV
= 470,938 ESA/yr



Transport

The ESA for the traffic generated by the IIPP was calculated in the same manner. The results are shown in **Table 14-11**.

Table 14-11 Forecast ESA's "With Development"

Parameter	Construction (2008)		Operation (2009)	
	West of site access	East of site access	West of site access	East of site access
Expansion Area Heavy Vehicle Traffic*	26 x 5% = 2 vte/day	26 x 95% = 25 vte/day	6 x 5% = 1 vte/day	6 x 95% = 6 vte/day
Days/yr	365	365	365	365
ESA: CV Ratio	3.2	3.2	3.2	3.2
Expansion Area ESA's	2,336	28,032	1,168	5,840
% Increase	<1%	6.2%	<1%	1.2%

NB: Does not include minibus vte's as minibus' only have a capacity of 12 seats.

The results summarised in **Table 14-11** indicate that the IIPP is not expected to significantly increase ESAs on the Peak Downs Highway during full operation. This result is not unexpected, given that coal from the Expansion Area will be transported by truck to the existing rail head on the northern side of the Peak Downs Highway via the proposed underpass, i.e. the Peak Downs Highway will not be used for the transport of coal.

As presented in **Table 14-11**, a slight increase in ESAs, 6.2 %, is forecast for the section of the Peak Downs Highway east of the subject site approximately halfway during the construction period of the IIPP. DMR have advised that the typical routine maintenance costs for a road carrying 2,000-5,000 vpd range from \$2,500-\$3,500/km per annum (pers. comm. Mr Patrick Aprile - Principal Engineer, DMR, February and March 2007). Given that the development proposal is situated 26 km from Coppabella, the contribution will apply to 26 km of road length. The nominal contribution figure can be calculated as follows:

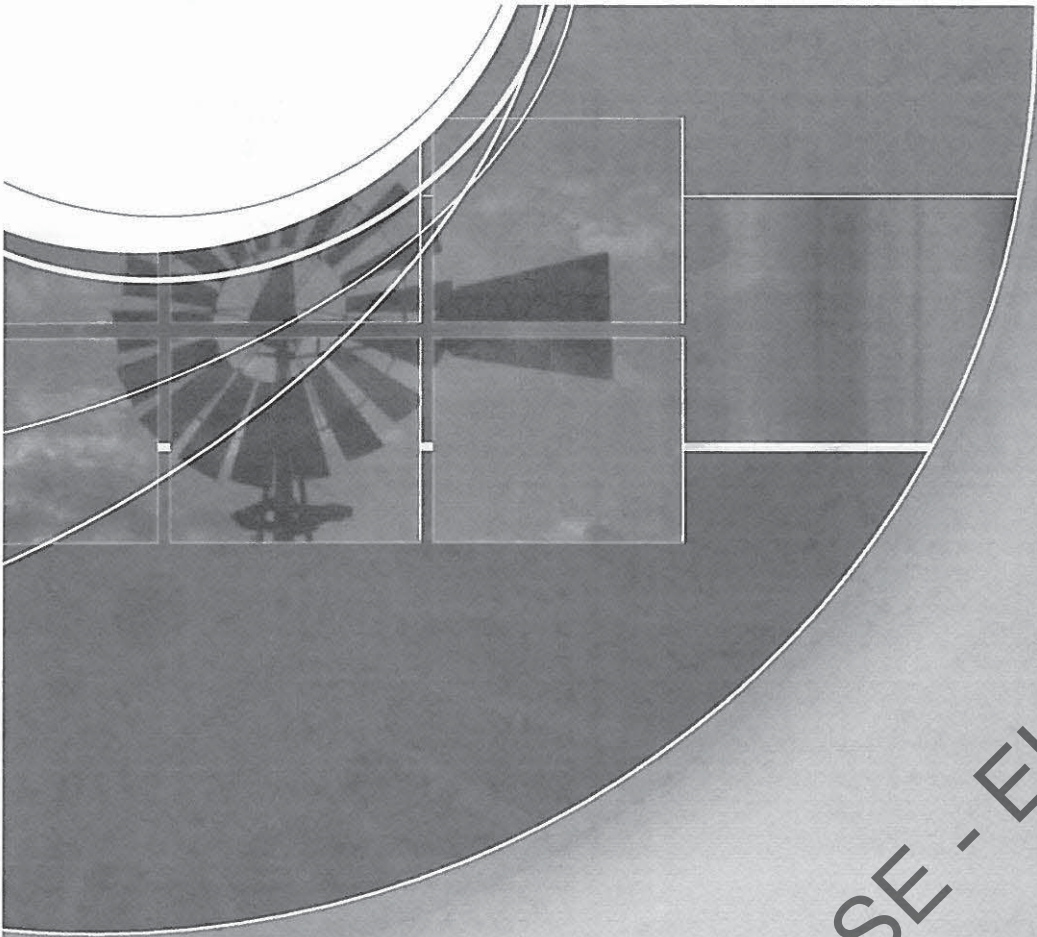
- \$3,000/km (average cost) x 26 km x 6.2 % over 12 months = \$4,836.

It would therefore be reasonable for the applicant to contribute approximately \$4,850 towards the upkeep of the eastern section of the Peak Downs Highway during the 12 month construction period. However, no ongoing annual contributions would be required.

14.5 RAIL CORRIDOR IMPACTS AND MANAGEMENT STRATEGIES

The rail loop, designed and constructed by Queensland Rail, and the corridor, designed and constructed by Leighton, facilitates loading and transporting coal. It is envisaged that the rail loop/corridor will not be used for the transport of any goods for the construction phase.

Access to the rail loop on the existing Isaac Plains Coal Mine site is via internal access roads and therefore will not impact on existing transport routes or local roads.



RTI DL RELEASE - EHP

15

SOCIAL
ENVIRONMENT

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

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15 SOCIAL ENVIRONMENT

15.1 ENVIRONMENTAL VALUES

The IIPP is located within the Nebo Shire Council and Belyando Shire Council LGAs. The Expansion Area is located within the Nebo Shire Council LGA, while the existing Isaac Plains Coal Mine, on ML70342, is located within the Belyando Shire Council LGA¹.

The environmental values to be protected include the retention and maintenance of community and social values for the Moranbah and Nebo communities and the five homesteads in the vicinity of the IIPP.

The Expansion Area is located approximately 10-12 km south-east of Moranbah and the existing Isaac Plains Coal Mine is located approximately 7 km from Moranbah. The IIPP is within 5 km of five homesteads (one of which is abandoned) (refer to **Figure 1-2** and **Figure 1.3**). It is anticipated that the local communities that are living in Moranbah and Nebo may be affected by the IIPP, however given the distance from the township and homesteads, any potential environmental and social impacts are expected to be minimal.

15.2 EXISTING SOCIAL ENVIRONMENT

15.2.1 Community Infrastructure and Services, Access and Mobility

15.2.1.1 Nebo Shire

There are limited public transportation facilities within the Nebo Shire with only one State coach company (Emerald Coaches) servicing the area. The residents rely heavily on private vehicles for transportation. Queensland Rail has a service in the area for transporting coal only. The nearest airports to the Nebo township are located in Mackay and Moranbah, which are both approximately one hour's drive from the Nebo township.

Within the Nebo Shire, there are two full time Queensland Police Officers, one located in Nebo and one located in Glenden.

There are approximately 33 businesses located in Nebo and in its surrounds (including Coppabella). These are listed in **Section 16**.

It is believed (Rolfe *et al.* 2003) that the population of Nebo Shire would increase if the infrastructure of the Shire was updated and additional housing was provided. Many mine workers work in the Shire but reside elsewhere, mostly in Mackay and Sarina. The current vacancy rate of rental accommodation is low, with almost no seasonal fluctuations as seen in other regions.

15.2.1.2 Belyando Shire

Moranbah and Clermont both have private airports with Macair flights servicing Moranbah. The nearby towns of Mackay and Emerald also have daily flights. There are no rail services; however, there is a daily bus service which runs between Mackay and Emerald, i.e. Emerald Coaches, which stops at both Moranbah and Nebo.

The 2001 census indicated that the majority of workers travel to work using private vehicles with a small number of people using buses. Some mines in the area supply transport in the form of buses for mine workers to and from site.

There are two police stations within the Shire. Clermont has four full-time officers while Moranbah has nine full-time officers and two full-time Criminal Investigation Branch (CIB) officers.

There are approximately 99 businesses within Clermont and Moranbah including hotels and motels, cinemas, a variety of services and a small number of restaurants. All businesses in the Shire are listed in **Section 16**.

¹ NB: Since the release of the final EIS for public comment Belyando, Nebo and Broomsound Shires have been amalgamated into the Isaac Regional Council. This revised EIS has not been amended to reflect this as the intention of this version of the EIS is to address comments from stakeholders at the time of public release, including both Belyando and Nebo Shire Councils.

15.2.2 Population and Demographics

15.2.2.1 Nebo Shire

Nebo Shire encompasses an area of 10,009 km² and includes the towns of Nebo, Glenden and Coppabella, with Nebo being the administrative centre of the Shire. As at 30 June 2005, the estimated resident population of Nebo Shire was 2,107 persons, representing 0.05 % of the State's population. **Table 15-1** illustrates the regional growth and change in the population of Nebo Shire in comparison to the growth and change in Queensland over the 2000-2005 periods.

Table 15-1 Estimated Resident Population and Comparative Growth Figures - Nebo Shire and Queensland

Year	Nebo Shire	Queensland
2000	2,100	3,561,537
2004	2,147	3,888,077
2005	2,107	3,963,968
Annual average change, 2000-2005 (%)	0.1	2.2
Annual average change, 2004-2005 (%)	-1.9	2.0

Source: Australian Bureau of Statistics (ABS), Regional Population Growth, Australia and New Zealand (Cat. no. 3218.0).

Nebo Shire forms part of the Whitsunday, Hinterland and Mackay (WHAM) region. The population of this area is 143,700 (Department of Local Government, Planning, Sport and Recreation (DLGPSR), 2005) with Nebo Shire accounting for 2,144 people (DLGPSR, 2005). The region's population has grown by 1.4 %; however, Nebo Shire experienced a negative growth rate of 1.9 % during the 2004 to 2005 period.

At the time of the 2001 Australian Bureau of Statistics (ABS) census², the age group of 15-44 yrs had the highest number of individuals at 1,038. The smallest age group was the 65+ year category; comprising 124 individuals (refer to **Table 15-2**).

Just under half of the population of Nebo Shire lies between the ages of 20 and 49 in 2004. The 2006 Population and Housing fact sheet for Nebo Shire, provided by the Department of Local Government, Planning, Sport and Recreation (DLGPSR), has projected growth in population in each age group. This information is presented in **Table 15-2**.

Table 15-2 Nebo Shire Population by Age Group & Projected Figures for 2026

Year	Age Group					Median Age
	0-14	15-24	25-44	45-64	65+	
2001	587 25.6 %	243 11.6 %	795 38.0 %	395 18.9 %	124 5.9 %	32
2026	290 17.2 %	126 7.5 %	504 29.9 %	445 26.4 %	318 18.9 %	42

Source: Department of Local Government, Planning, Sport and Recreation, March 2006.

The recent publication by DLGPSR 'Population growth-highlights and trends the Whitsunday, Hinterland and Mackay region 2005' discusses subdued growth in the region largely because the official population measure, resident population, does not include construction and mining workers who live temporarily in these areas for the duration of their roster. Nebo recorded a growth rate of less than 1 % in the year to June 2004. However, a large increase in the number of construction and mine workers residing in the local area for the duration of their roster has led to an increase in the demand for infrastructure and services provided by both Local and State Governments. The 'real' population appears to be shifting to a male dominated society due to the expanding opportunities for employment within the local mining industry.

² 2001 Census data is the most recent published census data. The 2006 census data is not yet publicly available in a published format.

Population predictions based on the projected development of new mines and expansions in the region are presented in **Table 15-3** below.

Table 15-3 Population Projections for Nebo Shire

Year	Median	Mining Expansion Scenario ¹	Average Annual Change (mining scenario)*
2006	2,074	2,273	1.7 %
2011	1,978	2,667	5.2 %
2016	1,880	2,714	6.5 %
2021	1,780	2,718	7.7 %
2026	1,683	N/A	N/A

Source: Department of Local Government, Planning, Sport and Recreation, Population and Housing Fact Sheet Nebo Shire, March 2006.

*Based on expected development of new mines and expansion of existing mines.

The mining expansion scenario indicates that Nebo Shire can expect a 7.7 % increase from their existing population to the year 2021.

It should be noted that the projected population increases contained in the DLGPSR study are based on estimates of the growth in jobs in the Shire, i.e. people directly employed in mines, as well as people otherwise employed in the Shire, but whose jobs are indirectly attributable to the mining sector. As such, these projections are entirely dependent upon the anticipated mining developments taking place.

On the basis of the above, new mining activity generally is expected to play a large role in the future growth of Nebo Shire.

In terms of direct impact, the IIPP will add an additional 40 full time equivalent (FTE) persons to the population of Nebo Shire. The economic impact of this contribution to the Shire is discussed in **Section 16.3**.

15.2.2.2 Belyando Shire

Belyando Shire is approximately 30,000 km², and has a resident population of 10,651 (as of 30 June 2005). This represents approximately 0.27 % of Queensland's population. The two main centres within the Shire are Moranbah and Clermont, with the majority of the population living in Moranbah.

Belyando Shire also forms part of the WHAM region which has a population of 143,700 as of June 2004 with Belyando Shire accounting for approximately 7.4 %. From 2000 to 2005 Belyando Shire experienced a population growth rate of 1.1 % which was lower than the Queensland rate of 2.2% for 2000 to 2005 and 2.0 % for 2004 to 2005. **Table 15-4** provides the growth change from 2000 to 2005 for Belyando Shire in comparison to the growth and change in Queensland over the 2000-2005 periods. Belyando Shire, WHAM region and Queensland have all experienced increases in population.

Table 15-4 Estimated Resident Population and Comparative Growth Figures – Belyando Shire and Queensland

Year	Belyando Shire	Queensland
2000	10,068	3,561,537
2004	10,540	3,888,077
2005	10,651	3,963,968
Annual average change, 2000-2005 (%)	1.1	2.2
Annual average change, 2004-2005 (%)	1.1	2.0

Source: Australian Bureau of Statistics (ABS), Regional Population Growth, Australia and New Zealand (Cat. no. 3218.0).

It should be noted that the population figures provided by the ABS do not include the non-resident population of the Shire. Surveys of the accommodation providers in Moranbah suggest that the non-resident population is equivalent to at least an additional 1,260 persons.

In 2001, the population of Belyando Shire comprised predominantly of two age groups, 0-14 yrs and 25-64 yrs with a median age of 31 (refer to **Table 15-5**). The DLGPSR have projected that the population of the shire will continue to increase to between 14,200 and 16,200 by 2011. However, the demographics of the Shire are not predicted to change significantly by 2026.

In 2001, the Shire was slightly male dominated with 5,464 males compared to 4,419 females. The 2004 data reveals the ratio of males to females has not changed significantly, with a ratio of 5,692 males compared to 4,848 females.

Table 15-5 Belyando Shire Population by Age Group and Projected Figures for 2026

Year	Age group					Median Age
	0-14	15-24	25-44	45-64	65+	
2001	2,665 26.8 %	1,279 12.9 %	3,399 34.2 %	2,131 21.4 %	474 4.8 %	31
2026	4,319 24.8 %	2,124 12.2 %	5,372 30.8 %	3,412 19.6 %	2,223 12.7 %	34

Source: Department of Local Government, Planning, Sport and Recreation, September 2006.

As with Nebo Shire, the projected growth in the population of Belyando Shire is based on anticipated developments in the mining sector, and related employment opportunities. This includes people directly employed in mines, as well as people otherwise employed in the Shire, but whose jobs are indirectly attributable to the mining sector. Again, these projections are entirely dependent upon the anticipated mining developments taking place, but provide some baseline indication of the cumulative effect of mining developments on the Shire's population.

More recent population predictions are given in **Table 15-6** based on the projected development of new mines and expansions in the region.

Table 15-6 Population Projections for Belyando Shire

Year	Median	Average Annual Change
2006	11,251	2.5 %
2011	15,524	6.7 %
2016	16,154	0.8 %
2021	16,292	0.2 %
2026	16,380	0.1 %

Source: Population and Housing Fact Sheet, Belyando Shire, Department of Local Government, Planning, Sport and Recreation, March 2007.

The DLGPSR has projected that the population of the Shire will increase from 2006 numbers by 38 % to around 15,524 by 2011, but to only 16,380 by 2026.

15.2.3 Local Community Values and Lifestyles

The communities of both Nebo and Belyando Shires enjoy the benefit of a rural lifestyle, while not being isolated. Communities value a range of aspects of their social environment. In particular, people acknowledge the history of Moranbah is intimately linked with mining. The traditional demographics of the mining workforce (male 20 to 40 yrs old) are reflected in the high level of interest in sport and social events (SKM, 2005).

15.2.4 Recreational, Cultural, Leisure and Sporting Facilities and Activities

Sport is an important part of the Nebo, Coppabella and Moranbah communities with a wide range of sporting and recreational facilities available. Whilst Moranbah has a range of facilities, Nebo and Coppabella's facilities are limited and require upgrading and extension (SKM, 2005).

15.2.4.1 *Nebo Shire*

Nebo township has a museum which houses a variety of collections, and buildings including a jailhouse and a courthouse. Outside Nebo, there is the Pioneer Tracks of Queensland museum which has a collection of historic photos dating back to the settlement of the State.

There are a range of sporting facilities located in the Nebo Shire. With the majority in Glenden including a tennis club, karate club, swimming club, and pony club. Nebo has a bowls club, soccer club, pony club and a rodeo association. Rolfe *et al.* (2003) found that the residents are satisfied with the facilities available, but would strongly support the further development and upgrade of these facilities. A multi-purpose area, skate ramp, basketball courts, rotundas, public toilets and barbeques were identified as the biggest need in the Shire. There are two golf courses within the Shire and other activities that are available include beach volleyball and waterskiing.

There is a local library in the Nebo township and it is estimated that 39 % of the population has member.

Nebo township is located on the Bicentennial Heritage Trail, and the Council is proposing to develop a Tourism, Arts and Cultural Centre for the Shire.

The Nebo Sport and Recreational Showgrounds host one of Queensland's largest Rodeos each May.

15.2.4.2 *Belyando Shire*

Moranbah has several parks, gardens and walks which provide many kilometres of walking tracks. Lake Elphinstone, located 70 km north of Moranbah, is extensively used for water skiing, boating and fishing activities. Moranbah also hosts a rodeo in October each year at the local showgrounds.

There are many community groups within the Shire. Moranbah has two Masonic lodges and a lodge of the Royal Antedulvian Order of Buffaloes, as well as a Rotary Club, a branch of Quota International, and an RSL sub-branch. There is also a branch of the Country Women's Association.

Moranbah has a Cultural Centre, which was opened in 2004. This not only plays host to local groups, but is also the venue for visits from performing arts groups. Moranbah also has its own Arts Council, which coordinates such visits, as well as art exhibitions and local theatre productions.

Clermont boasts the Clermont Art Group, Clermont Historical Society, Clermont Fish Stocking Group and the Clermont Pottery Association, among others. There are also 26 sporting groups/clubs within the Shire including rugby, golf, gymnastics and tennis.

Clermont has a range of historic buildings which provide some insight into Clermont in the late 1800's and early 1900's. There is also a museum which contains displays of steam engines, wagons as well as 8,000 historical artefacts.

The EH Faint Memorial Showgrounds/Saleyard Complex is located in Clermont. The local show is held here in May each year. Clermont also has a racecourse which holds monthly race meetings.

15.2.5 Health and Educational Facilities

15.2.5.1 *Nebo Shire*

Nebo's health system is limited to a Community Health Centre located in Glenden. There is a general practitioner (GP) located in Glenden, however, there is no longer a GP available in the Nebo township. Nebo does not have a locally based ambulance service, but is covered by the ambulance based in Moranbah. As explained further in **Section 15.4.5**, it would appear that Nebo is under-serviced in terms of general practitioners. The same applies to Belyando Shire.

Nebo Shire has three primary schools located in Nebo, Coppabella and Glenden, and one high school located in Glenden. Glenden, and Coppabella and the high school. Primary school sizes range from 37 to 196 students and Glenden High School has 198 students. The single largest provider of mining training in Queensland is TQ Mining Services (located in Rockhampton) which delivers training and assessment services to meet the needs of mining and related industries, in conjunction within both shires individual mines.

15.2.5.2 Belyando Shire

In comparison to Nebo Shire, Belyando Shire has two hospitals and community health centres located in Moranbah and Clermont. The Shire has four general practitioners.

Both Nebo and Belyando shires have access to a helicopter service for transportation of critical patients to either the hospital at Mackay or Moranbah. There is an ambulance service based in Moranbah and Clermont. Both Clermont and Moranbah have pharmacies, while Moranbah has full time dental, optical and physiotherapy services.

Belyando shire has four kindergartens/day care centres, four primary schools, two high schools and two TAFE centres. School sizes range from six students to 528 students. The nearest TAFE to the IIPP is located in Moranbah and the nearest University located in Mackay.

According to Queensland Regional Profiles, Mackay Statistical Division, there were approximately 2,098 students from years 1 to 12 in the Belyando Shire and 304 students in Nebo Shire in December 2006. The education level from the 2001 census is shown in **Table 15-7**. The data indicates that approximately half of the population completed their studies at year 10 or below.

Table 15-7 Education Level Completed for Nebo and Belyando Shires

Education Level Completed	Nebo Shire	Belyando Shire
Year 8 or below	185	657
Year 9 or equivalent	136	482
Year 10 or equivalent	697	2,614
Year 11 or equivalent	156	557
Year 12 or equivalent	515	2,129
Still at school	23	226
Did not go to school	10	19
Not stated	278	676
Total	2,000	7,360

15.2.6 On Farm Activities near the IIPP

15.2.6.1 Nebo Shire

Nebo Shire is a large producer of cattle and cattle products, producing a number of store, fat and stud cattle. The shire also has its own cattle saleyards where much of the region's livestock is sold before being transported to Rockhampton and Mackay for processing. It was estimated that in 1998/99, that \$22.9 M or 13.42 % of the Region's total value of livestock was sold through the Nebo saleyards.

In a sign of confidence in the cattle industry, the Nebo saleyards were acquired by new owners see great potential in the yards, indicating the general perception that the cattle industry has a long-term future in the region.

Grain and sugar are minor crops being grown within the Shire.

15.2.6.2 Belyando Shire

Belyando Shire also has a large cattle industry with a premier saleyard complex in Clermont. The value of agricultural production for the year ending 30 June 2001 was \$59.3 M for crops and \$66.2 M for livestock. There is also some cotton cultivation in the Shire.

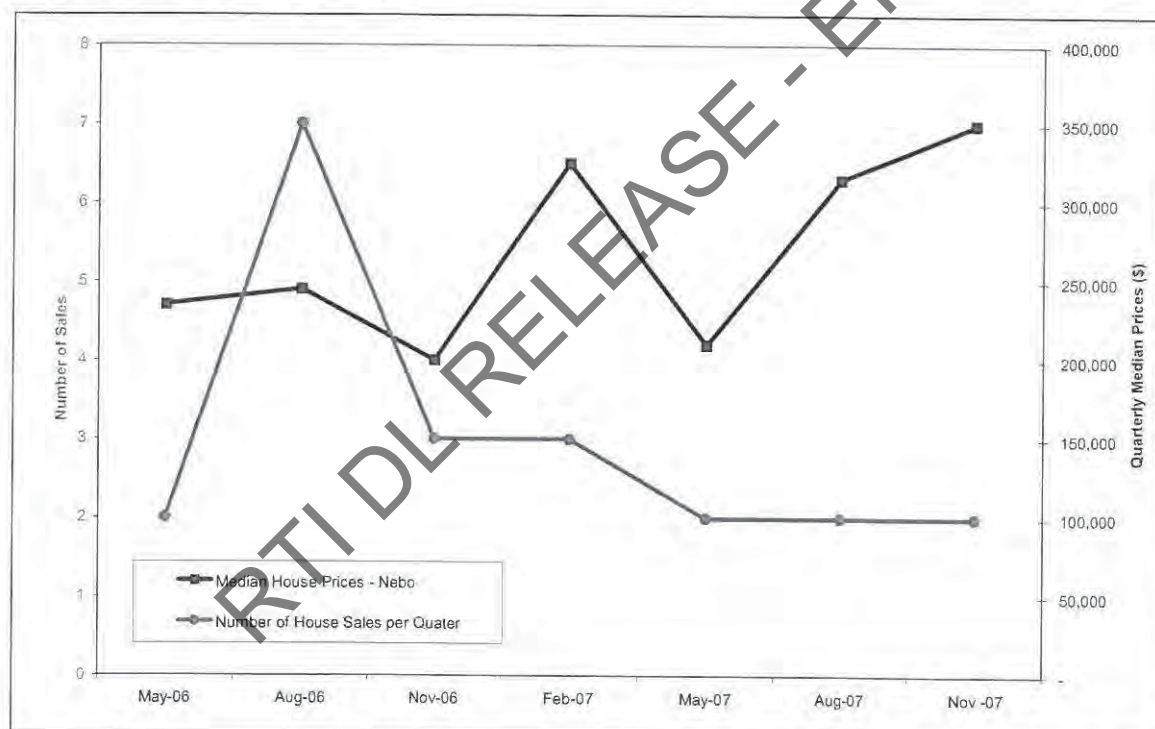
15.2.7 Current Property Values

15.2.7.1 Nebo Shire

There have been only a limited number of new residential buildings approved in the last several years in Nebo Shire. In 2002, only three were approved with a combined value of \$0.5 M (Rolfe *et al.* 2003). Only limited land that is appropriately zoned is available in the Shire for development of residential estates. Rental properties are in high demand and affordable housing, land availability and the time delays in making housing available is an issue in this Shire.

In the 2005-06 year, 44 town planning applications were approved by Council along with 73 building and plumbing applications. There have also been cases where building and plumbing works have been undertaken without approval in Nebo due to increasing demand for developments.

Using data obtained from Australian Property Monitors an assessment of median house prices for Nebo from April 2006 to November 2007 indicates the median house price is volatile in a very thin market characterised by a relatively low volume of monthly house sales. From April 2006 until November 2007, the median house price rose and fell a number of times, from a low of \$200,000 in the quarter ending November 2006, and peaking at \$350,000 in the quarter ending November 2007 as is illustrated in **Figure 15-1** below.

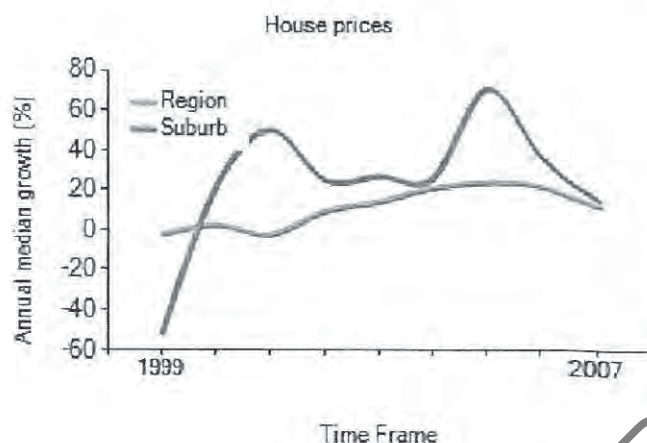


(Source: Australian Property Monitors, 2008)

Figure 15-1 Quarterly Median House Prices in Nebo Shire and Sales Volume Belyando Shire

There has been a steady increase in the number of building approvals in Belyando Shire from 2000 to 2004. There were 35 buildings approved in 2004, 33 of these being houses, with a total value of \$8.6 M.

As with Nebo, Moranbah has also experienced historically high rates of growth in house prices in recent years. However, even more so than Nebo, there are indications that this price growth has slowed dramatically, as is shown in **Figure 15-2**.

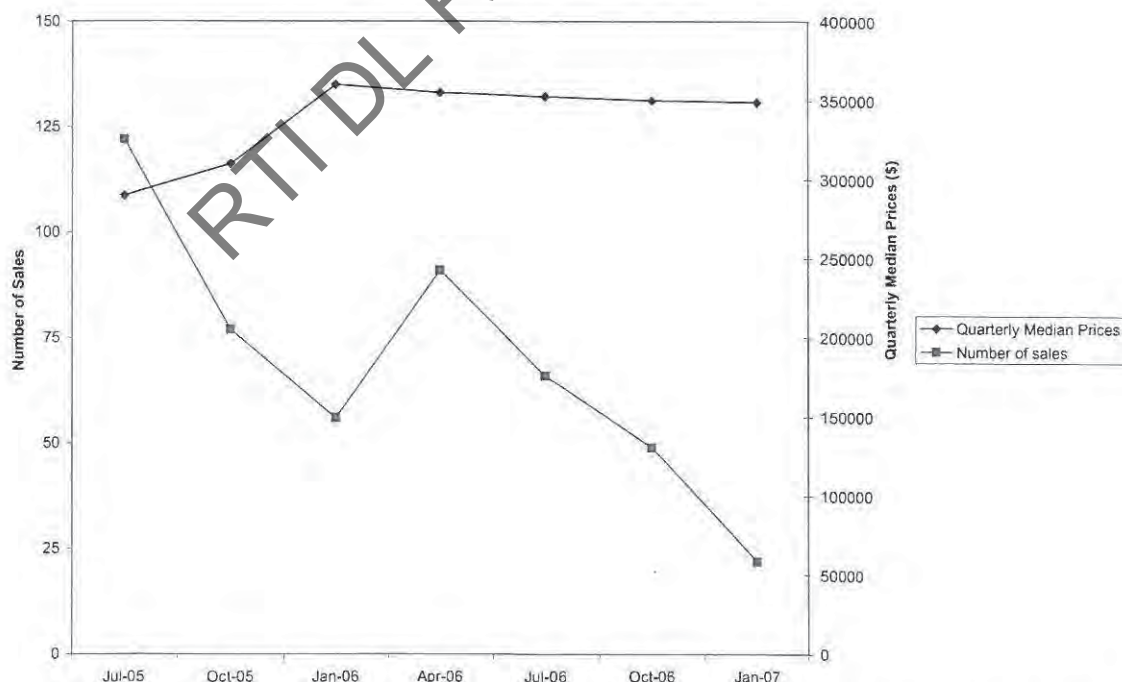


(Source: Australian Property Monitors, 2007)

Figure 15-2 Annual Growth in Median House Prices in Moranbah 1999-2007

Utilising data compiled by Australian Property Monitors (1999 to 2007), a detailed analysis was conducted on 655 house, unit and land sales in the 4744 postcode (Moranbah) for the period from May 2005 to April 2007. This analysis reveals that quarterly median house prices in Moranbah actually appear to have peaked in the three months ending January 2007 at \$360,000. Moreover, quarterly median house prices appear to have declined since then to a low of \$349,500 in the three months ending January, 2007.

The explanation for this may lie in the declining number of house sales. House sales actually peaked in the three months ending July 2005, and have displayed a long-term trend downhill since then. The number of sales and their relationship with quarterly median house prices is shown in **Figure 15-3** below.



(Source: Australian Property Monitors, 2007)

Figure 15-3 Quarterly Median House Prices and Sale Volume, in Moranbah

Another factor worthy of consideration is the projected availability of housing stocks in the near future. Belyando Shire Council is developing a new residential subdivision in Moranbah East, in conjunction with BHP Mitsubishi Alliance. This development is expected to supply approximately 500 residential allotments. Other residential developments are also planned. Based on the population projections contained in **Table 15-6**, the Moranbah East residential subdivision alone is likely to meet the projected demand for housing for the next two years.

For further consideration of property values and housing affordability in the region generally, and Moranbah in particular, please refer to **Section 16.5**.

15.2.7.2 Mackay

Median quarterly house prices for Mackay for the period February 2006 to November 2007 have also been calculated with data obtained from Australian Property Monitors. This indicates the median house price increased relatively quickly from \$330,000 in quarter ending June 2006 to \$380,000 in quarter ending June 2007. However, in the period since June 2007, median house prices have dropped to a little under \$370,000, and even appear to have plateaued around this level.

The number of house sales appears to reflect a similar trend to the median house price, increasing between June 2006, when 623 house sales were made, and September 2006, when it peaked at 700 house sales for the quarter. However, since September 2006, the volume of house sales per quarter has declined overall.

It can be reasonably stated that median house prices in Mackay for the period March 2006 to September 2007 are affected by the volume of house sales over the same period, and that overall, the rate of increase for both has slowed, if not declined, since June 2007 (refer to **Figure 15-4**).

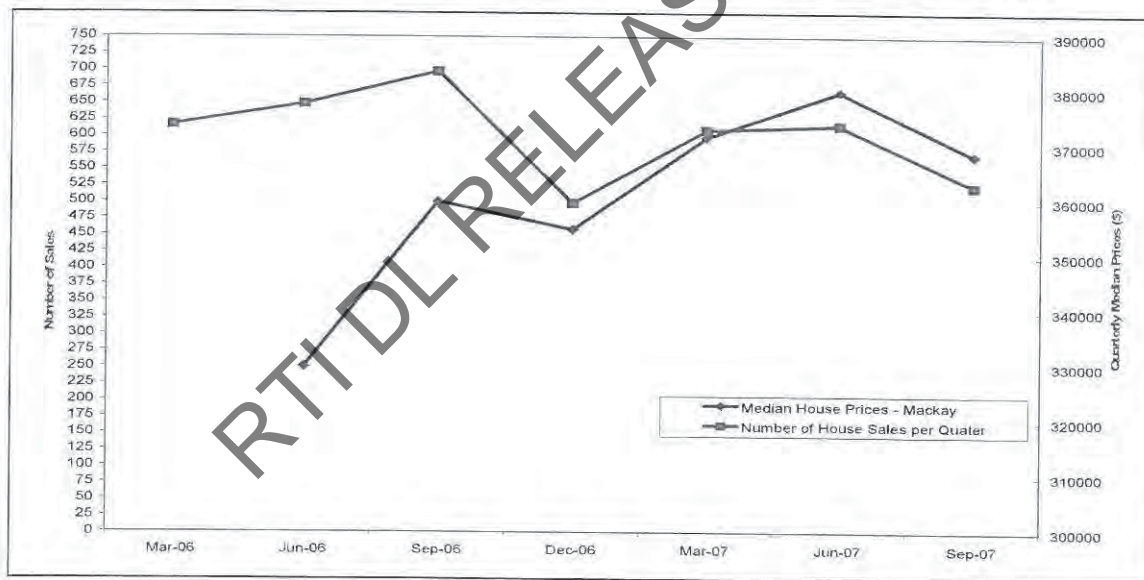


Figure 15-4 Quarterly Median House Prices and Sales Volume, in Mackay

The final conclusion is that the small number of additional workers will have no appreciable impact on property or rental prices in Belyando or Nebo Shires, nor in Mackay.

15.2.8 Number of Properties Affected by the IIPP

As previously mentioned there are five homesteads within 5 km of the existing Isaac Plains Coal Mine and proposed Expansion Area, none of which are protected by a homestead right boundary. The homesteads and their locations are illustrated in **Figure 1-2** and **Figure 1-3** and distances and directions in relation to the IIPP are listed below:

- sch4p3(3) Prejudice the protection of an individuals right to privacy of the existing Isaac Plains Coal Mine and 13 km from the Expansion Area;

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- sch4p3(3) Prejudice the protection of an individuals right to privacy less than 1 km south of the proposed Expansion Area boundary and approximately 1 km from the planned southern extent of the open cut development;
- sch4p3(3) Prejudice the protection of an individuals right to privacy of the proposed access/haul road crossing of the Peak Downs Highway, 2 km from the existing Isaac Plains Coal Mine and 7 km from the Expansion Area;
- sch4p3(3) Prejudice the protection of an individuals right to privacy of the Expansion Area and 3 km from the existing Isaac Plains Coal Mine;
- the sch4p3(3) Prejudice the protection of an individuals right to privacy of the Expansion Area and 6 km from the Expansion Area, on the Poitrel ML; and

sch4p3(8) Prejudice the protection of an individuals right to privacy are located approximately 17 km for the Expansion Area and 16 km from the Peak Downs Highway underpass.

15.2.9 Number of Families Directly Affected by the IIPP

The number of families on properties affected by the IIPP are listed below:

-
-
- sch4p3(3) Prejudice the protection of an individuals right to privacy
-

NB: M = male
F = female

Number of employees (primary employment) on the affected properties are listed below:

-
-
- sch4p3(3) Prejudice the protection of an individuals right to privacy
-

15.2.10 Employment and Income

15.2.10.1 Nebo Shire

In 2001, the ABS figures indicate that the employed persons of Nebo work in a variety of sectors with approximately one third working in the mining industry (544 out of 1420 persons). Agriculture, forestry and fishing were the next largest industries with 196 residents employed. The employment industry breakdown was as follows:

- coal mining - 38.23 %;
- agriculture - 13.77 %;
- accommodation, cafes and restaurants - 6.89 %;
- construction trade services - 5.8 %; and
- transport and storage - 8.78 %.

The actual numbers of individuals from each age group working in various industries of employment are presented in **Table 15-8** below.

In 2003, Nebo Shire had a low unemployment rate of 1.3 %. This is believed to be a result of the number of operational mines in the Shire and the availability of low income housing.

The weekly income for a Nebo residence ranges between no or negative income to incomes over \$1,500 (refer to **Table 15-9**). Approximately 40 % of the population, who stated their income in the 2001 census, earned over \$1,000 per week with the highest income earners in the 35-44 age bracket. Similar results were obtained in the study conducted by Rolfe et al. (2003).

Table 15-8 Employment by age group for Nebo Shire

Industry	Age Group (years)							Total
	15-19 years	20-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65 years and over	
Agriculture, forestry and fishing	12	23	44	33	33	33	18	196
Mining	8	40	157	183	130	23	3	544
Manufacturing	3	0	8	16	10	3	0	40
Electricity, gas and water supply	0	0	0	0	4	3	0	7
Construction	0	9	25	22	21	6	0	83
Wholesale trade	0	8	17	15	11	0	0	51
Retail trade	8	0	10	22	8	3	0	51
Accommodation, cafes and restaurants	11	12	20	23	26	6	0	98
Transport and storage	0	7	32	48	29	6	3	125
Communication services	0	0	0	3	0	3	0	6
Finance and insurance	0	0	0	4	0	0	0	4
Property and business services	3	7	22	15	15	6	0	68
Government administration and defence	3	3	7	9	3	3	0	28
Education	0	9	12	18	9	0	0	48
Health and community services	0	0	3	5	3	7	0	18
Cultural and recreational services	0	0	6	6	3	0	0	15
Personal and other services	3	0	8	0	0	0	0	11
Non-classifiable economic units	0	3	0	3	3	0	0	9
Not stated	0	0	6	3	6	6	0	21
Total	51	121	377	428	314	108	24	1,423

Table 15-9 Income by Age Group for Nebo Shire

Income	Age Group (years)								Total
	15-19 years	20-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65-74 years	75 and over	
Negative/Nil income	13	8	16	19	21	7	7	4	95
\$1-\$39	3	3	10	4	0	3	0	0	23
\$40-\$79	8	8	18	11	3	4	0	0	52
\$80-\$119	7	3	15	5	3	0	0	0	33
\$120-\$159	3	3	15	13	6	10	0	0	50
\$160-\$199	0	0	7	18	9	11	15	4	64
\$200-\$299	5	5	25	19	10	7	12	6	89



Income	Age Group (years)								Total
	15-19 years	20-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65-74 years	75 and over	
\$300-\$399	12	11	28	21	20	7	3	0	102
\$400-\$499	7	12	27	26	26	16	0	3	117
\$500-\$599	0	11	30	28	5	9	0	0	83
\$600-\$699	3	9	16	18	19	7	3	3	78
\$700-\$799	0	13	13	27	13	3	0	0	69
\$800-\$999	6	12	38	36	24	6	0	3	125
\$1,000-\$1,499	0	24	92	91	64	13	3	0	287
\$1,500 or more	0	19	101	141	96	18	0	0	375
Not stated	29	29	77	54	64	31	27	26	337
Overseas visitors	3	0	0	0	0	0	0	0	3
Total	99	170	528	531	383	152	70	49	1,982

15.2.10.2 Belyando Shire

The 2001 census reveals that employment in the Shire is predominantly from the mining, agricultural and retail industries with mining being the largest sector with 1,591 employees. Other industries providing employment include construction, education and wholesale trade. The numbers of individuals from each age group working in various industries of employment are presented in **Table 15-10** below.

The unemployment rate in 2004 was 2.9 %, which is below the state average. The weekly income for residents of Belyando Shire by age group according to the 2001 census ranges from nil/no income (8.29 %) to \$1,500 or more (14.65 %) (refer to **Table 15-11**).

Table 15-10 Employment by Age Group for Belyando Shire

Industry	Age Group (years)							
	15-19 years	20-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65 and over	Total
Agriculture, forestry and fishing	47	63	120	121	108	71	29	559
Mining	39	110	401	493	435	110	3	1,591
Manufacturing	8	25	43	48	25	12	0	161
Electricity, gas and water supply	3	3	3	9	3	0	0	21
Construction	10	35	88	74	51	28	0	286
Wholesale trade	16	16	54	61	59	14	3	223
Retail trade	124	43	88	83	92	22	9	461
Accommodation, cafes and restaurants	22	16	31	51	56	18	6	200
Transport and storage	7	31	50	52	38	13	4	195
Communication services	3	0	7	14	6	3	0	33

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Industry	Age Group (years)							Total
	15-19 years	20-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65 and over	
Finance and insurance	0	4	21	5	16	0	0	46
Property and business services	10	29	64	63	52	11	0	229
Government administration and defence	3	7	15	37	34	11	3	110
Education	0	34	93	81	51	10	3	272
Health and community services	11	6	44	71	62	16	3	213
Cultural and recreational services	3	3	14	10	6	3	0	39
Personal and other services	13	12	32	33	16	3	0	109
Non-classifiable economic units	3	0	6	9	0	0	0	18
Not stated	9	4	13	18	18	9	4	75
Total	331	441	1,187	1,333	1,128	354	67	4,841

Table 15-11 Income by Age Group for Belyando Shire

Income	Age Group (years)								Total
	15-19 years	20-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65-74 years	75 and over	
Negative/Nil income	158	27	105	116	131	62	13	0	612
\$1-\$39	60	6	48	45	30	10	0	0	199
\$40-\$79	63	19	79	52	27	6	3	3	252
\$80-\$119	33	15	62	43	34	11	3	0	201
\$120-\$159	24	12	43	52	40	45	23	13	252
\$160-\$199	30	25	53	41	43	58	81	35	366
\$200-\$299	76	43	84	99	69	54	75	67	567
\$300-\$399	46	73	80	85	64	48	23	11	430
\$400-\$499	22	50	86	97	84	38	14	7	398
\$500-\$599	4	75	97	76	76	47	18	3	396
\$600-\$699	6	41	74	63	57	32	6	3	282
\$700-\$799	0	48	84	55	54	23	9	0	273
\$800-\$999	6	31	121	94	72	29	3	0	356
\$1,000-\$1,499	3	60	253	266	219	54	5	0	860
\$1,500 or more	0	18	257	369	353	78	3	3	1,081
Not stated	96	67	141	167	153	86	58	70	838
Overseas visitors	0	0	3	0	3	0	6	3	15
Total	627	610	1,670	1,720	1,509	681	343	218	7,378

15.2.11 Marital Status

15.2.11.1 Nebo Shire

The marital status for males and females in the Nebo Shire is provided in **Table 15-12**. Approximately 57 % of the population was married at the time of the 2001 Census.

Table 15-12 Marital Status for Nebo Shire

Age Group	Married		Separated		Divorced		Widowed		Never Married	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
15-19 years	0	3	0	0	0	0	0	0	57	37
20-24 years	12	16	0	0	0	0	0	0	96	47
25-29 years	60	50	6	0	0	3	0	0	102	48
30-34 years	85	60	10	3	6	0	0	0	81	14
35-39 years	142	76	9	5	16	6	0	0	41	4
40-44 years	122	48	13	5	14	4	3	3	20	5
45-49 years	121	42	6	6	19	7	3	0	9	5
50-54 years	92	31	3	3	25	5	3	3	8	0
55-59 years	34	26	6	0	12	3	3	0	4	0
60-64 years	42	13	3	0	4	0	3	0	5	0
65-69 years	19	16	0	0	3	0	3	3	3	0
70-74 years	11	5	0	0	0	0	4	0	3	0
75-79 years	11	5	0	0	0	0	4	0	3	0
80-84 years	4	4	0	0	0	0	4	3	0	0
85 and over	0	3	0	0	0	0	9	0	3	0
Overseas visitors	3	0	0	0	0	0	0	0	3	0
Total	758	398	56	22	99	28	39	12	438	160

15.2.11.2 Belyando Shire

The marital status for the Belyando Shire is provided in **Table 15-13**. Approximately 59 % of the population was married at the time of the 2001 Census.

Table 15-13 Marital Status for Belyando Shire

Age Group	Married		Separated		Divorced		Widowed		Never Married	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
15-19 years	0	3	0	0	0	0	0	0	338	288
20-24 years	21	51	0	5	0	0	0	0	325	205
25-29 years	166	197	8	6	8	12	0	0	232	137
30-34 years	293	310	17	12	19	15	0	0	168	65
35-39 years	361	316	22	14	30	24	0	3	70	33
40-44 years	347	307	17	10	41	22	3	5	74	21
45-49 years	348	275	26	4	46	42	3	3	50	6
50-54 years	325	232	21	8	48	26	9	7	25	4
55-59 years	218	128	12	4	27	11	5	16	20	3
60-64 years	106	72	5	3	13	5	12	13	6	4
65-69 years	71	53	0	5	9	6	3	17	8	0
70-74 years	60	34	5	0	3	6	16	27	3	3
75-79 years	25	17	0	0	5	0	11	27	6	0
80-84 years	14	7	0	0	3	0	7	22	3	3
85 and over	7	3	0	0	0	3	26	21	3	0
Overseas visitors	5	4	0	0	0	0	0	0	0	0
Total	2,367	2,009	133	71	252	172	95	161	1,331	772

15.2.12 Dwelling Structure

The vast majority of the population, i.e. 93 %, within Nebo Shire live in a stand alone house and 90 % of Belyando Shire lives in a stand alone house. The population that live in households with two to four people was found to be 71 %. **Table 15-14** presents the dwelling types and rates of occupancy in both Shires.

The majority of the houses in Belyando Shire (52 %) were fully owned or in the process of being purchased at the time of the 2001 census. This is contrast to Nebo Shire where only 27 % houses were fully owned or in the process of being purchased.

Caravans, cabins and houseboats are the second most popular form of accommodation in both Nebo and Belyando Shires.

Table 15-14 Dwelling Structure for Nebo and Belyando Shires

Dwelling Structure	Nebo Shire		Belyando Shire	
	Dwellings	Persons	Dwellings	Persons
Stand alone house	613	1,727	2,906	8,340
Semi-detached, row or terrace house, townhouse etc.				
One storey	13	18	48	63
Two or more storeys	0	0	13	17
Total	13	18	61	80
Flat, unit or apartment				
In a one or two storey block	19	28	124	203
In a three storey block	0	0	0	0
In a four or more storey block	0	0	0	0
Attached to a house	0	0	3	8
Total	19	28	127	211
Other dwelling				
Caravan, cabin, houseboat	35	49	263	389
Improvised home, tent etc	8	13	3	7
House or flat attached to a shop, office, etc.	0	0	17	40
Total	43	62	283	436
Not stated	6	14	52	127
Unoccupied private dwellings	222	N/A	586	N/A
Overall Total	916	1,849	4,015	9,194



15.2.13 Accommodation

Many long-term residents of both shires are mortgage holders, and the amounts of their repayments, and the number in each class is set out in **Table 15-15** below. This indicates the distribution of income spent on mortgage repayments, and also shows that the majority of mortgage holders make repayments of less than \$1,000 per month. This is an indication these residents likely have unrealised capital gains on their house properties, taking into consideration the median housing prices contained in **Section 15.2.7**.

Table 15-15 Monthly Housing Loan Repayment

	Belyando Shire	Nebo Shire
\$1-\$199	144	0
\$200-\$399	156	4
\$400-\$599	84	11
\$600-\$799	53	7
\$800-\$999	31	5
\$1,000-\$1,199	21	3
\$1,200-\$1,399	11	3
\$1,400-\$1,599	3	0
\$1,600-\$1,799	3	4
\$1,800-\$1,999	0	0
\$2,000 or more	12	3
Not stated	50	10
Total	568	50

There are approximately 20 accommodation establishments in Belyando and Nebo Shire including hotels, motels, accommodation camps and caravan parks. Most of the establishments experience high to full occupancy rates with a slight decline over weekends.

Taking into consideration those renting houses and those paying for accommodation in hotels, motels, accommodation camps and caravan parks, the monthly housing cost per resident, for Belyando and Nebo Shires is contained in **Table 15-16** below.

Table 15-16 Weekly Rent

	Belyando Shire	Nebo Shire
\$1-\$49	301	212
\$50-\$99	442	88
\$100-\$149	225	61
\$150-\$199	82	4
\$200-\$249	21	0
\$250-\$299	10	3
\$300-\$349	3	0
\$350-\$399	3	0
\$400-\$499	3	0
\$500 or more	4	3
Not stated	64	11

Belyando has a total of 114 housing commission dwellings while Nebo Shire has three such dwellings (2001 Census).

There is a significant lack of rental properties in Clermont, with only one property listed. Moranbah has 26 properties for rent ranging in price from \$390 per week to \$800 per week.

Following concerns raised by Nebo Shire Council in its comments on the EIS that rents within the Nebo Shire are too high as a direct result of mining activity in the area, this issue has been analysed by referencing the relevant national averages and two reports that address the issue of housing affordability.

A report prepared by the St Vincent de Paul Society, *Housing Stress in Australia's Private Market*, defines housing stress as the level at which a household's housing costs are unsustainable, or where they represent a large proportion of household income³. Housing stress is experienced most commonly by families in the lower 40 % of incomes, and who pay more than 30 % of gross income on housing costs. Housing crisis is a further sub-category of housing stress and refers to a household that spends more than 50 % of its income on housing costs⁴.

A housing cost ratio of 30 % of gross income is more than double the Australia-wide average of 15 %⁵. Approximately 16 % of Australian households are represented in this category, that is, an estimated 1.2 million households⁶ spend 30 % or more of gross household incomes on housing costs. Of these, an estimated 862,000 households, or 71 %, were low income households, defined as being in housing stress. Low income, private renters therefore represent the largest group of households experiencing this affordability problem⁷.

In Australia, representative of all household types (lone, group and family households) recorded negative income levels for rent paid in the bracket \$0 - \$49. Specifically, in 2006, 660 family households paying rent of between \$0 and \$49 recorded their weekly income as 'Negative/Nil Income'. This demographic is clear evidence of the definition of housing stress outlined above⁸.

This was further examined using the 2006 Census statistics, which were released after the completion of the draft EIS. The results from the 2006 Census were not significantly different from the 2001 Census.

Figure 15-5 below provides a graphical display of the composition of the rental market in Nebo Shire. The graph clearly illustrates that the majority of residents (including, family couples with children, lone and group households) renting in Nebo, pay a weekly rent of between \$0 and \$49. The next largest weekly rent bracket in Nebo ranges from \$50 to \$99. The majority of residents paying rent in this bracket earn between \$2,000 and \$2,499 or \$2,500 and \$2,999. The next largest rent bracket, excluding those residents whose weekly rent is not stated, is also comprised of high end income earners, with almost 40 % of these stating weekly income at between \$2,500 and \$2,999.

³ St Vincent de Paul Society. (2007). *Housing Stress in Australia's Private Rental Market*. Page 2.

⁴ *Ibid.*

⁵ Australian Housing and Urban Research Institute. (2007). *Housing affordability: a 21st century problem*. Page 18.

⁶ *Ibid.*

⁷ *Ibid.* Page 12.

⁸ 2006 Census.

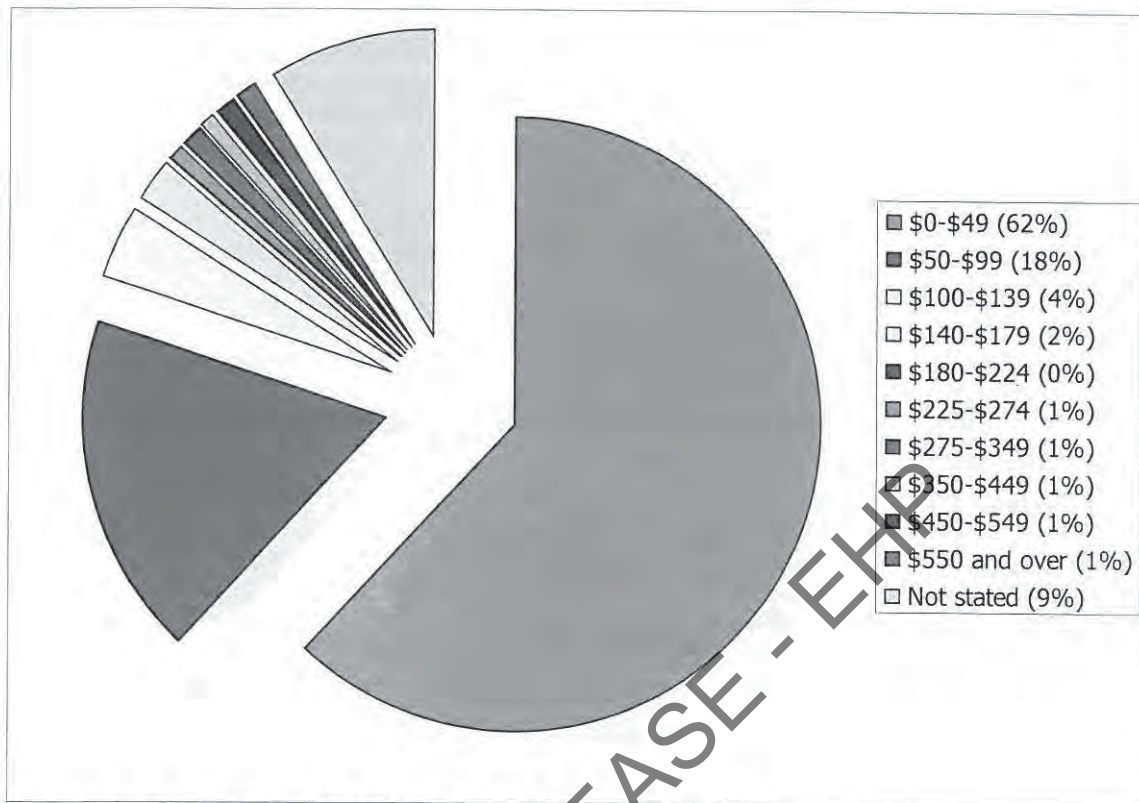


Figure 15-5 Rent Paid per Income Bracket in Nebo Shire

Analysis of the composition of households in Nebo Shire indicates the majority, at approximately 41 %, are "couple families with children". Although this demographic is considered most at risk of experiencing housing stress, it would appear that this is not the case in Nebo Shire. In Nebo Shire the majority couple family with children households pay weekly rent in the range of \$0 - \$49 and earn a weekly income between \$1,700 and \$1,999. A similar quantum of households is represented by couple families with children earning a gross weekly income of between \$2,500 and \$2,999 and pay weekly rent within the range of \$0 to \$49. These statistics clearly show that the definition of housing stress as it is described above does not apply in Nebo Shire.

A further distinguishing factor of the housing market in Nebo Shire is the disproportionately high percentage of renters versus home owners or purchasers. In Nebo Shire, approximately 69 % of the population fall into this category. A comparison with similar shires in Queensland indicates that figures for Nebo Shire are atypical (refer to **Table 15-17**).

Table 15-17 Comparison of Nebo with other Queensland Townships

Shire	Total Number of Dwellings	Number of Rented Dwellings	Percentage of Population Renting a Dwelling
Nebo	647	445	69%
Theodore	185	89	48%
Duaringa	2090	1050	50%
Taroom	647	254	39%
Belyando	3279	1482	45%
Mundubbera	813	265	34%

Social Environment

Nebo Shire has between 20 % and 30 % more renters than other similar townships. The majority of these rented dwellings are owned by either the government or by another employer, and much of this housing is subsidised. As a result, there appears a strong preference to rent dwellings in Nebo Shire rather than to purchase. This is probably due in part to the transitory nature of the workforce employed in the area, as well as the attractiveness of living in subsidised mine accommodation in Nebo Shire and investing in the property market elsewhere.

On the basis of the findings presented above, it would appear that in Nebo Shire, the demographic of private renters most commonly at risk of housing stress at a national level, that is, young families with children, is not so affected by housing stress.

The 2006 Census categorises private renters by income and by weekly rent paid. In Nebo Shire, the lowest income range for family households⁹ renting properties is \$500 - \$649 per week. Rents paid by family households in this income bracket range from \$100 - \$139 per week. These households represent just four out of a total of 445 rented dwellings, or less than 1 % of the total number of dwellings in Nebo Shire.

Even if family households earning \$500 per week paid rent at the upper end of the rent bracket, that is, paid \$139 per week on a gross weekly income of \$500 (the low end of the income bracket \$500 - \$649), these family households would still only be paying approximately 27 % of their income to housing costs. Although this is in the vicinity of housing stress ratio of 30 %, it is still below the benchmark determined by independent research.

It should also be noted that the highest rent paid in Nebo Shire, as detailed in the 2006 census, falls within a band of \$350 - \$449. The weekly gross incomes for these family households fell within a range of \$2,000 - \$2,499. Similarly, the housing cost ratio in this bracket, at 18 %, falls well within acceptable housing costs. There are only 3 households paying in excess of \$500 in weekly rent.

Lone person households in Nebo Shire reflect a similar situation. The lowest weekly income bracket, as stated in the census data, is \$150 - \$249. Three individuals on this income level are paying rent in a range of \$0 - \$49. Only those individuals paying \$49 on a weekly income of \$150 would be considered to be experiencing housing stress. This represents less than 1 % of the total number of households in Nebo, and less than 1 % of the total number of households paying rent.

By contrast with 2006 Census statistics for Australia as a whole, Nebo Shire performs very well. In Australia, at a weekly rent of \$49, approximately 5 % of renters experience housing stress, while 2 % experience housing crisis. At a weekly rent of \$99, there is a sharp spike in the number of private renters experiencing housing stress, when it reaches 32 %. The number of private renters experiencing housing crisis also peaks at approximately 29 % at a weekly rent of \$99. Thereafter there is downward trend in the number of renters experiencing either housing stress or housing crisis. Nebo Shire by comparison fails to register any households in either category (refer to **Figure 15-6**).

⁹ It is assumed that demographic, "young families with children" as cited in the report, *Housing affordability: a 21st century problem*, comes into the Australian Bureau of Statistics category, 'Family Households'.

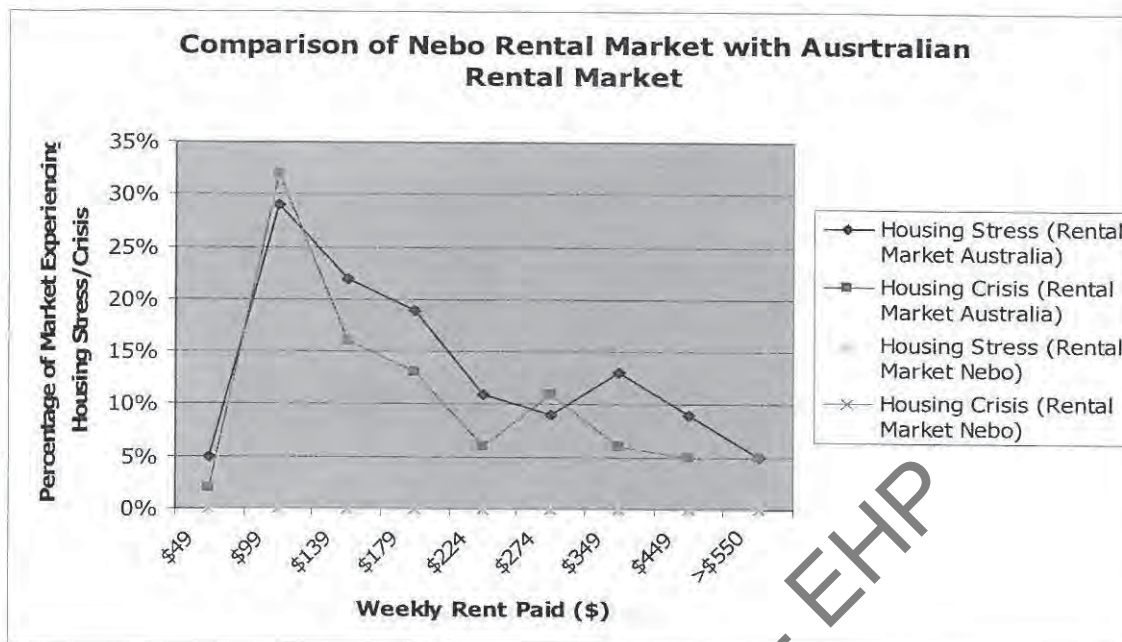


Figure 15-6 Comparison of Nebo Rental Market with Australian Rental Market

Concern was expressed by the Shire CEO that there was a paucity of available low cost rental housing for new council workers, and the example was given of properties being offered for rent at over \$500 per week.¹⁰ As the analysis above shows, there were only three houses actually rented out in the shire for more than \$500 per week. Moreover, as the rent sought for houses is not the same as the market rent, it is not really possible to comment on such anecdotal information. This is particularly so in the absence of more complete information on what other houses may be available.

However, should a shortage of properties exist, the Nebo Shire Council could approve the building of new houses for the rental market or undertake the building of such houses itself.

15.3 INTEGRATED ISAAC PLAINS PROJECT WORKFORCE

15.3.1 Number of Employees During Construction

During construction, there will be an additional 20 – 40 employees for approximately three to six months. This phase will involve the construction of an access/haul road between the existing Isaac Plains Coal Mine and the Expansion Area which will require a low level crossing of the Isaac River and an underpass of the Peak Downs Highway, and the development of mine infrastructure in the Expansion Area. Construction workers will be sourced predominantly from Queensland and housed in the MAC Coppabella camp. Assembly of the dragline will also require a peak workforce of up to 70 persons over a 12 month period. Refer to **Section 15.3.3** for details on the accommodation for the workforce.

15.3.2 Number of Employees During Operation

The number of staff required for the operations will increase by 40 persons to 110 (there are currently 70 staff in the existing mine), the vast majority (95 %) of whom will reside in the camp. Staff will be sourced predominantly from the Mackay region.

¹⁰ Personal communication, 15th February, 2008.



15.3.3 Accommodation for Employees

Accommodation for the current employees is at the MAC Coppabella camp on the Peak Downs Highway, approximately 26 km east of the IIPP and approximately 50 km east of Moranbah on main roads or 37 km on other roads. Coppabella is approximately 50 km from Nebo along the Peak Downs Highway. As stated previously, the majority of the employees reside at the camp with a small number of employees living in Moranbah (i.e. approximately 5 % of existing and projected employees).

The number of rooms available for Isaac Plains Coal Mine at MAC Coppabella camp will vary in accordance with demand ranging from 120 rooms to 228 rooms. This allocation will ensure sufficient rooms are provided during the construction and operational phases.

15.4 POTENTIAL IMPACTS AND MITIGATION MEASURES

15.4.1 Impacts of Demographic, Social, Cultural and Economic Profiles

Belyando and Nebo Shires currently contain a number of large mines, with continued growth in this area. Mining industry growth as a whole in the Shires is having cumulative impacts on the demographics. Given the small size and characteristics of the proposed changes in demographics introduced by the Expansion Area, there is a low probability of negative impacts on the Shires.

The population of males is expected to rise slightly due to the addition of the Expansion Area. This is in line with demographic trends across the Bowen Basin, where families are tending to locate in larger and coastal centres, mostly due to education, lifestyle and employment reasons..

According to Rolfe *et al.* there were several possible impacts on the demographics of the Coppabella Mine. These are:

- the increase in income as a result of the mining operations which can potentially have a flow on effect to the local businesses and in turn can be realised as an increase in employment opportunities;
- quality of life may be enhanced through the upgrade of infrastructure including telecommunications; and
- there may be a negative impact on the social activities in the Shires as a result of the mine due to the fly in/fly out nature of the mine.

In 2004, there were 5,692 males and 4,848 females in the Belyando Shire and 1,247 males and 900 females in Nebo Shire.

The principal demographic change likely in these Shires as a result of the IIPP, is the increase of mostly single and unaccompanied males who will be housed in temporary (camp) accommodation. They tend to be accommodated in a self contained manner as they are mostly shift workers who return to their principal place of residence during the roster breaks and therefore have only limited interaction with the community. The impact on the social profile of the community seen in the lack of participation in sport and community events as shift workers who reside in camp accommodation, are often unable to participate regularly in sporting and community events.

The IIPP construction phase will require approximately 20-40 additional employees for a period of up to six months, while the number of staff required for the assembly of the dragline will peak at 70 persons during the 12 month construction phase. Operational phase will increase by 40 employees to a total of 110.

The 'fly in – fly out' lifestyle can also affect workers' families since the breadwinners are away from home for extended periods of time.

15.4.2 Increased Demand for and Provision of Vocational Training

When interviewed, management at Central Queensland Institute of TAFE (CQIT) indicated that expenditure by the coal mining industry on vocational training and other services underpinned its operations and provided it with critical mass. In addition to utilising programmes provided by CQIT, the industry also avails itself of competency assessment modules prepared by CQIT. Vocational training results in a skills upgrading among the region's population which not only equips individuals for higher value jobs (and thus benefits the local community in the long run), but also makes them more adaptable to meet changes in the employment environment.



Another measure of the cumulative benefits of mining expansion in the region is the commitment from the State Government to spend approximately \$37.1 million to develop a specialist trade campus of the CQIT in Mackay. A total of \$5.96 million of this budget is expected to be spent in the 2006/2007 financial year (Source: Queensland Government 2006-07 Budget Paper No 3). This will have important spin-off value for the region generally, including Nebo and Belyando Shires, and for industries other than mining.

15.4.3 Impacts on Local Current Land Use

The Expansion Area and existing Isaac Plains Coal Mine are located within 5 km from five homesteads. Potential impacts to property values from environmental impacts such as dust, visual amenity, noise and vibration are minimal as environmental mitigation measures will be employed to reduce any impacts.

Activities have not altered on properties surrounding the original mine and are not expected to change with the expansion project.

15.4.4 Impacts on Local Residents' Values, Existing Lifestyles Enterprises and Aspirations

While interested in capturing the benefits of mining, residents of Nebo township would be reluctant to be perceived as a 'mining community' because of both negative internal and external perceptions. Areas of potential impact in economics, crime, transport, traffic and the demand for services are discussed in this section.

It has been recognised that mining in Nebo and Belyando Shires has led to the expansion of other sectors to service the mining industry. As the Isaac Plains Coal Mine is already operational it is not expected that the introduction of the Expansion Area, and an increase in coal production, will result in significant new business opportunities within the Shires. The economic effects of the mine on the local, State and regional area are further discussed in detail in **Section 16**. Contractors are encouraged by IPCM to source local goods and services where possible.

There is limited data available on crime statistics for the region, however, the small area crime profile for the combined area of Nebo and Belyando Shires for 2002 and 2003 (OESR, 2003) indicates that the rate of offences against persons in Belyando and Nebo Shire was statistically higher than the overall rate for Queensland but the rate of offences related to property and other offences was substantially lower.

Mine employees, who are shift workers, will be transported to the IIPP site by bus from their accommodation as will the majority of contractors during the construction phase. The use of the bus to transport shift workers will alleviate the community perception that the introduction of the Expansion Area will lead to an increased number of fatigued drivers on the road.

There will be minor increases in heavy vehicle traffic during the construction phase of the IIPP, but these numbers are low. Traffic movements and potential impacts and mitigation measures are discussed further in **Section 14**.

The increase in the rate of production of coal will increase the number of coal haulage vehicles within the mine site. These vehicles will travel on internal access/haul roads only and therefore will not impact on the state controlled Peak Downs Highway.

15.4.5 Impacts on Human Services

There appears to have been no significant enhancement of human services in the community as a result of mining activity in the Nebo area. This is possibly attributable to the close proximity to Mackay and there being a small population base.

Information from the Australian Bureau of Statistics shows that on average the Australian population receive the services of one general practitioner for every 1,103 people (Source ABS 8689.0 and 3222.0). By contrast, both Nebo Shire and Belyando Shire are under serviced in terms of general practitioners. Nebo has one general practitioner for 2,107 permanent residents, and Belyando Shire has a ratio of one general practitioner for each 2,663 permanent residents. When non-permanent residents are added to these calculations, the ratios for both Shires are, naturally, higher.



Demand for health, education or sporting services is not predicted to increase significantly as a result of the introduction of the Expansion Area. Basic first aid will be available on-site and within Coppabella camp and therefore there will be a minimal impact to the demands on Clermont and Moranbah services. It is noted, however, that each population increment strengthens the case for more primary health care resources and would justify efforts to recruit more general practitioners and other health professionals to both Shires.

15.4.6 Impacts on Community Infrastructure

After the submission of the EIS the Queensland Department of Infrastructure and Planning released the Bowen Basin Population Report, 2007. This report details the resident and non-resident populations of nine shire councils in the Bowen Basin as at 31 July, 2007. As the census data for local government areas is based on "the place of usual residence" of the census respondents, this means that non-resident workers are excluded from the population survey for the shire.

The Bowen Basin Population Report shows that non-resident workers accounted for 11,075 of the full-time equivalent (FTE) population of 89,903 people in the Bowen Basin. While this means non-resident workers represent 12.4 % of the FTE population across the region, the distribution varies from shire to shire.

In Nebo Shire, the non-resident worker population was 2,868 and the resident population was 2,716. This means that non-resident workers constituted 51.36 % of the FTE population of the shire.

These figures are relevant for the planning of infrastructure in the region generally and Nebo shire in particular, especially for the provision of water, power, medical and other services, all of which are the responsibility of state and local government. To a lesser degree this also applies to Belyando Shire, although there the non-resident worker population accounts for only 14.16% of the FTE population.

While the Proponent is aware that the provision of infrastructure in local communities is the responsibility of governments, it intends to assist local government, where feasible to better plan for community needs. To this end the Proponent proposes to undertake further discussions with local government to identify ways in which it can voluntarily contribute to the well being of the local community.

The cumulative demands imposed by the mining sector on the infrastructure of both Nebo and Belyando Shires have been identified as an issue by the State Government. One of the particular issues in question has been the demand for and supply of water to the coal mines and towns of the region.

In the 2006-07 Budget, the Queensland Government announced the allocation of \$270 million over two years (of which \$129.35 million is to be spent in the current financial year) to build a 215 km pipeline from Gorge Weir, near Burdekin Falls, and which is stated to terminate in Moranbah. According to the Deputy Premier, this is intended to provide and enhance water supply to the coal mines and towns of the Bowen Basin. (Source: Queensland Government 2006-07 Budget Paper No. 3).

The investment by the State Government in this project is acknowledged as being a consequence of growth in the coal mining sector in the region, and can be taken to demonstrate one of the benefits of the cumulative effect of mining expansion. Naturally, the pipeline will remain after the closure of the currently operating mines, and represents a long-term asset for Nebo and Belyando Shires, amongst others.

In discussions held with officials of Belyando Shire, concerns were expressed as to whether there would be an allocation of water from this pipeline to meet the needs of the town. This is not a matter which is within the knowledge or control of the Proponents. Naturally, any increase in the resident or non-resident population of the Nebo and Belyando Shires will have an impact on the water demands for town use, and may need to be taken into consideration by policy planners.

IPCM will be participating in the State Government led initiative to supply water to the township of Moranbah based on a pro-rata system and subject to equivalent full-time IIPP residents of the township.

The IIPP will also contribute to the wider Mackay region in that it will play an important role in underpinning other infrastructure investment by the State Government, which might not otherwise go ahead.

15.4.7 Impacts Related to Mine Closure

In its response to the EIS, the Nebo Shire Council raised concerns regarding the effect of the eventual closure of the mine on the local community. These were particularised further in subsequent discussions.¹¹ Most of these concerns related to the potential impact on property prices, and have been dealt with separately above.

The Proponent recognises, however, there may be legitimate concerns over what will be final impact of mine closure on the community. These concerns may include the possibility of the community having too much infrastructure for the final population, to the extent to which it can capture residual economic value over the life of the project.

In order to assist the local community, the Proponent undertakes to involve local government and the community in the process of closure planning with a view to identifying ways in which the mine can leave a lasting positive impact on the local community.

A significant item of State Government capital expenditure will be for improved port facilities for the export of coal. In this regard the State Government has budgeted \$57.6 million this year to construct a third rail loop at Dalrymple Bay Coal. The IIPP will increase product coal from the existing Isaac Plains Coal Mine from 1.6 Mtpa to approximately 3.3 Mtpa, and will make a positive contribution to ensuring the viability of the Dalrymple Bay terminal.

15.4.8 Impacts on Housing

Accommodation for the current employees is at the Coppabella camp on the Peak Downs Highway, approximately 26 km east of the IIPP and approximately 50 km east of Moranbah on main roads and 37 km on other roads. Coppabella is approximately 50 km from Nebo along the Peak Downs Highway. A small number of employees reside in Moranbah (i.e. approximately 5 % of existing and projected employees).

During construction phase, there will be an additional 20-40 employees for approximately three to six months. Construction workers will be sourced predominantly from Queensland and housed in the MAC Coppabella camp. Up to 70 additional people will be required to construct the dragline over a 12 month period and they will also be housed at the MAC Coppabella camp. The number of staff required for the operations will increase by 40 persons to 110, the majority of whom will reside in the camp. Staff will be sourced predominantly from the Mackay region. This small increase in personnel will have minimal impact on the social environment in Belyando and Nebo Shires given the distance to the Coppabella camp (refer to distances provided above). The impact on the housing and accommodation within Nebo and Belyando Shire is therefore expected to be minimal. The cumulative effect, across Nebo and Belyando Shire, from the increased mining operations has hitherto been an increase in property values.

15.4.9 Increase in Crime

According to Rolfe *et al.* (2003), the perception of residents of Nebo Shire is that there is a greater risk of crime from the development of mining activities in the local area due to the large number of temporary residents staying in camp style accommodation.

There is limited data available on crime statistics for the region, however, the small area crime profile for the combined area of Nebo and Belyando Shires for 2002, 2003 (Office of Economic and Statistical Research) indicates that the rate of offences against persons in Belyando and Nebo Shire was statistically higher than the rate for Queensland but the rate of offences for property and other offences was substantially lower.

¹¹ Personal communication, Mr Mark Crawley, Nebo Shire Council, February 2008.

Recent informal discussions with a Nebo Shire Councillor have indicated that the perception of increased crime has changed somewhat with the expansion of local opportunities as a consequence of mining and it is not expected that the increase in workers for the IIPP will result in an increase in either the community perception of, or actual rise in crime rate in Nebo Shire.

It is observed in Rolfe *et al.* (2003) that 'informal sanctions' are placed on employees considered to be acting up within the vicinity of the mine, and that this may have the effect of controlling any potential increase in the crime rate.

15.4.10 Impacts on Employment

As discussed previously, 20-40 contractors will be required during the construction period which will last approximately three to six months, assembly of the dragline will require up to 70 persons for a period of 12 months and an additional 40 staff will be required for the operational phase of the IIPP.

Staff for the IIPP will be sourced locally where available, which will have the potential to marginally decrease the availability of tradespersons for non-mining work within the Shires.

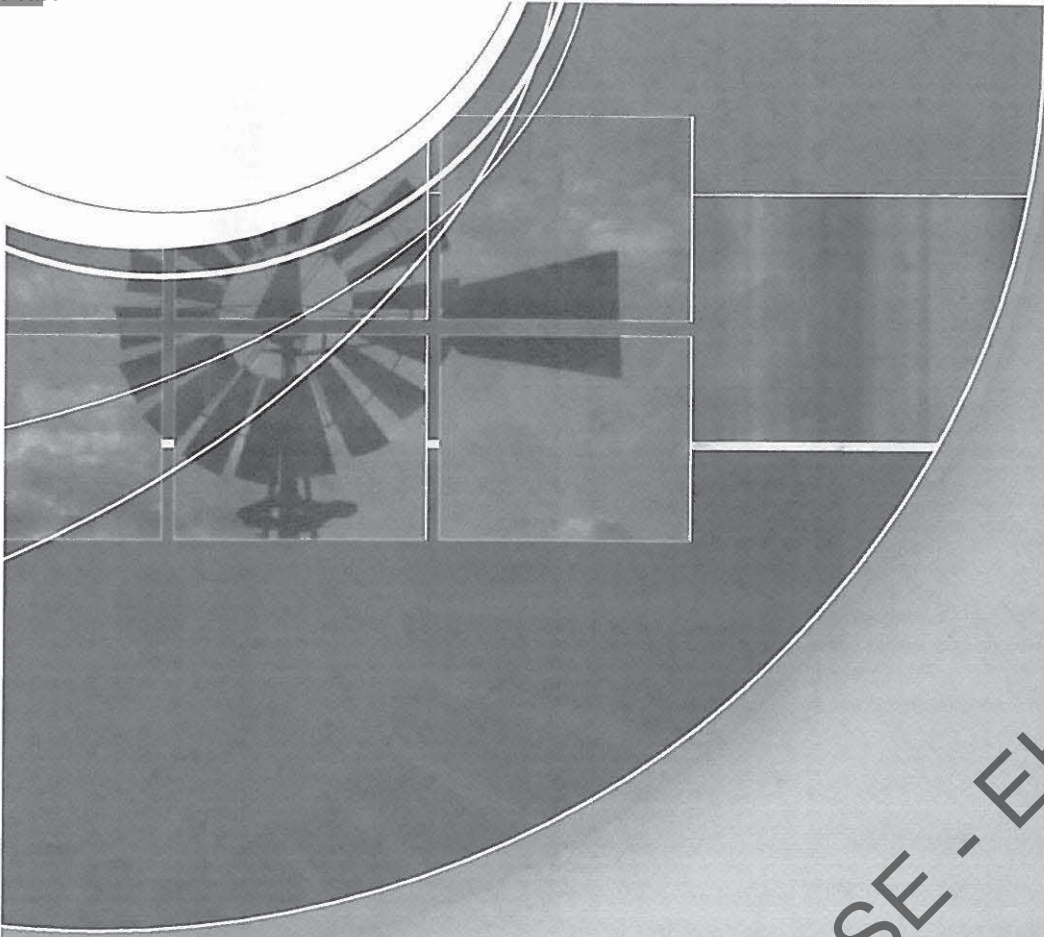
A shortage of skilled workers has existed across both Nebo and Belyando Shires in recent years. The Proponents note, however, that Macarthur Coal recently retrenched 120 employees at the Coppabella mine. These would potentially become available to the IIPP, and if the IIPP is approved, could mitigate some of the employment and economic impacts of Macarthur Coal's announcement.

To reduce the impact on skilled worker availability within the Shire, the IIPP proposes to recruit people with a range of skill profiles, including people with limited skills in mining and provide the necessary training to up-skill them. Local training providers in the region such as local TAFE colleges and apprenticeship schemes will be utilised to provide relevant skills and opportunities for local people.

15.5 CUMULATIVE IMPACTS

Any major development in a community by its very existence is accompanied by a degree of involuntary change and additional pressures to change. This impacts on and challenges prevailing community identities as there will be many competing influences which will challenge community cohesion.

In the case of the IIPP it is unlikely that significant environmental impacts will occur on the amenity of residents closest to the Expansion Area or the existing Isaac Plains Coal Mine. Monitoring programs are in place for the existing IIPP and these will be modified to incorporate the Expansion Areas. In addition, current mitigation measures for the existing Isaac Plains Coal Mine will be extended to cover the Expansion Area. The main body of this EIS presents all of the potential environmental impacts which may result from the IIPP and mitigation measures are proposed in the EM Plan in **Section 20**.



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16

ECONOMIC
ENVIRONMENT

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT



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16 ECONOMIC ENVIRONMENT

16.1 INTRODUCTION

The economic assessment for the IIPP has relied on existing literature relevant to both Nebo and Belyando Shires¹, in particular the surveys undertaken by Rolfe *et al.* (2003) to identify behavioural trends from which the economic and social impacts of the Coppabella Mine were based. These survey results have been used in this assessment to provide estimates of expenditure by individuals and local businesses from which indirect economic effects (multipliers) have been derived. Background literature has been combined with actual operational expenditure data provided by IPCM to estimate direct economic impacts from the IIPP. Direct economic impacts will arise through employment opportunities and procurement of goods and services from local and regional communities and business. Indirect effects will arise through flow-on multiplier effects.

Nebo Shire comprises an area of 10,009 km² and Belyando Shire encompasses an area of 30,078 km². Production of beef and crops dominate the land utilisation within both Shires. Nebo Shire comprises the townships of Nebo, Glenden and Coppabella with Nebo being the administrative hub. Moranbah and Clermont are the two main towns within Belyando Shire. A number of mines already exist within the two Shires, including South Walker Creek, Coppabella, Newlands, Hall Creek, Blair Athol, and Poitrel. Their presence with others has come to dominate the economic and industrial base of the Shires with some evidence of expansion in other sectors that service the mining industry. However, within Nebo Shire, the relatively small number and size of businesses, offering a limited scope of services, appear to have a limited flow on effect to other sectors. Belyando Shire has a larger, more varied number of businesses which may provide greater opportunity for the flow on effects to occur.

The number of businesses operating within Nebo Shire has increased over the past five years, particularly those related to the mining industry. **Table 16-1** presents the key businesses that are presently located within Nebo and Coppabella townships. **Table 16-2** presents the businesses that are currently located in Clermont and Moranbah.

Table 16-1 Businesses within Nebo Shire

Businesses Currently located in Nebo and Coppabella	
Allplant Services	Nebo Post Office
B&S Bus Hire Pty Ltd	Nebo Store
Bowen Mechanical	Pics-Broadstock Pty Ltd
BP Junction Café	Precise Maintenance
Bus It Queensland Pty Ltd	Professional Diesel Hydraulics
Coppabella Store/Post Office	Queensland Railway Institute Coppabella
Cowan AJ & PA	Ray White Rural
Greg Mclean Electrical	Retreat Hotel
Marley Accommodation Centre (The MAC Service Group)	Scullies Bulk Haulage
Nebo Bowls Club	Simpson Contracting
Nebo Caltex and Caravan Park	Shell Junction Café
Nebo Concrete	Story D&T
Nebo Electrical and Refrigeration	Stayawhile Caravan Park
Nebo Hotel	Venture Mining
Nebo Mechanical and Repairs	Waitara Crushing Plant
Nebo Sawmill	Ward E&S
Nebo Motel	Warell Homes

¹ NB: Since the release of the final EIS for public comment Belyando, Nebo and Broadsound Shires have been amalgamated. This revised EIS has not been amended to reflect this as the intention of this version of the EIS is to address comments from stakeholders at the time of public release, including both Belyando and Nebo Shire Councils.

Table 16-2 Businesses within Belyando Shire

Businesses Currently located in Moranbah and Clermont	
87.6 Vision FM	Hi-Dip Trophies and Engraving
Amalgamated Pest Control	High Country Enterprises
ANZ Bank	Holus Boalus
Ashley Hamblin Diesel Fitting and Field Service	Jammo's Bakehouse
Austock Exports Pty Ltd	Johnstone's Saddlery
Australia Post	Kevin Hickling Agencies
Australian Livestock Pty Ltd	Laser Magic
Award Carpets	Leading Edge Telecoms
Bacon Street Produce	Leo Hotel/Motel
Belyando Bearings and Gases	Machado and Associates
Belyando Building Supplies	Medical Services
Belyando Furniture Shop	Mintech Group Pty Ltd
BH & LM Sporne	Moranbah Auto
Black Nugget Hotel	Moranbah Bus Service T/A CQ Coaches
Body Obsessions	Moranbah Cinema Complex
Brat's & Angels	Moranbah Computer Centre
Bretz Building Pty Ltd	Moranbah Delicatessen
Brinin & Hedges	Moranbah Engineering
Coalcity Auto Repairs & Spares	Moranbah Motor Inn
CCI Australia Pty Ltd	Moranbah Outback Motel
CDI Pest Management	Moranbah Panel Works
Central Highlands Safety and Security	Moranbah Pharmacy
Central Queensland News	Moranbah Plumbing
Chantelle's Coffee Garden	Moranbah Screenprints and Embroidery
Charles Hair Studio	Moranbah Sportscene
China's Restaurant	Mr Softy
Clermont Automotive Repairs & Services	N.A.T.S. Panel and Paint Pty Ltd
Clermont Caravan Park	Nathan Nordland Pump & Electrical
Clermont Cleaning Services	National Australia Bank
Clermont Detectors	Oasis Laundry Service
Clermont Haulage	Our Open House
Clermont Hotel Motel	Paul Breckon Steel Fabrications
Clermont IGA Everyday	Peppercorn Motel
Clermont News	Perfect Type - Secretarial and Publishing
Clermont Plant and Flower	Perfect Type Signs
Coal Country Caravan Park	Pioneer Construction Materials
Coalfields Office Support	Pioneer Permanent Building Society
Commercial Hotel	PT Signs
Cool Auto Electrics	PT Signs
Dave Wykes Dingo Hire	Radio Communications Solutions
Direct Pest Control	Ray's TV Services
Dixon's Transport	Retravision (GG Walters Pty Ltd)

Businesses Currently located in Moranbah and Clermont	
Dolma Transport	Ricbuilt Engineering
Donut Land	Rob Williams Clermont Electrical Pty Ltd
Drovers Rest Motel	Robertson Plumbing
Duncan's Dozer and Scraper Hire	Rockmans
Echidna Inkjet Services	Ron Ryan Enterprises
Enzed	Shell Peak Downs Roadhouse
Extra Storage	Shoes 'n' Things
Flutterbuys Creative	Smith's Backhoe and Truck Hire
Fresha Bin	Soul Purpose
G & D Communications	The Cutting Station
Geoff Allen Optometrist	The Marley Accommodation Centres
Goldfields BP	Traveland
GR Motors	Union Co-operative Society
Grand Hotel/Motel	Unique Flowers by Roz
Gregory Fabrications	W N & J A Cruickshank Pty Ltd
Happyland Chinese Restaurant	Walsh Mechanical Pty Ltd
HCE Electrical Pty Ltd	Western Heritage Motor Inn
Heart of the Country	Westfund
Heritage Media	

16.2 ENVIRONMENTAL VALUES

The environmental value to be protected is the maintenance of direct economic benefits to both the local Shires and to the Region as a whole.

16.3 DIRECT ECONOMIC EXPENDITURE

16.3.1 Workforce

Employment of labour for the IIPP will provide one of the main direct economic benefits to the area.

16.3.1.1 Construction Phase

A maximum of 40 persons will be required for the construction and/or upgrading of the haul/access/haul roads within and between the Expansion Area and the existing Isaac Plains Coal Mine (including construction of the underpass of the Peak Downs Highway) and a workforce of 70 for the construction of the dragline. This workforce will also be required for construction of the low level crossing of the Isaac River and the development of the mine infrastructure area within the Expansion Area. Construction activities will be completed over a period of approximately nine to 12 months. Construction employees will be principally sourced from Queensland, the majority of which will be housed in the Coppabella camp.

16.3.1.2 Operational Phase

The existing Isaac Plains Coal Mine currently employs 70 full time equivalent employees (FTE). During the operational phase, with the addition of the Expansion Area, an additional 40 FTE employees will be required increasing staff number from 70 to 110. The additional employees will be engaged over a 4 to 6 week period.

The geographical distribution of the additional workforce is based on the existing workforce distribution. Annual average labour costs are predicted to be approximately \$120,000 per employee. The operational phase distribution within central Queensland of the additional workforce and income is shown below in **Table 16-3**.

Table 16-3 IIPP Operational Phase Workforce and Income Distribution

Locality	Percentage (%)	Number	Employee Annual Income Distribution (\$M)
Mackay	80	32	3.84
Nebo and Belyando Shires	5	2	0.24
Other	15	6	0.72
Total	100	40	4.80

16.3.2 Income Expenditure

The spending pattern of IIPP employees is unknown although it can be assumed it will be minimal within the Shires. Rolfe *et al.* (2003) undertook a survey of income expenditure by employees at the Coppabella mine, the results of which indicated that non-resident mine employees of Nebo Shire in 2003 spent an average of \$64.28 per week within the Shire. The key expenditure items identified in the survey were alcohol, entertainment, fuel and other (accommodation and food were excluded as it is provided by the mine). Using annual inflation data sourced from the Reserve Bank, this would equate to an annual average expenditure of \$125.95 per week in 2006 dollars. Extrapolating across 48 working weeks per year for the additional 40 employees required for the expansion indicates that their expenditure within Nebo Shire would equate to \$0.24 M per year.

16.3.3 Transport

The mine does not have a contract with a bus service, however buses are hired by site contractors, to the transport employees to and from the site from camp daily. This service is valued at \$17 per day plus operating costs, equating to \$10,700 per yr. Employees are responsible for their own transport to and from their homes to workforce supplied accommodation.

16.3.4 Accommodation

The mine has a contract with the MAC Camp for 120 rooms in Coppabella. With the increase in operational employment at the IIPP, this will increase to 228 rooms, an increase of 108 rooms. An agreement has been reached with MAC Coppabella camp to allow for a fluctuation in demand to accommodate dragline construction staff. The mine currently pays \$70 per night per room when occupied and \$35 per night when unoccupied, an average value of \$53 per night. This equates to a total of \$6,360 per night or \$2.32 M annually for accommodation to house the employees required for the IIPP.

16.3.5 Capital and Operational Expenditure*16.3.5.1 Estimated Capital Costs*

The IIPP will require capital expenditure on new plant and equipment and an increase in total operating costs. Major capital expenditure is summarised in **Table 16-4** based on data provided by IPCM.

Table 16-4 IIPP Estimated Capital Expenditure

Expenditure Item	Value (\$ Million)
Land Acquisition, IIPP Access/Haul Road and IIPP infrastructure etc	15.05
Mining Equipment (Dragline & D11 Dozer)	88.20
Total Capital	103.25

Total estimated annual operating costs for the IIPP are \$135 M. It should be noted that State Government Royalties are estimated to amount to \$12.6 M per year over the life of the IIPP. In addition, annual Rail and Port charges are estimated to reach \$7.7 M.

16.3.6 Mine Expenditure Distribution

16.3.6.1 Capital Expenditure

IPCM indicate that the capital expenditure required for the IIPP (refer to **Table 16-4**) is likely to be distributed as follows:.

- Nebo and Belyando Shires - \$15.05 M;
- QLD other - \$67.2 M; and
- International - \$21.0 M.

These results are summarised in **Table 16-5**.

Table 16-5 Expansion Capital Expenditure Distribution Summary

Item	Value (\$M)	Distribution	Queensland (\$M)	Other Aust (\$M)	International (\$M)
Land & infrastructure	15.05	100 % Qld	15.05	0	0
Mining Equipment	88.2	QLD and USA	67.2	0	21.0
Total	\$103.25M		\$82.25 M	\$0 M	\$21.0 M

16.3.6.2 Operational Expenditure

A summary of the estimated incremental operational expenditure in the region is provided in **Table 16-6**. The estimate is conservative as it excludes the wages paid to the construction workforce during the construction phase (\$2.1 M), the indirect effects of their expenditure (\$0.08 M) and the potential direct employment of residents of the Shire.

Table 16-6 Additional Direct Annual Regional Expenditure from IIPP

Item	Nebo and Belyando Shires (\$M/yr)	Mackay (\$M/yr)	Other (\$M/yr)
Direct Wage Expenditure to Nebo and Belyando Shire residents (refer to Table 16-3)	0.24	3.84	0.76
Non-Resident Employee Income Expenditure in Nebo and Belyando Shires	0.24	0	0
Contracted services (transport and accommodation)	1.42	Not assessed	Not assessed
Other services to the mine (food, cleaning etc-should be from Nebo and Belyando Shires)	2.20	0	0
Total	\$4.10 M	\$3.84 M	\$0.76 M

Using the total annual regional expenditure rates from **Table 16-5** for an estimated mine life of 20 yrs, the additional direct annual regional expenditure in Nebo and Belyando Shires is estimated as \$72.4 M and \$92 M outside of the two Shires (i.e. Mackay plus other areas).

16.3.7 Flow on Effects from Direct Expenditure

Direct annual expenditure as shown above will create flow-on economic effects within Nebo Shire, Belyando Shire and the surrounding region.

16.3.7.1 Multiplier effects

Multiplier effects (represented as Keynesian multipliers) estimate the flow-on economic activity that results after an initial spending injection into the local community in the form of wages for labour and procurement of locally sourced goods and services (Jensen and West, 2002). Multipliers provide an estimate of the 'gross' activity generated for some given impact on the economy. The concept of gross effects occurs because input-output multipliers do not account for potential crowding out of one activity by another. Mathematically, Keynesian multipliers comprise the form:

$$K = 1/(1-MPC_L \times PSY)$$

where:

- | | | |
|-----|---|---|
| K | = | Keynesian multiplier |
| MPC | = | the marginal propensity to consume; |
| PSY | = | the proportion of local consumption expenditures that eventuate as local income rather than lost through purchase of non-local (imported) goods and services. |

Typical values for MPC vary between 0.2 to 0.4 for smaller communities of less than 5,000 people to 0.6 to 0.7 for larger communities. Typical values for PSY range between 0.25 and 0.75, with smaller communities often lying somewhere between 0.4 and 0.5.

Rolfe *et al.* (2003) reports that it is feasible to source goods and services from Mackay given its proximity to Nebo and Belyando Shires. Therefore flow-on effects of spending within the Nebo and Belyando Shire communities are limited because:

- there is a difficulty for small communities to capture a high proportion of spending; and
- a large proportion of goods and services used as business inputs have to be sourced from outside the community.

Leakages outside of the regional economy occur through:

- shareholder dividend payments;
- interest payments on loans taken out by the mine;
- interest payments on housing loans; and
- payments to suppliers of goods and services outside the local region.

16.3.7.2 *Nebo and Belyando Shire Household Expenditure and Business Consumption*

Rolfe *et al.* (2003) surveyed expenditure in Nebo Shire and found that approximately 17 % of total household expenditure occurs within the Shire. It is reasonable to infer that a similar expenditure pattern arises in Belyando Shire. Some variation is expected between low and high income earners due to the effects of tax and superannuation. Therefore, they estimated MPC to equal 0.15. Surveys of local Nebo Shire businesses indicated that approximately 23.5 % of business expenses may become income (through wages and purchases of local goods) to other businesses or households in Nebo Shire and they estimated PSY to equal 0.235. Again Belyando Shire is assumed to be similar.

Substituting these values into the Keynesian multiplier equation:

$$K = 1/(1-0.15 \times 0.235)$$

$$K = 1.0366.$$

Using the lower end typical values reported for communities of less than 5,000 people (MPC 0.2, PSY 0.25) would result in a K value of 1.05.

In other words, for every additional dollar of income that arises in Nebo and Belyando Shires, the additional income generated is \$0.037 (based on Rolfe *et al.*) to \$0.05 (based on lower end typical values). The small value of the multiplier was attributed to the low propensity of locals to purchase local goods and services, instead preferring to spend in larger regional areas such as Mackay.

Wages were surveyed at approximately 22 % of business expenses. This percentage was used in **Table 16-7** to estimate the net addition to incomes from non-resident employee expenditure in the two shires, contracted services and other services. The Keynesian multiplier of 1.0366 (or 3.66 %) was used to calculate the net addition to incomes for indirect impacts based on the total economic impact of non-resident employee expenditure in Nebo and Belyando Shires, contracted services and other services. The total economic impact from indirect impacts was determined by dividing the net addition to incomes (for indirect impacts) by 22 %.

The total additional annual economic impact to the shires from the IIPP is estimated to be \$4.76 M, with \$1.14 M flowing to residents as increased income, as presented in **Table 16-7**.

Table 16-7 Additional Estimated Economic Impact to Nebo Shire from the IIPP

	Total Economic Impact (\$ M)	Net Addition to Incomes (\$ M)
Direct wage expenditure to Nebo and Belyando Shire residents	0.24	0.0528
Non-resident employee income expenditure in Nebo and Belyando Shires	0.24	0.0528
Contracted services (transport and accommodation)	1.42	0.3159
Other services (food, cleaning etc)	2.20	0.484
Indirect impacts (calculated using Keynesian income multiplier 3.66 %)	0.66	0.2003
Total	\$4.76M	\$1.11 M

The estimate is conservative as it is likely that additional local expenditure will occur throughout the project life, other than just the expenditure on transport and accommodation that has been assumed. The resultant expenditure from wages earned by the construction workforce in the first year estimated at \$0.08 M, has also been excluded on the basis that it will not recur.

16.3.7.3 Mackay and Other Regions Household Expenditure and Business Consumption

The Government Statistician's Office publishes a Type I value added multiplier of 0.8 (1996-1997) for the Coal, Oil and Gas Sector for the Mackay region. Type I multipliers represent the initial impact on final demand plus the additional output required from other industries in the economy needed to supply the additional demand of the industry receiving the initial impact. As stated previously, the multiplier is very coarse as there are subsequent effects to downstream industry from the initial demand increase. However, it does provide an indication of the economic benefits provided by the mine expansion. The value is significantly higher than the Nebo Shire multiplier because of the greater range of goods and services available in a much larger regional centre. Wages alone, paid to the additional Mackay based employees of \$3.84 M, will generate an additional \$3.07 M in indirect income using the Type I multiplier of 0.8.

As discussed in the section above, the additional direct regional expenditure for Mackay and other regions outside of the Nebo and Belyando Shires is estimated as \$72.4 M. Therefore, the benefits for Mackay and other regions, are estimated at \$73.6 M (using a Type I multiplier of 0.8).

16.4 IMPACT ON MEAN INCOMES

The Australian Tax Office has published information for the 2003-04 financial year, which represent the latest available tax statistics. This information is classified, *inter alia*, by postcode, and so it is possible to identify the mean income attributable to wages and salaries in different areas of Queensland. This information is contained in **Table 16-8** below.

Table 16-8 Mean Wage and Salary Incomes in Selected Queensland Areas

Locality	Mean Income Attributable to Wages and Salaries 2003-04
All Queensland	\$37,021
Brisbane metropolitan area	\$39,504
Mackay	\$40,135
Nebo and district	\$42,709
Glenden and district	\$64,820
Moranbah and district	\$65,046

(Source: Australian Taxation Office, Taxation Statistics by Postcode 2003-04).

As a general rule, wages and salaries in rural areas are lower than those in metropolitan areas. This would not appear to be the case in the mining areas of the Mackay region.

On the basis of the above table, it can be established that mean wage and salary incomes for those localities most directly affected by the influx of miners, such as Moranbah and Glenden, as well as those where the effects are more diffuse, such as Nebo and Mackay, have been positively affected. In all of these localities the mean income attributable to wages and salaries was higher than it was for the Brisbane metropolitan area, and higher than the Queensland mean.

Another useful comparison is between mining areas and those similar areas whose economic mainstays are the pastoral or agricultural sectors. Using the same methodology as above, the mean income attributable to wages and salaries has been calculated for Jericho and district, and Longreach and district. Both of these localities are similar to the Nebo and Belyando Shires, although somewhat further west.

Longreach, like Moranbah is a regional service town. The mean income attributable to wages and salaries for Longreach and district in the same period was only \$34,972 compared to the \$65,046 for Moranbah and district.

Jericho is similar to Nebo in that it lies upon a main East-West highway, but is not, itself, a regional service town. Here the disparity in income was even more marked. The mean income attributable to wages and salaries in Jericho and district was only \$23,944 compared to the \$42,709 for Nebo and district.

Thus it is clear that mining increases the mean income attributable to wages and salaries in towns with which it is associated. Where mining sector employment is concentrated, such as Moranbah, the mean income attributable to wages and salaries was 75.7 % higher than the Queensland mean, and 64.6 % higher than the Brisbane metropolitan area.

16.5 IMPACT ON HOUSING AFFORDABILITY

A key concern for many stakeholders is the effect of the influx of mining workers on housing affordability in towns in which they are domiciled.

Using the above statistics for mean income attributable to wages and salaries and information on median house prices from the Coordinator-General's Office, it is possible to generate an index of housing affordability.

The Coordinator-General's Office reveals that median house prices in Brisbane for the period ending September 2005 were \$360,500 and that the median land price in the period was \$225,000 (Source: <http://www.coordinatorgeneral.qld.gov.au/workliveplay/index.shtml>).

The Coordinator-General's Office also has similar data for certain towns in the Mackay Region. This shows that the median house price in Mackay during this period was \$339,050, and median land price was \$263,500. For Moranbah the median house price was \$335,000 and the median land price was \$31,500. This data accords with historical data obtained from Australian Property Monitors and the analysis contained in **Section 15.2.7**.

It is noted that the house and land prices were for a slightly later date than those for mean income attributable to wages and salaries contained in **Section 17.4** above. If anything, however, this would tend to overstate the cost of housing relative to income if there has been a surge in house and land prices in the Mackay region since 2004.

On the basis of this information it is apparent that housing remains more affordable in both Mackay and Moranbah than it is in Brisbane. This is summarised in tabular form in **Table 16-9** below.

Table 16-9 Median House Price Affordability

Locality	Mean Wage and Salary Income	Median House Price	House Price: Mean Wage and Salary Income	Median Land Price	Land Price: Mean Wage and Salary Income
Brisbane	\$39,504	\$360,500	9.13	\$225,000	5.69
Mackay	\$40,135	\$339,050	8.48	\$263,500	6.56
Moranbah	\$65,046	\$335,000	5.15	\$31,500	0.48

House prices in Moranbah are certainly high by rural standards, but house prices expressed as a multiple of mean income attributable to wages and salaries remain low. This index showed houses in Mackay to be 7.1 % more affordable than in Brisbane. Houses in Moranbah were 43.4 % more affordable than Brisbane using the same measure.

Following responses to the draft EIS in relation to housing affordability in Nebo Shire and Mackay, further limited analysis was undertaken.

Referencing the data collected by the ATO in the 2004-05 financial year, we note the mean taxable income in Nebo for that year was \$71,673, while in Mackay, the mean taxable income for the same period was \$46,151. For Nebo, this represents a substantial increase in the mean taxable income of 32 % from \$54,222 for the shire in the 2003-04 tax period².

From the data presented above it is possible to revise calculations of median house price affordability and compare the affordability of Nebo with Mackay and Brisbane. This analysis is presented below in **Table 16-10**.

Table 16-10 Median House Price Affordability (2004-05)

Locality	Mean Wage and Salary Income	Median House Price	Median House Price: Mean Wage and Salary Income
Mackay	\$46,151	\$364,250	7.89
Nebo Shire	\$71,673	\$245,000	3.42

On the basis of this information it is evident that houses are more affordable in both Mackay and Nebo than in Brisbane. The housing affordability ratio for Brisbane, in the preceding year, was 9.13.

House prices in Mackay are relatively high by regional standards, however house prices, expressed as a multiple of mean income attributable to wages and salaries actually declined during the 2004-05 financial year. Thus, houses in Mackay were 24 % more affordable than in Brisbane, where in the previous reporting period, the ratio of median house price to mean wage and salary income was 9.13. Overall, housing in Mackay has become more affordable since the original EIS submission, due to an increase in the mean wage and salary income. Using the same measure houses in Nebo Shire were 43.3% more affordable than houses in Mackay, using the same measure.

Consideration should also be given to any price volatility in land and house prices. Officials from Belyando Shire have indicated that there has been considerable variation in land prices in Moranbah Township (pers comm. Scott Riley, Belyando Shire Council, April 2007). They advise that, contrary to the above, in 2006, the secondary market price of vacant land was as high as \$150,000.

We have verified this as correct through correlation with data obtained from Australian Property Monitors, although the median price for land was unaffected. This would suggest that land prices have been highly volatile due to limited stocks, and mismatches of supply and demand. Attention is also drawn to the peaking and decline of median house prices noted in **Section 15.2.7**.

Rapid increases in housing prices, while remaining affordable to those on a mean wage and salary income, can still have unwelcome effects on those whose income has not risen as quickly. This can be mitigated by matching the supply of housing to projected demands, and by regulating the price at which land is released to the public.

As stated above, it is not anticipated that any significant number of additional staff required for the IIPP will reside permanently in either Nebo Shire or Belyando Shire. It is noted, however, that Belyando Shire Council is developing a new residential subdivision in Moranbah East, in conjunction with BHP Mitsubishi Alliance. This development is expected to supply approximately 500 residential allotments. If it proceeds, the proposed residential development to the south-west of Moranbah would add another 1,000 to 1,500 residential allotments.

Belyando Shire officials have indicated the Shire intends to release land in this latter development at low prices to constrain growth in the secondary market price and thereby ensure affordability for the whole community. (Pers comm. Scott Riley, Belyando Shire Council, April 2007.)

² Australian Taxation Office, Taxation Statistics by Postcode 2004-05.

These additional housing allotments would appear to be sufficient to meet the population increases projected and outlined in **Section 15.2.2**, and to provide a buffer to reduce price volatility. This would appear desirable.

To the extent that any staff of the existing Isaac Plains Coal Mine or IIPP were to choose to reside in Moranbah, these residential developments would be able to meet their demand for housing.

16.6 INDIRECT IMPACT ON FUEL PRICES

Fuel prices in regional areas display significant differences based on location, and distances fuel is carried from the terminal to the retailer. As a general rule fuel is more expensive the further it has to be carried from the terminal.

There is strong evidence to suggest that the volume of fuel transported by road and rail from refineries and ports to different destinations affects the final fuel price at each respective location. This would appear consistent with economic theory regarding economies of scale.

To test this assumption, the average price of unleaded petrol as stated by fuel price monitoring company FuelTrac Pty Ltd in selected Queensland towns from April 2005 to March 2007 was analysed. This is contained in **Table 16-11** below.

Fuel retailed in Charters Towers is carried a distance of 137 km from Townsville. The freight/price differential was calculated for each month and quarter in this period. The average quarterly differential varied from 3.3 cents per litre to 9.1 cents per litre. The average monthly differential was 5.5 cents per litre.

A similar analysis was undertaken of unleaded petrol sold in Emerald. This fuel is transported either from Gladstone (a distance of 389 km) or from Mackay (a distance of 377 km).

The maximum quarterly differential from Gladstone prices varied from 1.1 cents per litre to 3.6 cents per litre, with the average monthly differential being 2.1 cents per litre.

The maximum quarterly differential from Mackay prices varied from 1.3 cents per litre to 5.2 cents per litre, with the average monthly differential being 3.0 cents per litre.

Although Charters Towers is closer to Townsville than Emerald is to either Mackay or Gladstone, the freight/price differential was lower for Emerald than for Charters Towers. It can be inferred that the advantage enjoyed by Emerald was attributable to the economies of scale in transport flowing from it being a regional service centre for mines in the region.

Retail price figures are not available for Moranbah; however there is nothing which would suggest that it would differ substantially from Emerald in the advantage derived. In summary, there does appear to be a freight differential advantage on fuel which is enjoyed by mining service centres such as Emerald and Moranbah, and that this is attributable to economies of scale in the volumes of fuel transported to them.

Table 16-11 Regional Queensland ULP Fuel Price Comparisons

Area	June Qtr 05	Sept Qtr 05	Dec Qtr 05	March Qtr 06	June Qtr 06	Sept Qtr 06	Dec Qtr 07	March Qtr 07
Brisbane Metro. Average	99.1	111.6	110.3	113.7	125.8	124.5	109.0	111.4
Townsville Average	100.1	114.3	113.1	116.4	129.6	126.7	111.8	112.2
Charter Towers:								
Average	105.4	117.7	120.8	119.7	133.6	135.8	116.3	118.4
Variation from metro.	6.3	6.1	10.5	6.0	7.9	11.2	7.4	7.1
Freight differential from Townsville	5.3	3.4	7.7	3.3	4.0	9.1	4.6	6.2
Gladstone Average	102.3	114.4	118.1	115.5	127.8	129.8	114.0	113.7
Mackay Average	101.1	114.7	115.0	117.6	127.9	128.6	110.7	113.0
Emerald:								
Average	103.4	116.2	120.2	118.9	131.4	131.4	115.6	115.3
Variation from metro.	4.3	4.6	9.9	4.2	5.6	6.9	6.6	3.9
Freight differential from Gladstone	1.1	1.7	2.1	3.4	3.6	1.6	1.6	1.6
Freight differential from Mackay	2.3	1.5	5.2	1.9	3.5	2.8	4.9	2.3

Source: <http://www.aaa.asn.au/issues/petrol.htm>

16.7 POTENTIAL IMPACTS AND BENEFITS

The works required for the IIPP will require significant additional capital and operational expenditure. The additional economic impacts can be conservatively estimated as:

- employment of 40 additional FTE employees during the operational phase, approximately 80 % of whom will be sourced from the Mackay region and 5 % locally;
- capital expenditure of \$103.25 M of which approximately \$82.25 M will flow to Queensland businesses;
- estimated additional annual operating costs of \$135 M;
- annual operational expenditure of \$4.76 M (direct) and a further \$1.1 M (indirect) to be spent in the Nebo Shire;
- annual direct operating expenditure to be spent outside of the Nebo shire of \$92 M with estimated further indirect benefits of \$73.6 M;
- substantial annual payments to be made to the State Government in the form of Royalties \$12.6 M per yr and rail freight will amount to approximately \$7.6 M; and
- in addition, port charges will amount to up to \$7.7 M per year.

It is evident that the IIPP will add a significant monetary injection into the local, regional and State economies.

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17

HEALTH, SAFETY,
HAZARD & RISK

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

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17 HEALTH, SAFETY, HAZARD AND RISK

17.1 INTRODUCTION

The IPCM Safety and Health Management System (S&HMS) for the existing Isaac Plains Coal Mine is aligned to AS/NZS 4801 - *Occupational Health and Safety Systems – Specification with guidance for use* and reflects the company's belief that all injuries and environmental exposures are preventable through demonstrated leadership and the application of the system. The S&HMS, is based on a risk management approach and meets the requirements of the *Coal Mining Safety and Health Act 1999* (CMSH Act) and *Coal Mining Safety and Health Regulation 2001*. The existing S&HMS will also apply to the IIPP.

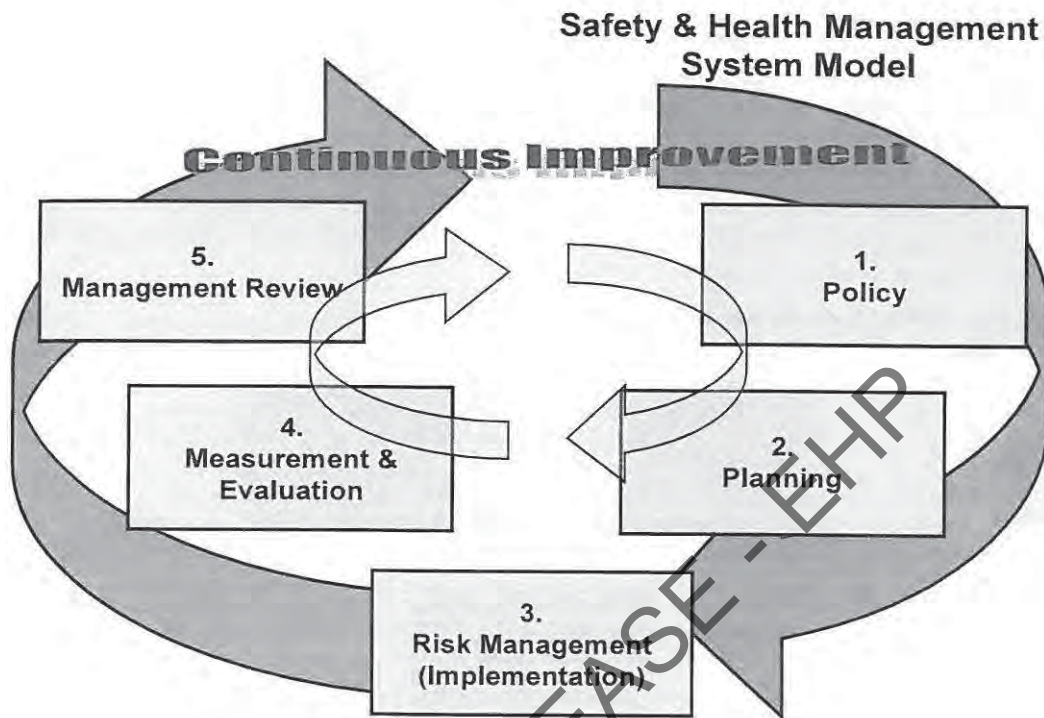
IPCM also recognises that the safety and health of employees and contractors is paramount, is a fundamental requirement for its continued operation and growth, and that the success and performance of the IIPP in these areas will be judged by employees, contractors, regulators and the community. Its safety and health performance also influences the ability of IPCM and the individual joint venture participants to enhance and develop future resources.

The S&HMS provides the framework for achieving the company's objectives in the area of safety and health. All IPCM personnel are expected to comply with the requirements of the IPCM Safety and Health policy, included in **Appendix L**.

The IPCM S&HMS comprises five elements and 20 documented standards, including risk management. **Figure 17-1** illustrates the relationship between the five elements and continuous improvement. **Table 17-1** lists and identifies the relationship between the elements and the documented standards.

Table 17-1 Safety and Health Elements and Standards

Safety and Health Elements	Safety and Health Standards
1. Policy	1.1. Safety & Health Policy
	1.2. Operating Philosophy
2. Planning	2.1. Leadership & Responsibility
	2.2. Structure – Organisational & Compliance
	2.3. Legal Compliance Register
	2.4. Annual Plans – Objectives & Targets
	2.5. Training & Competency
3. Risk Management	3.1. Risk Register
	3.2. Risk Management Framework
	3.3. Document Management & Control
	3.4. Change Management
	3.5. Contractor Management
	3.6. Emergency Preparedness
4. Measurement & Evaluation	4.1. Health Surveillance Program
	4.2. OH&S Audit & Review
	4.3. Incident Analysis & Reporting
	4.4. Corrective, Preventative Action Requirements
	4.5. Data Management & Reporting
5. Management Review	5.1. Management System Review
	5.2. Communication & Stakeholder Involvement

Figure 17-1 IPCM Safety and Health Management System**17.2 ENVIRONMENTAL VALUES**

This section addresses the existing community values for health and safety which may be adversely affected by the IIPP. The potential impacts on nearby and other potentially affected individuals and communities from air and noise emissions were addressed in **Section 8** and **Section 9** respectively.

IPCM has demonstrated a leadership commitment to the safety and health of employees and contractors working at the mine and in exploration activities. IPCM is committed to the continual implementation and development of a positive culture where the company is responsible and accountable for their actions at all levels of their business and where the individual employees feel they can make a difference and demonstrate a desire to take responsibility and ownership. Contractors are made aware of IPCM's commitments and are required to operate under these principles to achieve their objectives.

17.3 LEGISLATION AND APPLICABLE AUSTRALIAN STANDARDS

The relevant health and safety legislation applicable to the IIPP is listed below:

- *Coal Mining Safety and Health Act 1999;*
- *Coal Mining Safety and Health Regulation 2001;*
- *Electrical Safety Act 2002;*
- *Electrical Safety Regulation 2002;*
- *Explosives Act 1999;* and
- *Explosives Regulation 2003.*

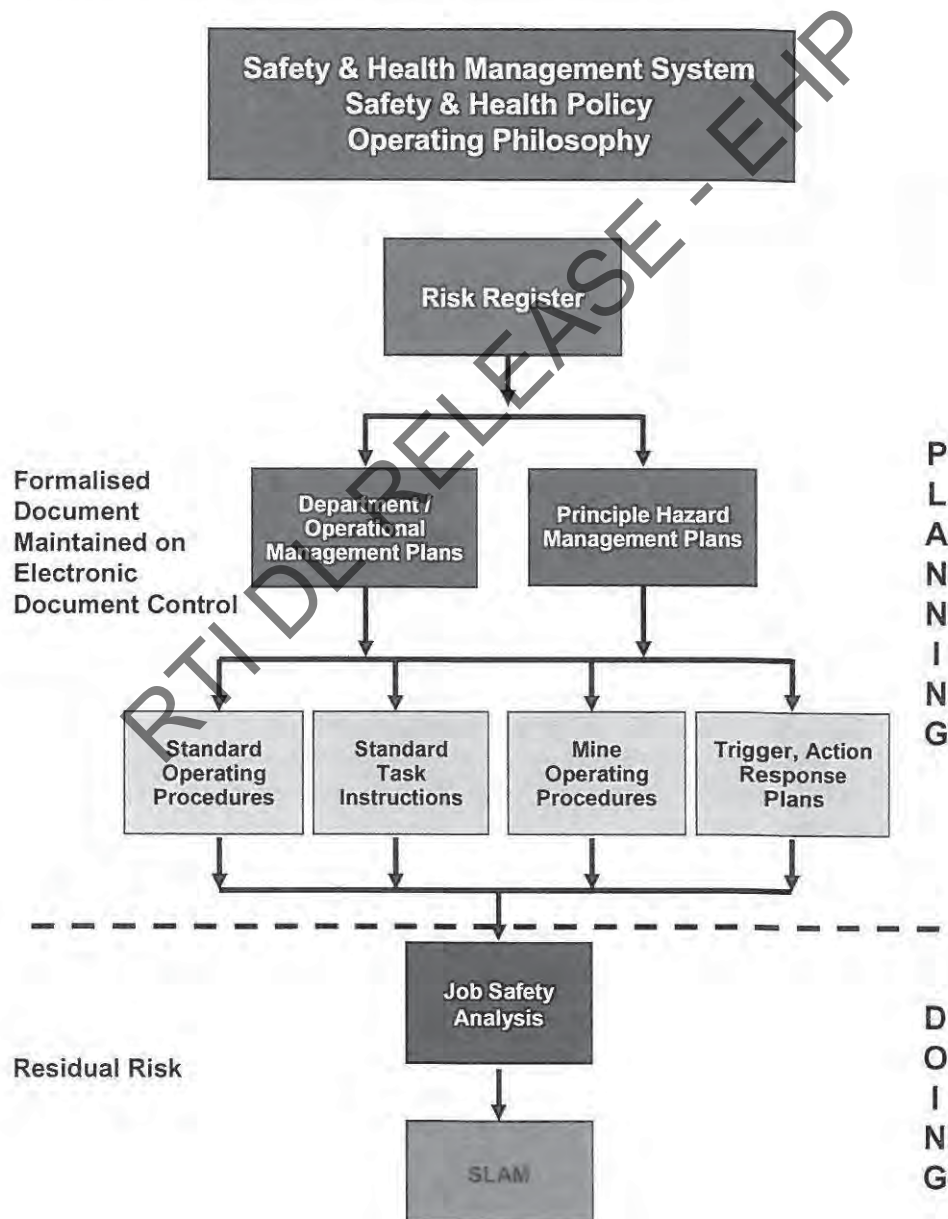
17.4 SAFETY AND HEALTH MANAGEMENT SYSTEM

The IPCM S&HMS Manual sets out the expectations to be achieved and is the highest internal document generated for the management of safety and health for the mine. These standards are designed to provide consistency and apply common practices throughout the organisation. They are documented, maintained and implemented at the appropriate organisational level and authorised by the IPCM General Manager.

Site operational procedures such as Standard Operating Procedures, Mine Operating Procedures and Standard Task Instructions are developed to address specific safety and health risks and hazards.

Figure 17-2 presents the existing Safety and Health System Model applied at the existing Isaac Plains Coal Mine which will also apply to the entire IIPP.

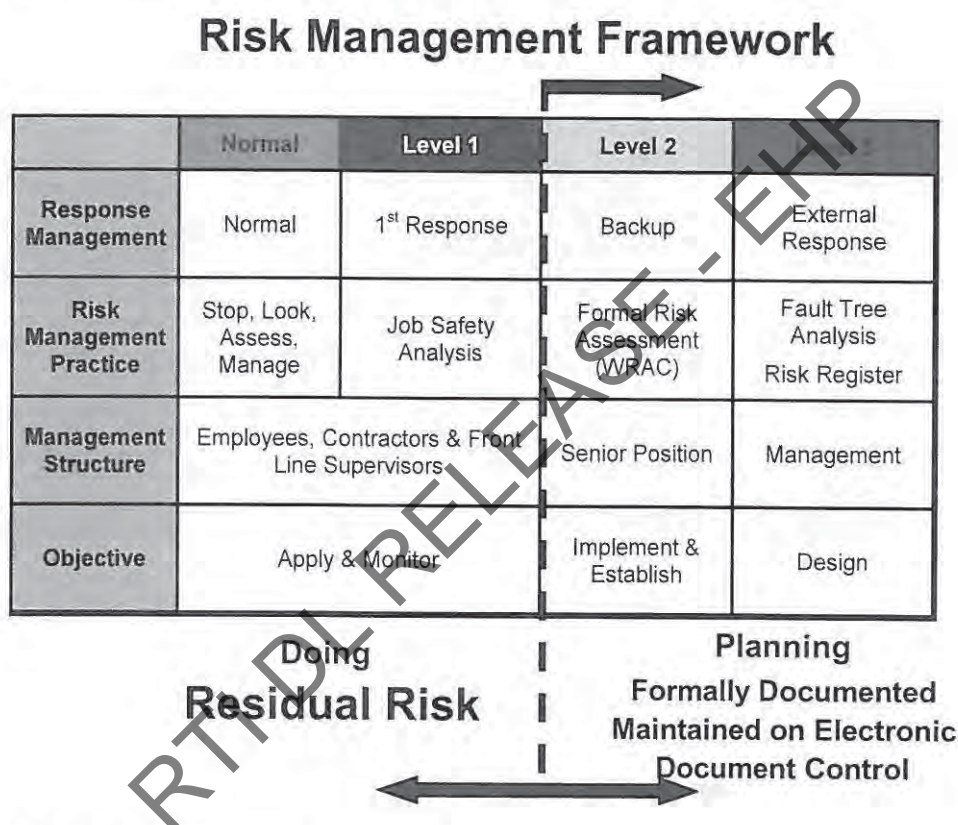
Figure 17-2 IPCM Safety and Health System Model



17.5 RISK MANAGEMENT FRAMEWORK

IPCM is committed to the establishment and maintenance of a Risk Management process that will provide an approach to reduce (minimise) risk to a level 'As Low As Reasonably Achievable' (ALARA). IPCM has developed a Risk Management Framework in line with AS/NZS 4360:2004 *Risk management*, that comprises four distinct levels and processes, with the identification of risk management tools utilised at each level. The Risk Management Framework outlines how all risk assessments are to be conducted, defines the report format and how to correctly complete relevant documentation (refer to **Figure 17-3**). It is aimed at ensuring a consistent approach, and all information is communicated within the specified timeframe to the relevant personnel.

Figure 17-3 Risk Management Framework



17.6 SITE RISK REGISTER AND ASSESSMENT

A process for the development of a Safety and Health Risk Register has been instigated and it will be reviewed annually or when a significant operational change takes place at the mine. Identified safety and health hazards are ranked in four categories: Extreme, High, Medium and Low. A summary of the nature of the hazard, existing and proposed control measures is included. This Risk Register and profile are documented and form the basis of the risk management framework.

The Risk Register is an important component of the IPCM S&HMS and is a high level risk assessment of the mine site which identifies the risks and the controls required to maintain these risks as low as is reasonably achievable. The register, which includes elements of concern for both construction and operational activities, such as vehicle collisions, falls, impact incidents and the potential for fire at the site, is listed within the document control system.

The IPCM risk assessment matrix and IPCM risk profile are provided in **Table 17-2** and **Table 17-3** respectively.

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Health, Safety, Hazard and Risk



Table 17-2 IPCM Risk Assessment Matrix

Risk Assessment Matrix					
Loss Type	Consequences				
	Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
People Injury or Illness (P)	Slight injury or health effects – first aid/ minor medical treatment level	Minor injury or health effects – restricted work or minor lost workday case	Major injury or health effects – major lost workday case/ permanent disability	Permanent total disabilities, single fatality	Multiple Fatalities
Damage and Consequential Losses (PL)	Easily addressed or rectified by immediate corrective action. No loss of production. No damage to equipment.	Minor or superficial damage to equipment and/or facility. No loss of production.	Moderate damage to equipment and/or facility. Loss of production < one week.	Major damage to facility requiring significant corrective / preventative action. Loss of production < six months.	Future operations at site seriously affected. Urgent corrective/ remedial action. Loss of production > six months.
Reputation, Community Regulatory Compliance (R)	Slight impact – public awareness may exist but no public concern	Limited impact – some local public concern	Considerable impact – regional public concern	National impact – national public concern	International impact – international public concern
Environmental Impact (E)	Environmental nuisance, no clean up, aesthetic impact only	Minor clean up, no legal breach, minimal impact, minor non – conformance	Major cleanup. License breach. Business disruption at site level.	Local Ecosystem damage, Legal / statutory breach	Regional Ecosystem damage, Major rehab failure, Mine Closure
Financial / Commercial (F)	<AUS \$10,000	AUS \$10,000 to \$100,000	AUS \$100,000 to \$1M	AUS \$1M to \$10M	>AUS \$10M

Likelihood		Risk Rating			
Almost Certain (A)	The event is expected to occur in most circumstances (once per month)	M (15)	H (10)	H (5)	
Likely (B)	Will probably occur in most circumstances (once per year)	M (19)	M (14)	H (9)	
Possible (C)	Might occur at some time (once per 10 years)	L (22)	M (18)	H (13)	H (8)
Unlikely (D)	Could occur at some time (once per 100 years)	L (24)	L (12)	M (17)	H (12)
Rare (E)	May occur only in exceptional circumstances (Once per 1000 years)	L (25)	L (11)	M (20)	M (16)

Risk Matrix Rating	Risk Level	Guidelines for Risk Management
1 to 5		
6 to 13	(H) – High	Proactively manage via S&H Management System
14 to 20	(M) – Medium	Manage by S&H Management System
21 to 25	(L) – Low	Manage by S&H Management System

Table 17-3 Risk Profile

Hazard	Proposed Controls	Risk Profile		Risk Level	
		L	C	Value	Level
1. Haul truck tips over	<ul style="list-style-type: none"> Traffic management plan Speed limits and speed controls Education and training Qualified drivers Rollover Protective Structures (ROPS) fitted to equipment 	Possible	Minor	18	Moderate
2. Storage and handling of HazMat	<ul style="list-style-type: none"> Education and training Bunds and spill kits Personal protective equipment (PPE) Storage and handling in accordance with AS 1940 MSDS 	Possible	Minor	18	Moderate
3. Fatigue	<ul style="list-style-type: none"> Work rosters which include rest between shifts Fitness for work policy Training and awareness 	Possible	Minor	18	Moderate
4. Water balance effects	<ul style="list-style-type: none"> IPCM is willing to contribute to the water supply of the Moranbah township to an extent equivalent to its impact on the township and has an in-principle agreement with BSC to enter into a water contribution agreement Monitoring program 	Unlikely	Minor	21	Low
5. Fire/Bush Fire	<ul style="list-style-type: none"> Documented emergency response plan Education and training Water trucks utilised with water cannons 	Possible	Moderate	13	High
6. Critical dependency suppliers/contractors	<ul style="list-style-type: none"> Contract conditions including environmental controls 	Possible	Moderate	13	High
7. Manual handling	<ul style="list-style-type: none"> Documented standard operating procedure Education and training Education and awareness program JSAs covering manual handling 	Possible	Moderate	13	High
8. Lack of human resources	<ul style="list-style-type: none"> Proactive recruitment Attractive contract conditions 	Possible	Moderate	13	High

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Hazard	Proposed Controls	Risk Profile		Risk Level	
		L	C	Value	Level
9. Environmental impacts	<ul style="list-style-type: none"> Water trucks to reduce dust Wash down of vehicles to reduce spread of weeds Control of dust from conveyors via dust extraction and enclosure where practical Wind shields on conveyors Documented blasting work instruction including times and monitoring Personnel trained in appropriate spills and waste management practices Noise control as appropriate Monitoring program 	Unlikely	Moderate	17	Moderate
10. Cultural heritage impacts	<ul style="list-style-type: none"> CHMP with conditions to avoid any impacts on areas of cultural significance Consultation with relevant Traditional Owners 	Unlikely	Moderate	17	Moderate
11. Regulatory non-compliance	<ul style="list-style-type: none"> Legal register Documented legal and other requirements process Monitoring program Regular internal reporting Training 	Unlikely	Moderate	17	Moderate
12. Spontaneous combustion of coal	<ul style="list-style-type: none"> Testing program Visual inspections Quick turnover of stockpile Education and training 	Unlikely	Moderate	17	Moderate
13. Health and hygiene	<ul style="list-style-type: none"> Monitoring program Education and training 	Unlikely	Moderate	17	Moderate
14. Strata Failure	<ul style="list-style-type: none"> ROPS fitted to equipment Geotechnical investigation and design Drainage control Clearance from site boundary or protective berm or bund 	Possible	Major	8	High
15. Pinch points	<ul style="list-style-type: none"> Inductions, training and site familiarisation Signage 	Possible	Major	8	High
16. Tyres and rims (cost and disposal)	<ul style="list-style-type: none"> Inspection and maintenance program Close monitoring of stock Agreement with supplier for quick delivery Disposal management plan 	Possible	Major	8	High

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Health, Safety, Hazard and Risk



Hazard	Proposed Controls	Risk Profile		Risk Level	
		L	C	Value	Level
17. Electric shock	<ul style="list-style-type: none"> Documented isolation standard operating procedures Maintenance program Education and training Induction to site 	Unlikely	Major	12	High
18. Uncontrolled release of energy	<ul style="list-style-type: none"> Documented isolation standard operating procedure Maintenance program Trained and educated personnel Induction to site 	Unlikely	Major	12	High
19. Explosion	<ul style="list-style-type: none"> Documented emergency response and preparation plan Education and training Well maintained fire fighting equipment on-site Coordination with external emergency services 	Rare	Major	16	Moderate
20. Emergency response causes injury	<ul style="list-style-type: none"> Documented incident management process First aid hut on-site Trained first aid officers on-site 	Rare	Major	16	Moderate
21. Water balance effects production	<ul style="list-style-type: none"> Water supply agreements Effective mine water management system Documented water balance 	Unlikely	Major	16	Moderate
22. Inrush (water)	<ul style="list-style-type: none"> Effective mine water management system Hydrology and hydrogeology records Highwall bunding 	Rare	Major	16	Moderate
23. Working at heights	<ul style="list-style-type: none"> Fall from height restraints Education and training Use of scaffolding in accordance with relevant standards 	Rare	Major	16	Moderate
24. Failure to optimise coal resource	<ul style="list-style-type: none"> Detailed exploration records Mine scheduling/operation optimisation EM Plan/Plan of Operations 	Possible	Catastrophic	5	Extreme
25. Vehicle interactions on the haul road	<ul style="list-style-type: none"> Traffic management plan Speed limits and controls Radio communications Education and training Qualified drivers 	Unlikely	Catastrophic	7	High

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Health, Safety, Hazard and Risk



Hazard	Proposed Controls	Risk Profile		Risk Level	
		L	C	Value	Level
26. Transport incident relating to bus travel	<ul style="list-style-type: none"> Traffic management plan Speed limits and controls Radio communications Education and training Qualified drivers Coordination with external emergency services Bus maintenance 	Unlikely	Catastrophic	7	High
27. Health & safety impacts on the community	<ul style="list-style-type: none"> Traffic management plans including on and off site vehicle movement Fencing, buffer zones and vegetation screens to exclude community from site Communication with the community through community liaison group and newsletters etc. to inform the community of site activities 	Unlikely	Minor	21	Low
28. Environmental impacts on the community	<ul style="list-style-type: none"> Dust suppression through water trucks, enclosure of conveyor belts, dust extraction devices and use of vegetation screens Use of buffer zones and vegetation screening to reduce aesthetic impact Advertised blasting schedule and monitoring of blasts Noise reduction devices fitted to equipment as required Lighting control as required All water discharged in accordance to approved water management plan Traffic management plan includes vehicle movement on and off site to reduce unacceptable noise and dust Washing of all vehicles before they leave site to reduce spread of weeds Pest management program as required to ensure no increase in the number of feral animals in the area Community liaison group and complaints register to ensure information is disseminated to the community and their feedback is captured 	Unlikely	Moderate	21	Low

17.7 POTENTIAL IMPACTS AND MITIGATION MEASURES

17.7.1 Mine Health and Safety

17.7.1.1 Inductions

Any members of the public or staff that enter the site must complete a site induction. The induction covers environmental, health and safety aspects and rules that must be adhered to on-site. The Site Manager, IPCM, and the contractors Ascentis and Cook's, have different inductions, the content being dependent on the activities being conducted on-site by the staff member or visitor. The following section details the induction type carried out by the respective parties.

Note: All visitors, contractors and subcontractors are required to sign in and out at IPCM office. Alternative sign in/out procedures are initiated for remote workers.

IPCM

IPCM have one induction which covers all visitors, contractors & subcontractors. The content of the induction includes:

- Safety and Health Policy;
- Environmental Management;
- Operating Philosophy;
- Safety Requirements;
 - Fitness for work;
 - Incident/Hazard Reporting and Investigation;
 - Site Induction;
 - Power Tools and Ancillary Equipment;
 - Site Driver's licence;
 - Traffic Rules;
 - Housekeeping;
 - Pre-start meetings/toolbox talks;
 - Communications;
 - Motor Vehicles including Mobile Equipment;
 - Pre-start Inspections;
 - Working at Heights;
 - Authorisation to Operate Equipment;
 - Electrical Equipment;
 - Modification of Plant and Equipment;
 - Permit to Work;
 - Isolation Systems;
 - Lifting equipment;
 - Rigging and Slings Requirements;
 - Personal Protective Equipment; and
 - Emergency Procedures.

Ascentis CHPP

Visitor (10 minutes)

Visitors to the site will undergo a Site Area Familiarisation induction which includes:

- Emergency Procedures;
- Site Layout;
- Ablutions Facilities; and
- Restricted Areas.

Visitors will also be accompanied by unrestricted site personnel and all subcontractors/visitors that enter site must sign into the IPCM visitor's book on arrival.

Unrestricted (1 day)

This is only for permanent personnel and includes the Ascentis generic induction and all site operating procedures (SOPs).

Restricted Induction (2.5hrs)

- Ascentis generic presentation and assessment covering:
 - Site Rules;
 - PPE Requirements;
 - First Aid;
 - Duty of Care;
 - Ascentis SAFE System;
 - Fitness for Work;
 - Risk Assessment Processes and Hazard Management – Take 5's, JHA's;
 - Safety Observations; and
 - Environmental Management.
- Mine Traffic Rules presentation and assessment;
- Stockpile and Excavation Management and assessment;
- Tagging and Isolation and assessment; and
- Site Area Familiarisation.

Cook's Construction

- Mine operations overview.
- Emergencies.
- Isolation and tagging.
- Safety signage and barricades.
- Procedures and standards.
- General employee's information.
- Safety Management System overview.
- Hazard identification, risk assessment and control measures.
- Fitness for work.
- Environmental.
- Cultural Heritage.

- Mine traffic rules.

SOP's are required to be reviewed, assessed and signed off on for all of the above during the induction.

17.7.1.2 *Personal Protective Equipment*

Mine employees, contractors and visitors are supplied with the relevant and appropriate PPE for the tasks to be conducted on-site. These items are required to be worn during particular activities and in designated areas, as indicated by safety signage, and by wearing them, the residual health and safety risks are expected to be low.

17.7.1.3 *Physical Interaction with Equipment and Noise Levels*

All equipment at the mine is expected to comply with the relevant Australian Standards in regard to design and operating noise levels. All vehicles are and will be maintained and serviced regularly to ensure that they are operating consistent with their design.

17.7.1.4 *Fuel and Chemical Storage*

All fuels and chemicals on-site are and will be stored in accordance with AS1940, and managed in accordance with the provisions of their respective Material Safety Data Sheets (MSDSs)¹. Fuels and chemicals are appropriately bunded to minimise the potential for environmental harm. The site has spill response kits and, during inductions, personnel are trained in their use in the event of any spill.

Sedimentation dams have been designed to contain any spilled fuels or chemicals, where sediment would settle out and chemicals and fuels would be removed prior to reuse of water. Discharge points can be isolated to enable clean up on-site and prevent any contaminated runoff from leaving the site. With these controls in place, the potential health and safety risks would be relatively low.

Clean storm water is diverted away from the bunded fuel storage areas. Consequently, the risk of contaminated runoff to ephemeral waterways from spills is negligible.

The amount of diesel fuel stored on-site will increase with the throughput increase in the CHPP and the increased numbers of mobile plant on-site. An additional fuel storage will be located in the Expansion Area, doubling the storage volume at the existing Isaac Plains Coal Mine.

Table 17-4 provides a list of Dangerous Goods and Hazardous Substances that will be stored and used on the existing Isaac Plains Coal Mine site.

Table 17-4 Hazardous Substances and Dangerous Goods – Operations Phase

Chemical Name	DC Class	UN Number	Packaging Group	Purpose/Use	Indicative Volume Stored On-Site
Diesel Fuel	3 (Class C1)	1202	III	Fuel for CHPP and mobile equipment	Two additional separate facilities each containing 26 kL diesel.
Methyl Isobutyl Carbinol (MIBC)	-	2053	-	Frothing agent in CHPP	One additional 26 kL facility.

There is a low safety risk to adjacent land users, the general public, employees and the environment from fuel and chemical storage. Any potential on-site incidents involving the listed substances are able to be contained on-site and dealt with under the product spill contingency plans that are in place.

Fire fighting equipment is located adjacent to the chemical and fuel storage areas. In addition, the water trucks utilised on-site are fitted with a water cannon which also has foam capabilities for fire fighting.

¹ IPCM subscribes to a chemical database (Chem Alert) for the latest MSDSs.

17.7.1.5 *Vehicle Management and Hazards on the Road*

The existing Isaac Plains Coal Mine access road is designed in accordance with the *Coal Mine Safety and Health Act 1999* (CMSH Act) requirements. The road is appropriately graded, has speed restrictions and is regularly watered for dust suppression to maintain visibility. The additional access/haul road linking the Expansion Area to the existing Isaac Plains Coal Mine will be designed in the same manner.

Vehicles moving around the existing Isaac Plains Coal Mine are required to be fitted with two way radios, as will vehicles operating in the Expansion Area of the site. Training provided to existing Isaac Plains Coal Mine staff will also continue to be given to drivers over the entire IIPP site so that the vehicles are driven in accordance with the road rules prescribed for the site. A boom gate will be installed at the light vehicle access at the turnoff from the Peak Downs Highway onto the site access road to restrict access to authorised personnel only.

New visitors are required to undertake an induction before undertaking any work, with a specific induction and competency assessment undertaken by drivers prior to driving unescorted along the road. Required inductions are outlined in **Section 17.7.1.1**.

Hazards associated with roadside drainage lines and drops may contribute to haul trucks tipping over. To mitigate these risks roads will be appropriately designed, graded and watered with berms positioned near all drop hazards as required by guidelines issued by the Queensland Department of Mines and Energy (DME). By maintaining appropriate road conditions on the haul roads, along with driver education and training, the risk to drivers is comparable to driving on public roads.

During the three to six month construction phase a maximum increase of approximately 16 % in traffic movements (from the east) is forecast along the Peaks Down Highway between IIPP and Coppabella. The increase in traffic from the west is much less. To ensure optimal road conditions during this period, IIPP will make a one-off contribution to the upkeep of this section of road (i.e. no ongoing contributions are required). Once operations begin, the heavy vehicle numbers will stabilise at less than 3 % greater than the existing use. This is discussed in further detail in **Section 14**.

Consistent with current practice, IIPP operational employees will continue to be transported by bus between the camp/accommodation and their workplace, thereby potentially reducing the number of light vehicles on the road. This will also reduce the potential impacts associated with driver fatigue at the end of their shift. There will be a small number of local contractors driving from the west, particularly Moranbah who will travel to and from the mine site during construction activities using light vehicles. However, it is estimated that these will only approximate 5 % of movements per day.

17.7.1.6 *Train Load-out Facility*

The train load-out facility is an automatic process managed from a control room. Accordingly, any hazard to personnel associated with this facility is considered low.

17.7.1.7 *Power Infrastructure*

The principal infrastructure is in place to provide power to the Expansion Area, although additional power lines might be required. The task will be undertaken by qualified contractors who will employ the appropriate procedures and standards.

17.7.1.8 *Working at Heights*

Elevated items of plant such as conveyors at the existing Isaac Plains Coal Mine require operational and maintenance personnel to regularly work at heights. Standard operating procedures are in place for such activities and include measures such as the use of fall arrestor systems or elevated platforms to control the risk. Any further risks are assessed on a job by job basis and controlled through the job safety analysis (JSA) process.

17.7.1.9 Explosive Handling & Blasting

Minimal blasting is currently undertaken at the existing Isaac Plains Coal Mine site and minimal blasting will also be required in the Expansion Area.

All blasting activities are strictly regulated, are authorised by the IIPP Site Manager and are undertaken under strict mine site operating procedures. These procedures cover such activities as transport, loading and firing of explosives, and handling of misfires.

A number of mitigation measures are currently in place at the mine site, including control of access to the blast area and ensuring that the blasts are undertaken by suitably qualified personnel with appropriate knowledge and skill.

Transportation of dangerous goods to site will be carried out by a licensed transporter that operates in accordance with the Australian Dangerous Goods Code and the appropriate Australian Standard.

Minor amounts of explosives are stored on-site and are used in accordance to the relevant Queensland legislation (refer to **Section 2**) and AS2187.2-2006 *Explosives – Storage and use*. Relevant staff are trained in the storage and handling of these products.

Explosives are stored on-site in magazines which are separate from any activities on the mine and access/haul road, and protected from other activities on the site and any natural incidents such as flood, fire and lightning.

The location of the explosives magazine, designed to store 120 tonne of explosives for use in both the existing Isaac Plains Coal Mine and Expansion Area, is located in the north-east section of the existing Isaac Plains Coal Mine ML (refer to **Figure 1-2**). The magazine does not pose a risk to the public as it is approximately 8.5 km to the township of Moranbah, 6.4 km from the Peak Downs Highway and 2 km from the nearest residence. There is also a designated 1 km exclusion safety zone around the magazine.

17.7.1.10 Wildlife

The potential risk from wildlife hazards, such as snake bites, is assessed as low. Due to the amount of traffic using the access/haul road and the extent of activity at the mine infrastructure area in both the existing Isaac Plains Coal Mine area, including the CHPP, and the Expansion Area, it is unlikely that wildlife will be found in active work areas. Consequently, the frequency of exposure to these hazards will be low. Never the less, staff trained in first aid are present on-site.

17.7.1.11 Pest Management

Weed management practices are implemented at the existing Isaac Plains Coal Mine to address the spread of noxious weeds on-site. All vehicles which enter weed infested areas will be washed, inspected and free of pests prior to leaving the mine site. It is expected that all vehicles arriving on-site will be clean and free of contaminants prior to arriving. If other declared pest species (either flora or fauna) pose a significant problem to the mine operations, appropriate eradication and management measures will be taken.

17.7.1.12 Bush Fires

Bush fires can be expected at some time in the area, and the current Emergency Response Plan ensures that staff are trained in fire fighting during induction and thereafter on an annual basis. The existing Isaac Plains Coal Mine has on-site equipment dedicated to firefighting around its operational areas, as well as a water truck with a firefighting ability, including water cannon and foam capabilities. IPCM also has a 'Mine Rescue Trailer' fully fitted with the appropriate fire fighting equipment, breathing apparatus and vehicle crash equipment in accordance with the CSMH Act. Firefighting equipment, and other equipment, is tested and inspected regularly.

The area around the existing mine infrastructure has been cleared. A dedicated buffer of (approximately 100 m), has been left around the CHPP and mine infrastructure areas, meeting the requirements of SPP 1/03 – *Mitigating the adverse impacts of flood, bushfire and landslide*. A 100 m buffer will also be constructed around the infrastructure located in the Expansion Area.



There is ongoing communication with the adjacent landowners regarding fire breaks and ongoing maintenance programs to minimise the risk of bush fire.

Current bushfire management practices will be extended to cover the Expansion Area.

17.7.1.13 Emergencies

IPCM follows the Queensland Mines Rescue Service regulations and procedures and has a dedicated, fully trained, Mines Rescue Team. Those employees/contractors who form the team have full first aid qualifications.

17.7.1.14 Spontaneous Combustion

Empirical testing carried out on coal samples to date determined that the Leichhardt seam coal has a low to moderate propensity to spontaneously combust. As the mine progresses into the Expansion Area, additional sampling will be conducted to validate the propensity of the coal to combust. Gas evolution characteristics have been conducted on the coal samples to determine the temperature at which gases are produced.

Spontaneous Combustion in Coal Stockpiles

There is a low to moderate risk of spontaneous combustion occurring in coal stockpiles which could result in smoke and odour, however this is regarded as a low environmental nuisance effect to adjacent landowners given the large separation distances and relatively low volume of smoke (smouldering) and odour.

Spontaneous combustion fires in coal stockpiles usually begin as 'hot spots' deep within the pile of coal. The hot spots appear when coal oxidises. Heat generated by the oxidation then initiates the fire.

The following control measures are in place to prevent, identify and control spontaneous combustion in coal stockpiles.

- Visual inspections of the coal stockpiles are carried out during operations.
- Quick turnover of coal stockpiles will be conducted where possible.
- The training of personnel on-site in control procedures in case a stockpile fire occurs. Refresher training is carried out regularly.

There is adequate equipment and water to suppress any spontaneous combustion events on-site.

The additional ROM coal stockpiles required in the Expansion Area, will be subject to the same management procedures as the existing stockpiles.

17.7.2 Monitoring, Audits and Review

Part of the IPCM S&HMS systems and procedures involves monitoring, auditing and reviewing to assess whether the implemented health and safety measures on-site are being complied with and are effective. Data is maintained on health and safety issues such as near misses, objects falling, accidents, S&HMS systems and procedures non-compliance and general illness. The data is then monitored monthly by senior mine management.

The annual audit and review processes, assess and evaluate the effectiveness of the overall emergency systems, procedures, facilities, maintenance programs, equipment, training and individual competencies and provide opportunities for improvement and verification of satisfactory performance levels of key activities.

External audits will be carried out by an independent expert to ensure the adequacy of the implementation of the S&HMS, the procedures and monitoring. Weekly reviews are conducted on compliance issues on the site including spontaneous combustion. Milestone reviews are triggered by a number of different scenarios, for example, changes which may occur in geological conditions that could have an adverse effect on the mine environment or the introduction of new technology that will enhance the control of the mine atmosphere.



17.7.3 Training

Most existing Isaac Plains Coal Mine site employees and contractors are trained in basic first aid, fire training and the S&HMS at induction (as per the Queensland Coal Board generic induction).

The primary and secondary emergency response plans are incorporated in a comprehensive training strategy for staff, including:

- the identification and containment of the incident (e.g. fire fighting, spill control and containment);
- notification, i.e. internal and external communications (e.g. radio and telephone procedures); and
- mobilisation and deployment activities of staff (e.g. fire fighting and casualty management).

The existing Isaac Plains Coal Mine has an Emergency Response Plan (ERP) in place which will be duplicated in the Expansion Area. The critical elements of the ERP such as evacuation, emergency power and remote alarm systems are tested regularly.

All mine site personnel are inducted to the site and all contractors on-site will undergo a contractor induction prior to commencing work for relevant duties. All visitors are escorted by mine site personnel as discussed in **Section 17.7.1.1**. The induction program, which is competency based, covers the associated procedures in the S&HMS for personnel to do their duties.

Refresher training is a continuing process aimed at informing all employees, including contractors, of their duties associated with the S&HMS and procedures.

17.8 RAIL CORRIDOR – QUEENSLAND RAIL

17.8.1 Risk Assessment

Table 17-5 presents a qualitative risk assessment carried out for the transportation of coal from the IIPP. The number of coal trains will increase from three trains per week to six trains per week when the mine is producing approximately 4 Mtpa ROM coal. At the low level crossings on the minor roads, boom gates, signal lights and signage or adequate lines of sight are installed to ensure the risk of collision is reduced.

Table 17-5 Qualitative Assessment of Risk for Potential Rail Related Incidents

Potential Mining Incident	Public Risk	Environmental Risk	On-Site Risk	Severity Rating	Frequency Rating	Residual Risk
Level crossings	Yes		Yes	H	L	M
Train derailment	Yes	Yes		H	L	M
Unrestricted pedestrian crossing	Yes			H	L	M

17.8.2 Potential Impacts and Mitigation Measures for Health & Safety

The residual risk of a train derailment is moderate. The increase in rail traffic has been assessed as minimal and any increase in hazard will be adequately controlled. Train derailments occur for a number of reasons including:

- compromised ballast stability;
- heavy items on train lines; and
- rail line tampering.

Ballast stability can be compromised over time or by situations where strong water flows deteriorate the packing of the ballast. Regular inspection by QR personnel and maintenance can overcome this



risk.

Heavy items on the tracks such as fallen trees or tree limbs can be overcome by vegetation maintenance along the railway line to ensure that unstable trees and overhanging limbs are removed before they become a risk. The risk of rail line tampering is considered fairly low as it requires significant effort to undertake tampering with rail lines and such incidents are rare. QR has the responsibility of maintaining the safety of the rail line to Queensland Ports.

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18

COMMUNITY
CONSULTATION

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT



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18 COMMUNITY CONSULTATION

From the outset, IPCM have recognised the importance of consultation with, and involvement of, local stakeholders in the planning and approvals process for the IIPP.

This process has already commenced with the identification and early engagement of stakeholders in order to identify broad issues of concern. Communications with the local community and interest groups will extend from the planning phase, through the IIPP operations to final rehabilitation. This process may include meetings with Council representatives, interest groups and other meetings designed to encourage and facilitate community involvement and/or education in relation to the IIPP and open cut coal mining as a whole.

The ongoing community consultation process is also intended to include a review process which:

- provides the broader community with opportunities to provide input; and
- ensures that the various management plans evolve over time to reflect changing community values and advances in scientific knowledge.

The community and stakeholder involvement process provides an opportunity for community issues and concerns to influence the nature of the IIPP. All feedback will be recorded and, where appropriate, used to refine IPCM's management processes, monitoring and future rehabilitation efforts.

18.1 CONSULTATION OBJECTIVES

The objectives of the consultation program undertaken to date have been to:

- identify stakeholders and any issues;
- ensure open and transparent discussions with these stakeholders;
- provide open, transparent and factual information about the IIPP and any potential impacts;
- manage expectations to ensure that stakeholders understand the nature of the IIPP; and
- ensure stakeholder issues are addressed appropriately as part of this EIS process.

18.2 CONSULTATION PROCESS OVERVIEW

In the development of the EIS, IPCM undertook community consultation in order to adequately address the various environmental, social and economic interests of the community within Nebo and Belyando Shires. Consultation involved IPCM working with stakeholders to identify and work towards the objectives identified in **Section 18.1** and the achievement of the best practicable environmental, social and economic outcomes for the local community.

To date there have been two main phases to the consultation process, as described with the following sub-sections.

18.2.1 Phase 1 - Stakeholder identification - affected and interested persons and parties

This phase involved the identification of all relevant stakeholders in order to involve them early in the process. Stakeholders can be categorised into two groups; affected persons or parties and interested persons or parties.

Under the EP Act an ***affected person/party*** is:

- 'a person on the operational land or any land adjoining it (i.e. directly affected landholder);
- a registered native title body corporate;
- a registered native title claimant;
- a representative Aboriginal/Torres Strait Islander body; or
- a relevant local government for the operational land'.

The affected persons/parties for the EPA were identified as local property owners, Traditional Owners and surrounding companies.

An **interested person/party** is:

"a person proposed under Section 41(3)(b) of the EP Act; i.e. an unincorporated community or environmental body with a financial or non-financial interest in the local government area that the operational land is in".

The interested persons/parties for the IIPP were identified as the State and Commonwealth Agencies, Non-Government Organisations and Community groups.

The list of affected and interested persons/parties was initially developed through research on the project area and through discussions with the EPA. This list is provided below.

18.2.1.1 Affected Persons/Parties

Property Owners

sch4p3(3) Prejudice the protection of an individuals right to privacy

Traditional Owners

- Barada Barna, Kabalbara and Yetimarla People (BBKY)

State Controlled Land - Peak Downs Highway

- Department of Main Roads
 - Rockhampton
 - Mackay
 - Brisbane

Others

- Kumba Australia Pty Ltd
- Arrow Energy NL Pty Ltd
- Anglo Coal (Grosvenor) Pty Ltd
- Exxaro Australia Pty Ltd
- BHP Mitsui Coal Pty Ltd

18.2.1.2 Interested Persons/Parties

- Department of Natural Resources and Water
 - Mackay
 - Brisbane
- Department of Mines and Energy - Rockhampton
- Department of Local Government, Planning, Sport and Recreation
 - Mackay
 - Brisbane
- Department of Communities - Mackay
- Queensland Health - Mackay
- Queensland Transport - Townsville
- Agforce – Brisbane
- SunWater – Biloela

- Nebo-Broadsound Landcare Group – Mackay
- Capricorn Conservation Council – Rockhampton
- Nebo Shire Council – Nebo
- Belyando Shire Council – Moranbah
- Department of Housing – Brisbane
- The Coordinator-General – Brisbane
- Environmental Protection Agency – Emerald
- Department of Emergency Services - Brisbane
- Queensland Health
- Department of Primary Industries and Fisheries – Rockhampton
- Queensland Police Service, Central Police Region – Rockhampton
- CHRRUP – Emerald
- Fitzroy Basin Association – Rockhampton
- Sunfish (Queensland) – Mackay Regional Branch
- Clermont Fish Stocking Group Inc.
- Emerald Fish Stocking Group Inc.
- MacKenzie River Fish Stocking Association Inc.

18.2.2 Phase 2 – Scoping and Stakeholder Contact

The objectives of this phase were to:

- initiate contact with stakeholders to identify any issues or concerns; and
- provide information on the IIPP and the EIS process (refer to **Section 1**).

Consultation conducted to date to meet the objectives of Phase 2 has included meetings with stakeholders and the distribution of the draft ToR for the IIPP.

The following meetings/discussions with targeted stakeholders have been conducted to date.

- Meetings with affected landowners (initially in January, 2005 – several meetings were held with landowners to discuss various issues regarding the existing Isaac Plains Coal Mine and the IIPP including the proposed alignment of the access/haul road since this initial meeting) and a discussion about the draft ToR (22 June, 2006). A site tour was also conducted at the request of one of the landholders on 30 October, 2006.
- Discussions in Canberra with DEWHA on the need for a referral for the Expansion Areas under the EPBC Act (22 May, 2006). (Note: a referral for the existing Isaac Plains Coal Mine was made and deemed not a controlled action on the 6 May 2005).
- Meeting with EPA Emerald to discuss IPCM's intentions in relation to the Expansion Area, IIPP and the assessment process (12 July, 2006).
- An initial meeting with the BBKY (8 August, 2006).
- An initial meeting with the Wiri #2¹ applicants (8 August, 2006).
- Site inspection with Belyando Shire Council (18 September, 2006).
- Meeting with Anglo Coal regarding the location of the access/haul road for the IIPP (8 November, 2006).

¹ The Wiri People do not currently have a registered Native Title Claim.



- Meeting with Arrow Energy regarding the access/haul road and MLAs (8 November, 2006).
- A site inspection with EPA officers (22 November, 2006).
- Receipt of letter from lawyers acting for the Wiri #2 applicants regarding the desire to participate in the CHMP development process (28 November, 2006).
- Discussions with the DMR on the impact of the IIPP on SCRs (December, 2006).
- Discussion with EPA Emerald regarding comments on the draft ToR (17 January, 2007).
- Discussion with J Torpy and P Freeleagus regarding comments from Belyando Shire Council on the draft ToR and discussion of planned subdivisions in Moranbah (15 February, 2007).
- Site inspection with Nebo Shire Council (8 March, 2007).
- Meeting with neighbouring tenement holders, Anglo Coal, regarding diversion options for Conrock Gully (22 March, 2007).
- IPCM initial contact with QR (23 March, 2007).
- Meeting with Frank Budby, BBKY, regarding cultural heritage surveys (26 March, 2007).
- Meeting with EPA Emerald to discuss EIS (11 July, 2007).
- Site familiarisation visit/meeting with Moranbah Police and Ambulance Service to provide details on the existing Isaac Plains Coal Mine layout and to inform them of the proposed Expansion Area (3 August, 2007).
- Meeting with BBKY (10 August, 2007).
- EPA Emerald Site Inspection (29 August, 2007).
- A number of discussions with Anglo Coal and Exxaro regarding the location of the access/haul road and diversion of Conrock Gully as part of the IIPP EIS (August to October, 2007).
- Deliver Draft EIS to EPA Emerald and meeting with Glen Schulz (IIPP EIS EPA Coordinator) (6 September, 2007).
- Meeting with EPA Emerald to discuss comments on Draft EIS (2 October, 2007).
- Meeting with Frank Budby, BBKY to discuss the EIS (30 October, 2007).
- Meeting with Arrow Energy regarding access/haul road and MLAs (8 November, 2007).
- Meetings with DNRW Rockhampton to discuss comments on the EIS and propose solutions to hydrogeology and hydrology issues raised (22 April and 24 April, 2008).

In addition to the above meetings, numerous phone calls have ensued with the EPA regarding the preparation of the IAS, ToR and EIS.

18.2.3 Terms of Reference

The draft ToR for the IIPP was advertised on the 4 November 2006 and available for public comment from 6 November to 15 December 2006 (inclusive). The draft ToR was also posted out to those stakeholders listed in **Section 18.2.1** either in hard copy or CD ROM format and available for viewing on both the EPA and Matrix+ websites.

During the public comment period, the EPA were responsible for the collation of comments from stakeholders, at the completion of which they were provided to Matrix+ for consideration in the development of the Final ToR. A total of 13 submissions were received on the draft ToR. The Final ToR was provided by the EPA on 23 March 2007.

IPCM have considered comments from meetings and the draft ToR submissions in the design of the IIPP.

Following the release of the final ToR for the IIPP, the EPA recommended the addition of the following affected and interested parties for the next stage of consultation, i.e. the release of this EIS:

- affected persons/parties;
 - BHP Mitsui Coal Pty Ltd;
- interested Persons/Parties;
 - Sunfish (Queensland) – Mackay Regional Branch;
 - Clermont Fish Stocking Group Inc.
 - Emerald Fish Stocking Group Inc.
 - MacKenzie River Fish Stocking Association Inc.

18.2.4 EIS

The EIS was forwarded to the EPA on the 5 September 2007 and amended on the 16 October 2007. A letter from the Director of the Integrated Assessment Branch of the EPA, dated 24 October 2007 confirmed the decision by the chief executive to allow the EIS to proceed to the public notification stage of the EIS process.

The EIS public comment period, commencing Monday 12 November and ending on Tuesday 8 January 2008 (30 business days²) was advertised in the public notices section of the Mackay Daily Mercury, Mid-Week and the Courier Mail on Saturday 10 November 2007. The comment period was informally extended, at the discretion of the EPA, to Tuesday 19 February 2008 to allow for further collation of stakeholder comments.

The Public Notice provided the following information:

- the location of the EIS for inspection: Nebo Shire Council, Moranbah Town Library, EPA Emerald and EPA Brisbane;
- how to purchase or download a copy of the EIS;
- how to submit written comments on the EIS; and
- the time, date and location of EIS public display days for affected and interested persons to come and discuss the EIS and its content: Moranbah Community Centre, Saturday 17 November and Nebo Town Hall, Sunday 18 November 2007. NB: No attendees were recorded for either EIS public display day.

Consultation during the EIS comprised the following:

- an open day workshops during the public comment period on the draft EIS, where the community were invited to meet with the EIS Consultant and IPCM personnel to ask any questions about the project. No community members or other stakeholders attended either open day;
- a presentation of the IIPP EIS findings to government agency stakeholders in Mackay on Friday 7 December 2007;
- a meeting with Belyando, Nebo and Mackay Councils on Tuesday 11 December 2007;
- a meeting with DNRW on 14 December 2007; and
- telephone discussions with various stakeholders regarding the content of the EIS throughout the public comment period.

² NB: Those days between 20 December and 5 January are not counted as business days by the EPA.



18.2.4.1 EIS Submissions

A total of 16 formal submissions providing comments on the EIS were made. These were received from:

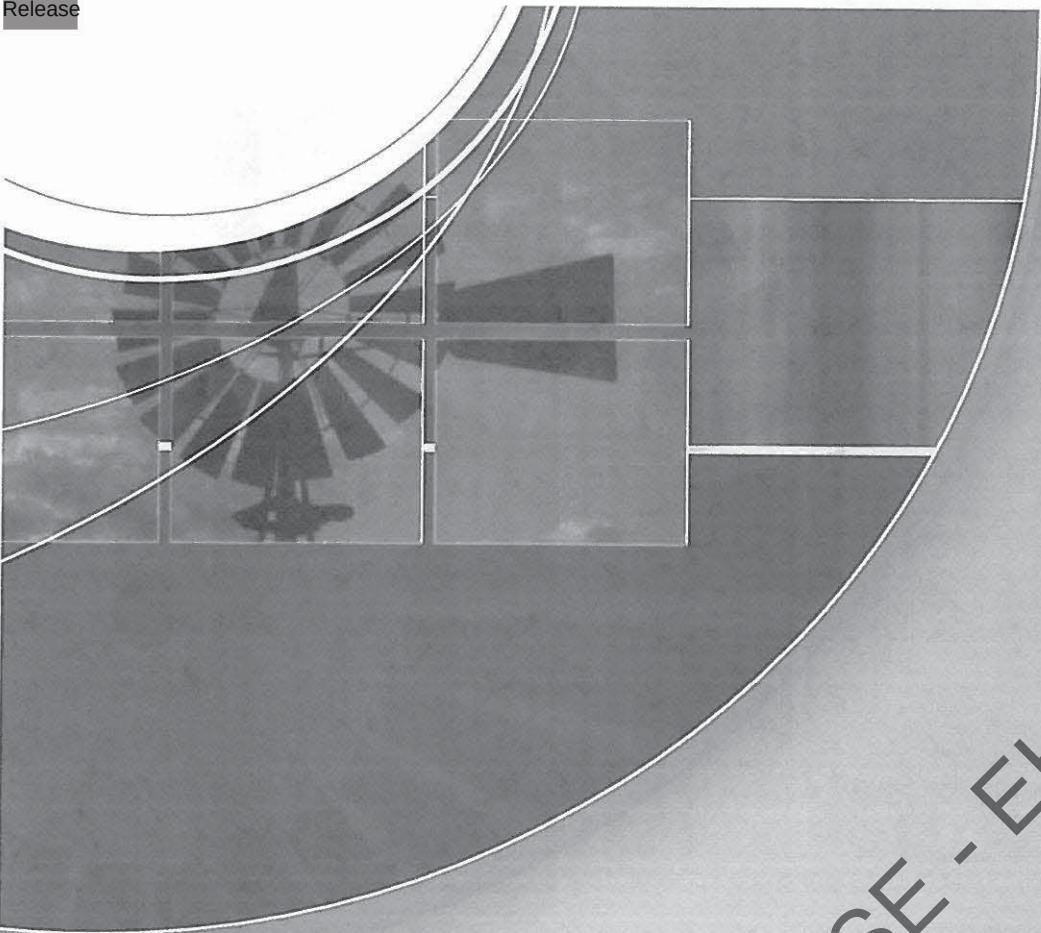
- Environmental Protection Agency;
- Belyando Shire Council;
- Nebo Shire Council;
- Department of Primary industries and Fisheries;
- Department of Main Roads;
- Fitzroy Basin Association;
- Department of Mines and Energy;
- Queensland Police Service;
- Department of Natural Resources and Water;
- Department of Housing;
- Department of Communities;
- Department of Infrastructure and Planning x 2;
- Department of Emergency Services; and
- Department of Transport; and Anglo Coal (Grosvenor) Pty Ltd.

Stakeholder comments that are relevant have been addressed in this Final EIS.

A number of other submissions were made by the community under the cover of Belyando Shire Council, the majority of which were in petition format. One submission related to the content of the EIS directly, however the remaining comments made were not specifically related to the EIS but broadly discussed issues within the township as a whole. Despite this, the issues deemed relevant to the IIPP have been addressed.

18.3 FUTURE CONSULTATION

One-to-one meetings will be conducted with individual stakeholders, as necessary, throughout the life of the project.



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19

REHABILITATION &
DECOMMISSIONING

INTEGRATED ISAAC PLAINS PROJECT
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19 REHABILITATION AND DECOMMISSIONING

19.1 REHABILITATION

The physical disruption of overburden during the mining process has the potential to change the nature of spoil materials and their interaction with the surrounding environment in a number of ways. Changes which may occur are outlined below.

- Exposure of unweathered material to oxidation processes near the post-mining landform surface can result in the release of oxidation products which are prone to transport by surface runoff or infiltration (e.g. salts and acid).
- Soils and rock expand when loosened through blasting and of excavation and swell by approximately 30%. This is often referred to as a bulking factor. Therefore, the overburden material excavated and disposed of in the spoil dump will swell to a volume approximately 1.3 times that of its *in-situ* or unmined volume. As a result, not all spoil can be contained within the mined out excavations leading inevitably to slopes and elevated areas above the original landform. The post-mining material will also have a higher initial porosity than the original *in-situ* spoil. Some residual settlement is expected, but this will have little effect on the final landform.
- A vegetation growth media on the surface of a landform that is different to that which was present prior to mining can alter the capability of native vegetation communities to re-establish.
- Surface spoil can have a poorer nutrient status, lower organic matter content and poorer structure compared to the original soil hosting vegetation communities. Poorly structured and dispersible materials will be prone to erosion, particularly on slopes.
- Impacts on surface and groundwater in and around the proposed mining activities. These impacts are further discussed in **Section 6**, and **Section 7**.

Thus, rehabilitation of mined lands is an important component of any mining project. A progressive rehabilitation program has commenced at the existing Isaac Plains Coal Mine. This program will be extended to cover the proposed Expansion Area and will continue throughout the mine life of the entire IIPP. The program will consist of detailed planning and design of post mine landforms, followed by the implementation of rehabilitation activities including erosion control management and design for long-term geotechnical stability.

The EPA Guideline 18: *Rehabilitation requirements for mining projects* provides information on both progressive and final rehabilitation requirements for mining projects operating in Queensland under the provisions of the EP Act.

IPCM is committed to the four general rehabilitation goals listed in the Guideline, i.e. that the rehabilitated landform be:

- safe to humans and wildlife;
- non-polluting;
- stable; and
- able to sustain an agreed post-mining land use.

The IPCM rehabilitation operating philosophy is based on the following concepts:

- design earthworks and revegetate to a predetermined post mine land use;
- minimise unnecessary land disturbance;
- minimise erosion and its potential off lease effects;
- protect downstream water quality from contaminated runoff;
- recognise and protect downstream beneficial uses (surface and groundwaters); and
- on relinquishment of title, ensure the agreed post-mine land use has been reached.



Other references used in the development of this section include:

- Environmental management policy for mining in Queensland 1991 (DME, 1991);
- A policy framework to encourage the progressive rehabilitation of large mines 2004 (EPA, 2004); and
- Technical guidelines for the environmental management of exploration and mining in Queensland 1995 (DME, 1995).

19.1.1 Land Disturbance

Mining the existing Isaac Plains Coal Mine will disturb up to approximately 45 ha per annum of land over the 15 year mine life. The land disturb in the Expansion Area is estimated to be 53 ha per annum. The total area of disturbance for the IIPP is estimated at approximately 1,477 ha.

It was initially thought as part of the EAR for the approval of the existing Isaac Plains Coal Mine, that rehabilitation would not keep pace with disturbance (i.e. typically lags by 2-3 years), however, rehabilitation has already commenced at the existing Isaac Plains Coal Mine during the first six months of operation and it is expected that the annual rehabilitation rate will generally keep pace with disturbance, dependent on spoil availability, financial and weather considerations.

Areas subject to operational constraints (e.g. adjacent ramps, pre-strip dumps), which prevent re-contouring, will be rehabilitated once the operational constraints have been removed. Detailed rehabilitation schedules and life-of-mine rehabilitation plans will be provided in the Plan of Operations for the IIPP.

19.1.2 Post-Mine Land Use

The overriding rehabilitation principle for the IIPP is that the land will be returned to an agreed post-mine land use that will be stable, self-sustaining and maintenance free.

Based on the findings of the soil and land suitability assessment (refer to **Section 5**), the post-mine land use for areas disturbed by IIPP mining activities will be a self-sustaining native vegetation using appropriate native tree, shrub and grass species based on site specific trials carried out during progressive rehabilitation¹. The rehabilitated mine areas will aim to be complementary to the nearby remnant vegetation to facilitate regional conservation. Other areas, not disturbed by the mine pit, could be returned to the pre-mine grazing user land as long as the rehabilitated spoil areas are fenced off from cattle. Appropriate conditions of use on the affected areas, e.g. the nomination of a stocking rate on suitable rehabilitated land, grazing excluded areas etc, will be negotiated with the landholder prior to end of mine life.

19.1.3 Post Mining Landform Design

The design of the out-of-pit and in-pit spoil dumps is based on the need to store spoil in a managed and environmentally controlled manner which will allow efficient and safe on-going mining operations and which is consistent with final rehabilitation objectives. These objectives primarily aim to:

- maintain low soil losses consistent with adjacent lands of equal land capability by encouraging a self-sustaining vegetation cover on all landforms;
- limit erosion potential through reduced slope lengths or design and implementation of appropriate erosion control measures; and
- minimise off-site impacts.

¹ The criteria for achieving a self-sustaining vegetation community is currently being developed with progressive rehabilitation having commenced at the existing Isaac Plains Coal Mine. The rehabilitation design proposed below will be used as a trial until monitoring results indicate positive outcomes.



In addition to the above, additional landform design criteria have been developed for the Expansion Area pit adjacent to the Isaac River. These include:

- minimise the risk that Isaac River floodwater overflows into the final void; and
- minimise the duration of an open pit in the alluvial material, thereby reducing the inflow of water that may be contained within the alluviums into the pit (refer to **Section 7.1.6.1** for a discussion on the occurrence of groundwater in alluvium).

In addition the infrastructure, such as dams and levees, on the site that may require long term maintenance will be minimised.

~~Based on the experience of other operating mines in the Bowen Basin a conceptual landform design was developed for the existing Isaac Plains Coal Mine as part of the existing approval in 2005. A notable feature of this design was the concept of a ponded landform to provide micro-habitat within the spoil dumps. However, this concept has been revised based on recent advancements of landform design practices in the Bowen Basin while also using information collected since operations commenced. The ponded landform concept is no longer used for the existing Isaac Plains Coal Mine and is no longer proposed for the Expansion Area.~~

Runoff from the out-of-pit dump batters will drain away from the spoil dumps through a system of appropriately designed sediment control structures and then into the site release dams. The crest and plateaux of the dumps will be shaped to mimic the pre-mine landform of undulating topography common to the Brigalow Belt with internal drainage to the final void.

The landform design will continue to evolve as more data is collected through operations.

Outer spoil slopes in the Expansion Area are expected to be reshaped initially to 6:1 to assist in controlling erosion which may result from the minor amount of dispersive spoil. ~~Bunds will be constructed at the base of the outer slope to capture suspended solids. Low wall slopes will be left at the angle of repose, as is the case at other operations. Internal slopes, such as ramps will be battered back on an as required basis. Further site specific investigations will assist in refining the rehabilitation design criteria and success.~~

The geochemical test work for the Expansion Area (refer to **Section 13.5.1**) indicates that the spoil material varies from non-sodic to moderately sodic. During the operational phase of the IIPP, a spoil material testing program will be implemented to control placement of problematic spoil materials. The mine plan will ensure the placement of sodic materials at depth away from the surface and the root zone for rehabilitating vegetation to prevent them being exposed to the atmosphere.

~~Final voids will remain at the end of mine life for the existing Isaac Plains Coal Mine as originally proposed in areas above the Probable Maximum Flood (PMF). All open cut pit areas below the PMF will be backfilled and protected by a flood protection levee built to the level of the PMF. However, to prevent flooding of the final void, the originally proposed mine plan for the Expansion Area has been revised to backfill the northern section of the void. Further details are provided in **Section 19.1.6**.~~

Final landform designs for the ancillary infrastructure areas (i.e. other than the mine pit), such as the plant and buildings, access/haul roads and the rail-loop will be based on decommissioning the plant and equipment and re-profiling the base to match the original pre-mining landform, with contour ripping, topsoiling and revegetating to encourage a vegetative cover. The objectives of the post-mine land use are to ensure that the:

- post-mine rehabilitated areas are self sustaining and require no ongoing maintenance while protecting the physical and biological integrity of the surrounding environment after mining activities have ceased; and
- existing and potential beneficial uses of the area are preserved where possible after mining activities have ceased.

Unless required by the landowner, water storages will be removed in a similar manner. The section of levee adjacent to the Isaac River, to the east of the highwall, will be re-profiled to blend in with natural surface. The decommissioning of levees is further discussed in **Section 19.2.5**.



19.1.4 Conceptual Post-Mining Landform Drainage

The conceptual post-mining landform drainage is illustrated on **Figures 19-1 to 19-5**. The final landform drainage system will be subject to detailed design as part of future detailed mine closure planning. Amendments to the conceptual design will be made as necessary at that time to address detailed design issues.

The overburden emplacement will drain externally with runoff being controlled by contour ripping and contour drains. The contour drains will be standard, open cut rehabilitation contour drains constructed by cut and fill, using a grader or small bulldozer. Drain cross sections will be sized to convey runoff from the 20 year average recurrence interval (ARI) rainfall event. The drains will have a 1% grade and will have typical spacings of approximately 100 m to limit the effective contributing catchment areas.

Drainage at the toe of the overburden dump, around the perimeter of the final landform, will be collected in a table drain as illustrated in **Figures 19-1 and 19-5**. These drains will convey runoff from the overburden emplacement to the surrounding natural drainage system via a series levee culverts fitted with flood gates. The flood gates will ensure the integrity of the PMF levee is maintained during any extreme flood events. Standard sediment and erosion will be installed the establishment phase of final landform drainage structures. Once drainage infrastructure has established grass cover, erosion sediment controls will be decommissioned.

19.1.4.1.5 Progressive Rehabilitation

The rehabilitation philosophy of the mining operation is to rehabilitate available disturbed active mining areas at approximately the same rate as they are disturbed. The first activity associated with mining of the Expansion Area will be clearing vegetation and topsoil recovery.

During the first two years, before steady state operations are reached, all topsoil recovered will be used for rehabilitation of completed and available site works and box-cut spoils, or stockpiled for future use.

Reshaping of the dumps will commence within 18 months of an area becoming available for rehabilitation. As discussed previously, rehabilitation of disturbed areas at the existing Isaac Plains Coal Mine has already commenced (refer to **Plate 19-1** and **Plate 19-2**) well ahead of the proposed rehabilitation schedule.

Truck and shovel methods of operation allow dumps to be reshaped on placement and revegetated in a shorter time frame. In general, steady state conditions will not be reached for topsoiling and revegetation until the fourth strip is being mined, however, rehabilitation of the outer slopes of the box-cut a out-of-pit spoil is available can commence earlier.

Dumping of pre-stripped material in the spoil will be included in the mine plan for the IIPP. Most initial box-cut spoil will be dumped adjacent to the low wall of the mine, with pre-strip spoil placed into spoil 'valleys' approximately two strips behind the mining face. The bulking factor (approximately 30%) of the spoil material will create a final landform profile up to 40-60 m above the original topography within the footprint of the mining area. The out-of-pit dump will also swell to a similar height above the natural surface level. The potential for visual amenity impacts from the final mine landform are discussed in **Section 12**.

To minimise the erosive mechanisms of surface water runoff accelerating over long slopes, the landform slope length will be reduced by contour banks and associated erosion control measures such as overfall structures and chutes, lining, and pipe drops as may be necessary. The detailed landform design will create a drainage pattern that reduces slope length and directs the water drains in a controlled manner.

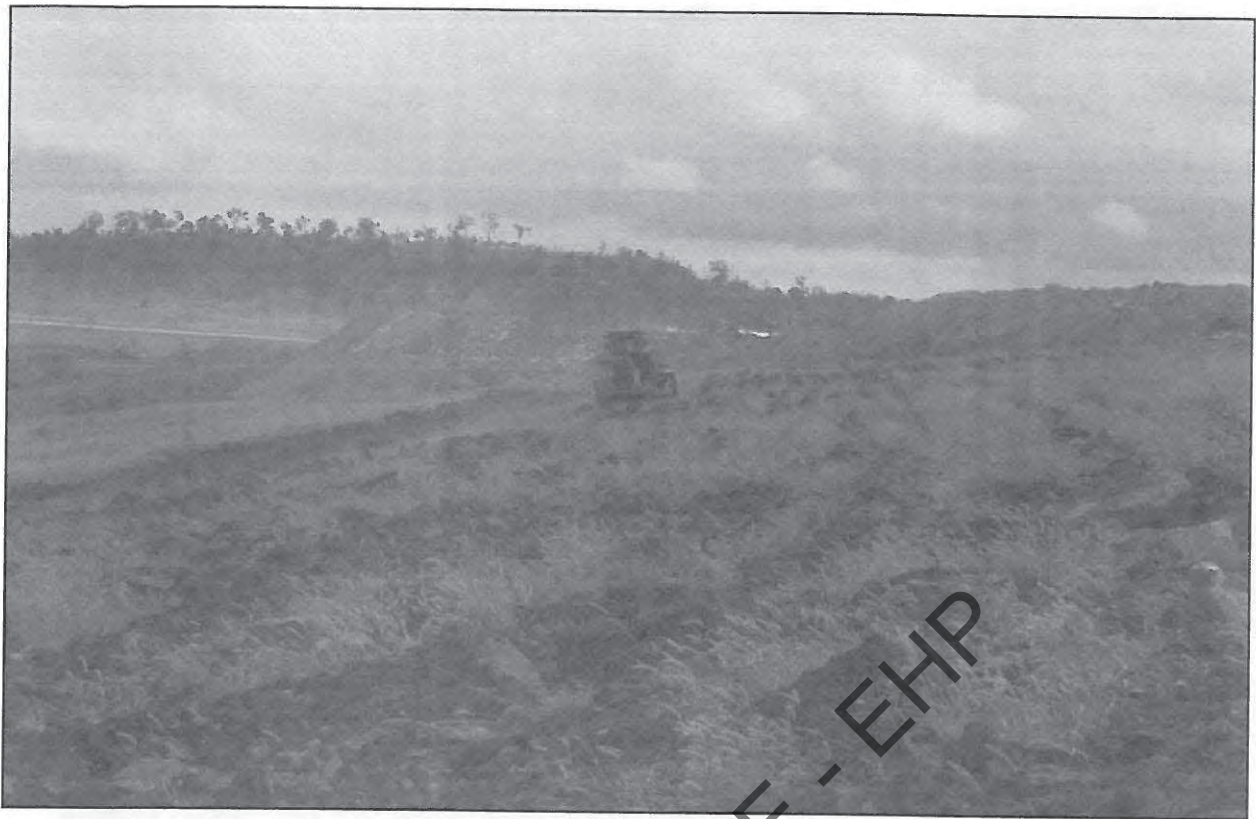


Plate 19-1 Progressive Rehabilitation at the existing Isaac Plains Coal Mine

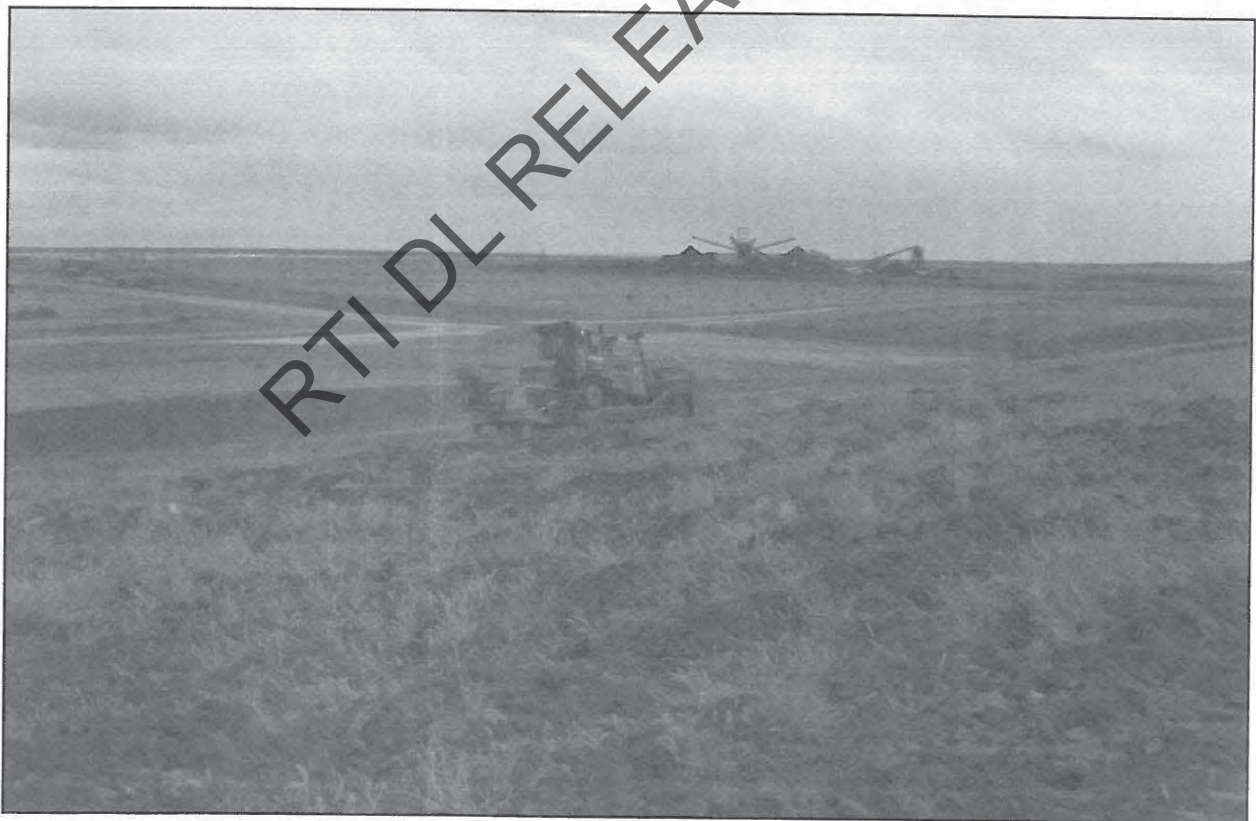


Plate 19-2 Progressive Rehabilitation at the existing Isaac Plains Coal Mine

19.1.519.1.6 Rehabilitation Design Criteria

As described above, the IIPP rehabilitation design is based on the following design criteria.

- Outer dump slopes will be designed at no greater than 16 % (also known as 1V:6H) or 10° until site specific trials indicate alternative design options. The outer pit dump slopes will have maximum slope lengths between graded banks conforming to current best practice. External slopes will drain to sedimentation dams.
- The surface of waste dumps will be shaped to mimic the original gently undulating landform to promote a self sustaining native ecosystem. Surface run-off will be directed towards appropriately lined drains.
- The low wall of the final void will remain as dumped (angle of repose) and will be benched as required. The low wall drains will drain internally to the final void.
- Highwall slopes in geotechnically stable ground, which have not been mined, will remain at their final batter angles (typically 70° based on geotechnical investigations to date) and will be made safe to ensure the safety of humans and animals.
- The coal seam in highwall will be sealed using spoil.
- A perimeter stormwater diversion drain to divert clean water from disturbance areas will be designed and installed (as per mine water management plan, refer to **Section 6.7.2**).
- The section of the final void in the Isaac River floodplain will be backfilled up to the 202 m AHD contour level of the PMF (refer to **Figure 19-1**), which is equivalent to the 1 % AEP plus 1 m to ensure there are no final voids within the post-mining floodplain. To minimise the risk of the Isaac River overflowing into the final void and drawdown of the alluviums. Further information is provided in **Section 19.1.6**.
- The perimeter of final voids will be fenced and appropriately signed to restrict access.
- Surface runoff from all rehabilitated areas will pass through sediment control structures to reduce the amount of final sediment loads reporting to watercourses near the IIPP, i.e. Smoky Creek, and the watercourses known locally as Billy's Gully and Conrock Gully to current EA discharge levels (refer to the EM Plan provided in **Section 20**).

The final design criteria will be developed following further engineering investigations.

19.1.619.1.7 Final Voids and Ramps

The conceptual final landform including the final void and final spoil dump layout is illustrated in **Figures 19-1 to 19-5**. At the completion of mining, open cut pit areas below the level of the Probable Maximum Flood (PMF) will be backfilled with spoil. These areas will also be protected by a flood protection levee built to the level of the PMF.

This arrangement will ensure that there is a low risk of flooding of the final void with Isaac River flood water and that the decommissioned will be stable in the long term. Typically, at open cut mines in the Bowen Basin, the last strip is left as a final void as there is no further overburden to fill the void and it is not economically feasible to push spoil back into the void. Consequently, final mining voids will form a significant feature of the post-mining land form. However, as described below, the northern section of the Expansion Area pit will be backfilled to minimise the risk of the Isaac River flooding the void.

Feedback received on the EIS raised concerns over the risk of failure of the highwall levee allowing migration of an erosion channel into the Isaac River. The need for such assessment has been highlighted to some extent by the levee failure that occurred at the Ensham mine during extreme weather in the period since the EIS.

To reduce the risk of overtopping the levee and flooding the final void, the final void design has been amended.



As mining progresses, the open voids that were to be left at the north of each strip, behind the levee, will be filled with spoil to the top of the levee and the slope battered back to the height of the spoil dump. The angle of slope and rehabilitation of this slope will be as per the outer slope of the box cut. A cross section of the conceptual design for the arrangement described above is illustrated in **Figure 19-2**.

The Expansion Area final void, that runs perpendicular to the Isaac River, will be progressively backfilled from north to south, following mining, for approximately 1.2 km along its length (refer **Figure 19-1**) by battering back the low wall until the backfill ground level exceeds the designated flood immunity level of 202 m AHD as illustrated by cross section in **Figure 19-3** and long section in **Figure 19-4**. The flood levee will remain in place. Backfilling to the 202 m AHD contour provides flood immunity for the 1 % AEP plus 1 m, which is estimated to provide immunity for the 0.5 % to 0.1 % AEP, as discussed in **Section 6.7.6**. The backfill spoil will be rehabilitated in a similar manner to the box cut outer slope to minimise erosion and undercutting by any potential floods. Finally, the highwall levee will be removed.

To achieve this level of flood immunity a large volume of material will need to be pushed into the void at considerable cost. At a length of 1.2 km, a width of 70 m and depth of approximately 80 m, the volume required is in the order of 7,000,000 m³. The movement of this amount of spoil is considered necessary in this instance to remove the threat of flooding the pit and provide a long term self sustaining landform.

As shown in **Figure 19-1** and illustrated in **Figure 19-5** the pit south of the 202 m AHD will be left as a final void. The rehabilitation strategy for the final voids is to seal the exposed seam in the highwall with spoil, leaving the low wall in its 'as dumped' position. However if this proves to be geotechnically unstable the low wall will be regraded. The high wall will remain as is, and be fenced. Existing ramps, accessing the voids, will be left and the sides benched to allow rehabilitation (**Figure 19-4**).

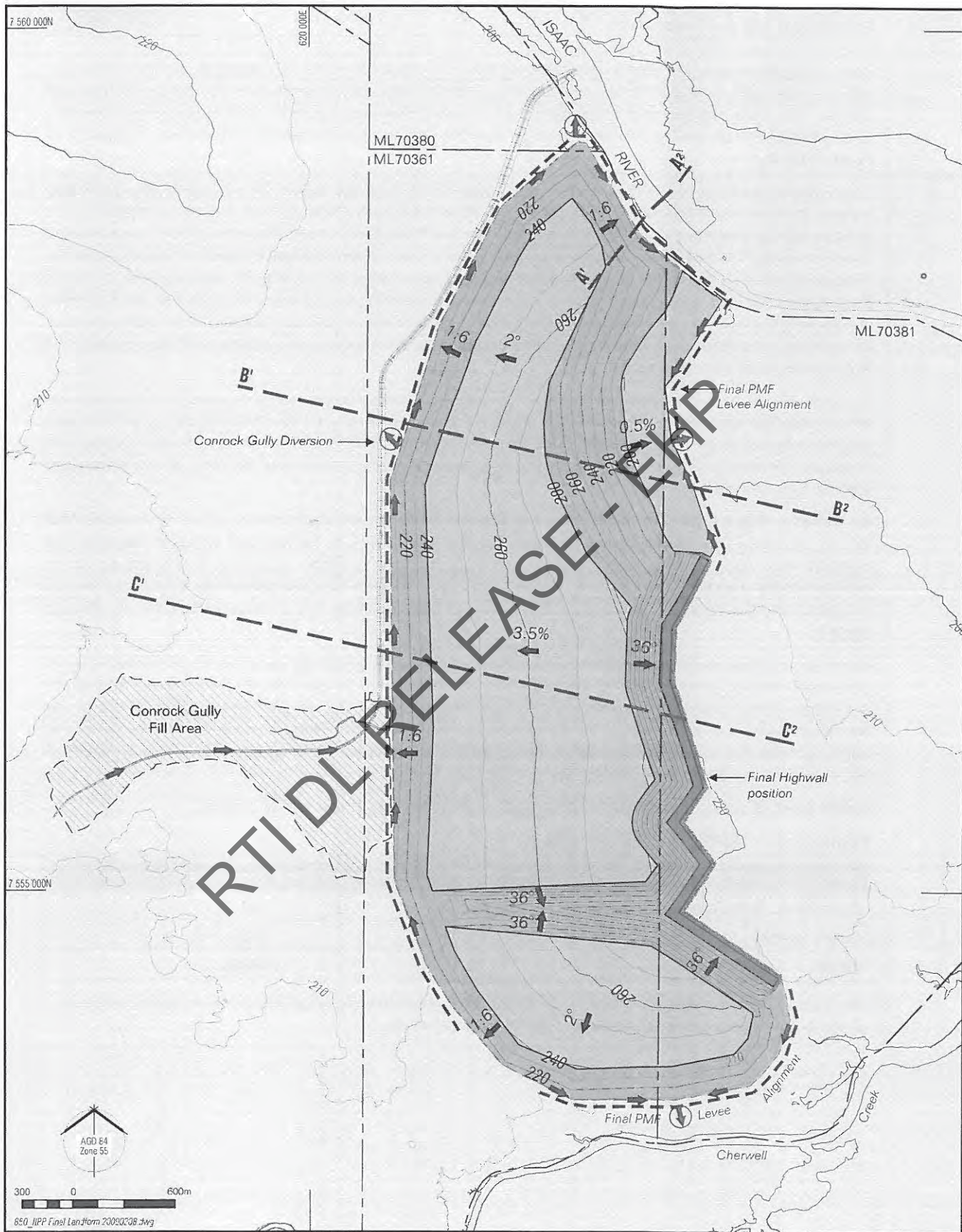
There is some risk during operations of overtopping the short length of levee where backfilling will not occur until mining progresses (i.e. the 70 m width of levee where the final void runs perpendicular to the Isaac River) should an event greater than the 0.5 % to 0.1 % AEP occur. This would be an operational risk for IPCM (i.e. loss of ability to mine while the void is dewatered while meeting appropriate water quality standards) as the appropriate machinery and equipment will be available on site to repair any damage to the levee.

Table 19-1 provides a summary of final void areas to remain at the end of mining.

Table 19-1 IIPP Final Void Areas

Mine Area	Void Area (ha)
Existing Isaac Plains Coal Mine	37
Expansion Area	2686
TOTAL	63123

The backfilling of the length of final void in the Expansion Area, as described above, takes up an area of some 8.4 ha, thereby reducing the area of the final voids.



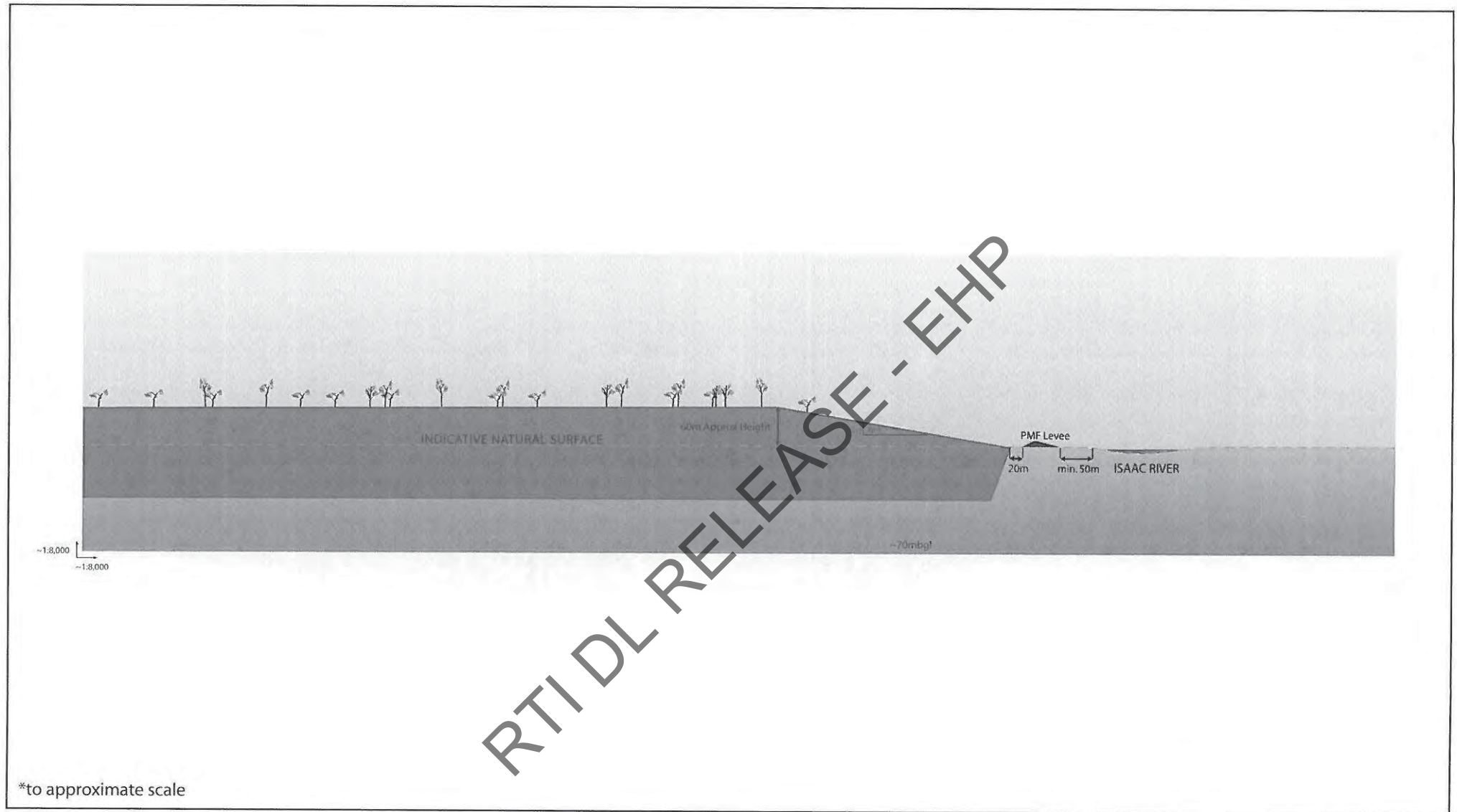
	ML Boundaries		Cross Section
	Surface Contours (5m interval)		PMF Final Levee Alignment
	Spoil Toe Drain		Proposed Final Void
	Culverts / Flood Gates		Rehabilitated Spoil
			Conrock Gully Fill Area



INTEGRATED ISAAC PLAINS PROJECT

Isaac Plains
Plan View Final Landform

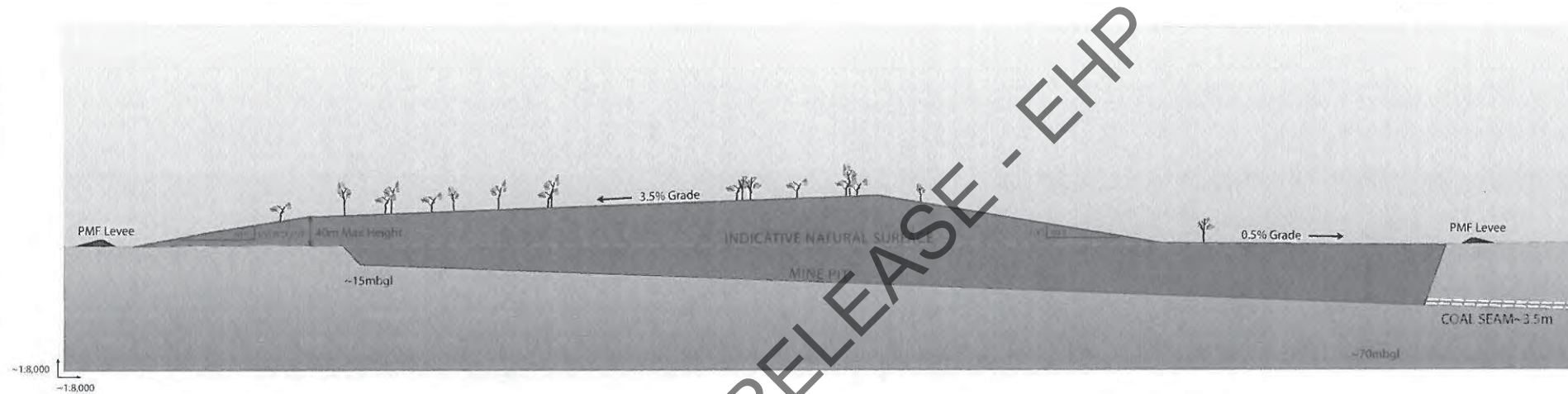
FIGURE 19-1



**Conceptual Final Landform
Cross Section A¹ to A²
Looking Upstream**

**Isaac Plains Coal Management Pty Ltd
Integrated Isaac Plains Project**

Figure 19-2



*to approximate scale

**Conceptual Final Landform
(north of 202m AHD contour)
Cross Section B¹ to B² Looking Upstream**

**Isaac Plains Coal Management Pty Ltd
Integrated Isaac Plains Project**

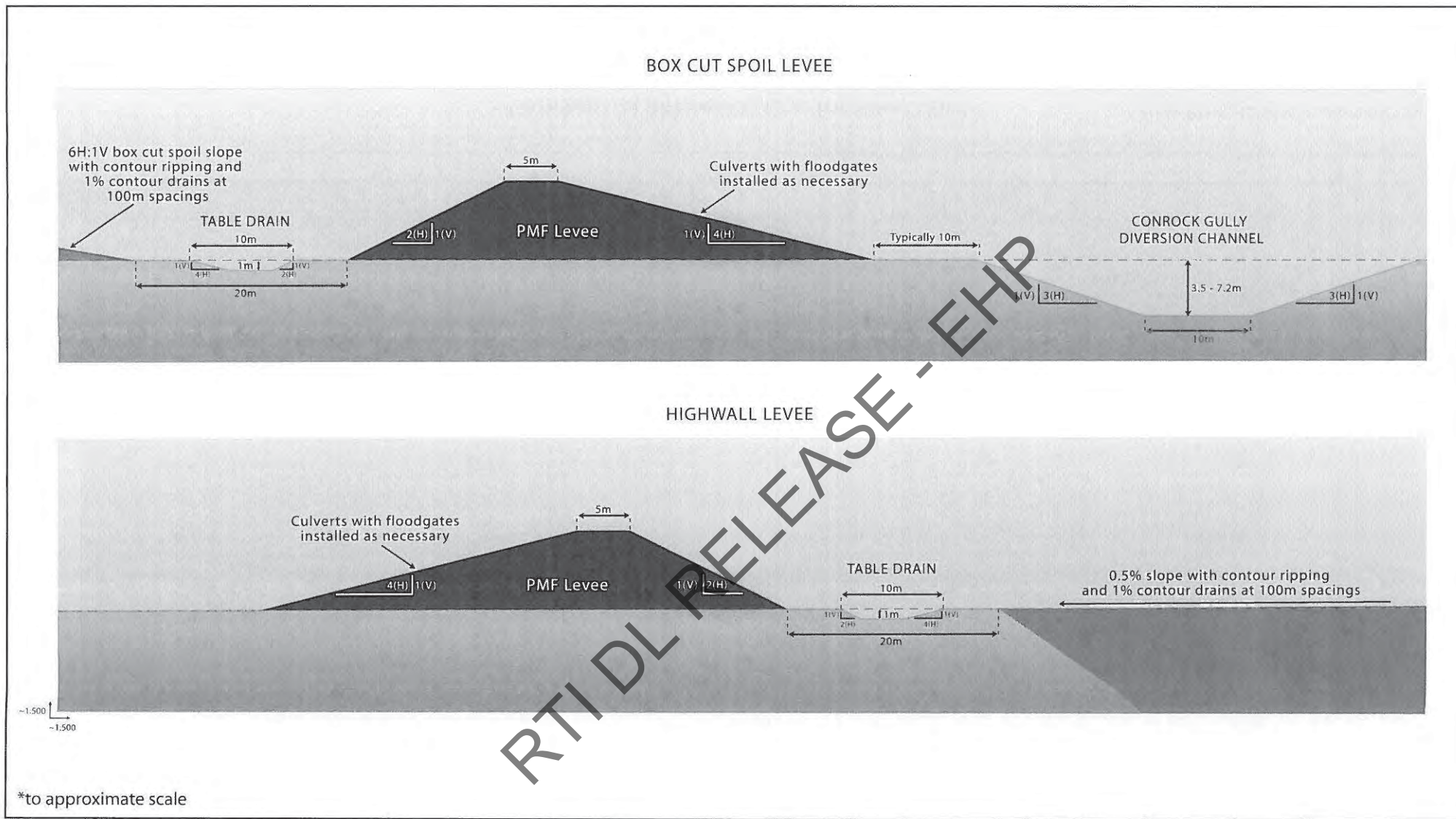
Figure 19-3



**Conceptual Rehabilitation for Final Void
(south of 202m AHD contour)
Cross Section C¹ to C² Looking Upstream**

**Isaac Plains Coal Management Pty Ltd
Integrated Isaac Plains Project**

Figure 19-4



**Final Landform Drainage
Conceptual Typical Sections**

**Isaac Plains Coal Management Pty Ltd
Integrated Isaac Plains Project**

Figure 19-5

19.1.7 19.1.8 Rehabilitation Methods

Results of geochemical test work to date indicate that spoil ranges from non-sodic to moderately sodic. On-going testing will be undertaken to assess the suitability of spoil for rehabilitation. Areas with moderate or high sodicity will be covered by inert material, then topsoil, to create a more suitable growth medium. At all disturbance sites, successful revegetation will depend on the provision of an adequate cover of viable topsoil. There will be sufficient topsoil available (refer to **Table 19-2**) to spread to a depth of approximately 250 mm on rehabilitation areas.

A summary of topsoil type, depth of topsoil suitability and the area of disturbance for each topsoil type by the IIPP is summarised in **Table 19-2** below.

Table 19-2 Estimated Topsoil Volumes – IIPP

Soil Type	Suitable Topsoil Depth (mm)	Surface Area - Existing Isaac Plains Coal Mine (ha)	Surface Area – Expansion Area (ha)	Surface Area Total (ha)	Topsoil Volume (m ³) Expansion Area
A1	500	0	193.9	193.9	969,950
A2	150	62.8	0	0	0
A3	300	0	162	162	486,600
A4	300	0	258.3	258.3	774,900
B1	300	175.8	135.2	308.3	405,600
B2	300	3.02	593.4	596.4	1,780,500
B3	200	28.9	0	0	0
B4	200	92.8	0	0	0
B5	150	115.7	0	0	0
E1	500	198.2	930.6	1,128.8	4,653,000
TOTAL				2,467.7	9,070,550

Based on **Table 19-2**, the total volume of recoverable topsoil from IIPP areas proposed to be disturbed by mine pits and out-of-pit spoil dumps and ROM stockpiles, IIPP, is 9.1 million m³. Topsoil will primarily be used as a growth medium on regarded spoil areas.

Topsoil suitable for rehabilitation purposes will be stripped from all areas to be disturbed by graders, scrapers and trucks.

Designated topsoil stockpile areas will be suitably prepared to ensure that surface runoff from the slope does not result in topsoil losses. To minimise deterioration of topsoil, stockpiles will be constructed with dozers or scrapers to minimise compaction and create a rough surface to reduce erosion and maximise storage of rainfall. As per best practice a 3 m maximum height of topsoil stockpiles has been adopted as a site wide standard. This maximum height minimises soil compaction and loss of soil micro-organisms. Where natural re-establishment does not take place within a maximum of six months, stockpiles will be sown with rapidly growing introduced grasses providing sedimentation and erosion control until native grasses can be established on the topsoil used.

Topsoil on the final graded surface will provide the most suitable seed bed for the establishment of groundcover. Topsoil compaction will be minimised during spreading by placing topsoil in windrows on the final surface. To be distributed by a dozer.

Deep ripping on the contour prior to seeding and fertilisation (where required) will be undertaken. Directly placed soils will not be fertilised. However, fertilisation of stockpiled soils will be required. Rehabilitation of coal mines has been undertaken throughout central Queensland for several decades, building upon existing knowledge and experience, with optimum methods of revegetation being established. This experience is applied to the rehabilitation plan, along with site-specific revegetation trials currently being conducted as part of progressive rehabilitation at the existing Isaac Plains Coal Mine. These trials will test the effectiveness of plant-rooting materials and subsoils as plant growth media as well as the suitability of local pasture and tree species. They will also determine any requirements and rates of fertiliser applications.

The prepared rehabilitation areas will be direct seeded with a mixture of tree and grass species as soon as possible after cultivation and at the beginning of a reliable rain season. Simple broadcasting of seed onto a coarsely cultivated surface has proven to be a reliable and effective means of achieving good establishment at other mining operations. The seed mix is comprised of the following:

- *Corymbia tessellaris* - Moreton Bay Ash;
- *Corymbia dallachyana* - Ghost Gum;
- *Corymbia clarksoniana* - Long-fruited Bloodwood;
- *Corymbia citriodora* - Lemon-scented Gum;
- *Acacia salicina* - Sally Wattle;
- *Acacia harpophylla* - Brigalow;
- *Eucalyptus crebra* - Narrow-leaved Ironbark;
- *Eucalyptus platyphylla* - Poplar Gum;
- *Eucalyptus populnea* - Poplar Box;
- *Cenchrus ciliaris* - Buffel Grass ;
- *Chloris* - Rhodes Grass;
- *Dichanthium sericeum* - Queensland Bluegrass; and
- *Clitoria ternatea Milgara* - Butterfly Pea.

In summary, revegetation methods for all types of land will normally consist of the following:

- re-spreading stockpiled or stripped topsoil at an average of 250 mm (depth of A horizon);
- re-spreading cleared vegetation on rehabilitation areas where possible to assist fauna re-establishment;
- contour deep ripping to >0.5 m depth;
- direct seeding with an appropriate seed mix; and
- application of appropriate fertiliser for plant establishment if required. Sedimentation control structures may be of a permanent or sacrificial nature depending on the requirements of the mining operation.

The following rehabilitation and decommissioning strategies will be employed:

- initially, overburden will be dumped by trucks in a landform requiring little re-contouring;
- stockpiles dumped by the dragline will be re-contoured to the design standard by dozers;
- a section of the final void and the levee will be removed from the Isaac River floodplain eliminating the potential for the void to fill with floodwater;
- with the exception of the Conrock Gully diversion dam, water storage will be removed unless required by the landholder;
- the Conrock Gully dam will be left in place to maintain flows into the diversion channel;
- ramps leading into the voids will either be backfilled with spoil or treated in the same way as the final voids; and
- negotiations will be held with the background land owner at an appropriate time prior to mine closure to determine what infrastructure will need to be removed. Where infrastructure is required to be removed, the ground will be deep ripped on the contour and revegetated to pasture or native species.

Vegetation clearing and topsoil management will include the following:

- prior to disturbance, all soil to the depth of the A horizon will be stripped;
- where topsoil is being stripped within an economic (scraper haulage) distance of a prepared rehabilitation area, topsoil will be directly placed on the rehabilitation area without stockpiling, as has already been the case. Where this is not feasible, topsoil stockpiles will be constructed;
- the maximum height of topsoil stockpiles will be 3 m; and
- topsoil replacement on reshaped spoil areas will occur at similar depths existing prior to mining (approximately 250 mm – A horizon depth).

19.1.8 19.1.9 Erosion Control

Erosion control is an essential component to achieving site stability, particularly on rehabilitated landforms that have steep or long slopes, and is usually achieved through a combination of vegetation establishment, structural cladding (rip-rap) and surface drainage control.

Ripping will increase depression storage on the slopes and allow a significant quantity of water to be stored before run-off commences. Between rips, the surface will be ploughed on the contour to create a satisfactory seed bed and also to increase surface roughness. Depending on the results of sodicity tests, gypsum application may be required to help the erosion potential by improving soil structure and increasing colloidal stability, thereby minimising clay dispersion.

The overall mine site water management and drainage system is described in detail in **Section 6**.

During mining the potential for soil erosion on disturbed areas may be influenced by:

- vegetative cover;
- soil conservation works (contour banks, diversion banks, watercourses);
- soil structure;
- re-configuration of soil profiles upon rehabilitation; and
- differential settlement of rehabilitated areas.

Appropriate measures will be taken to minimise these impacts. Excavations (borrow pits and quarries), required during mine infrastructure construction, will require erosion control measures to be in place in accordance with the Queensland Division of the Institution of Engineers "*Soil Erosion and Sediment Control - Engineering Guidelines for Queensland 1996*". Where possible, rehabilitation will commence as soon as construction of infrastructure is completed and borrow pits etc are no longer needed.

Areas to be excavated and levelled will be kept to a minimum for the required construction purpose. Unnecessary disturbance of soil or vegetation will not occur beyond the construction area. Similarly, the time of exposure of disturbed areas will be minimised by ensuring that excavation and leveling occurs immediately prior to construction. Removed topsoil will be salvaged and stockpiled for rehabilitation purposes. Diversion drains will be used to divert clean water away from disturbed areas. Sedimentation traps will be erected to capture and treat sediment run-off from disturbed areas. Service roads will have sufficient surface drainage to prevent runoff eroding the road or adjacent areas.

The existing Isaac Plains Coal Mine access road crosses Smoky Creek and Billy's Gully. The proposed access/haul road linking the Expansion Area will require a crossing of Isaac River to access the existing mine. Riparian zones and other areas under the influence of rivers and creeks are sensitive environmental landscapes; therefore, construction in these areas will require careful management.

The storage of excavation equipment and fuels should be distant from creek banks, preferably in existing cleared areas. Clearing of vegetation near watercourses must not affect the flow of the watercourses.

19.1.9 19.1.10 Geotechnical Stability

Rehabilitation activities will take into account the effective management of any potential risks associated with the geotechnical stability of spoil dumps and the final void. It is recognised that the stability of these final landforms is critical to the overall success of rehabilitation of the IIPP site. The designs of the mine plan for the project will be regularly reviewed and adjusted to adopt the most appropriate methods that reflect the conditions encountered to ensure geotechnical stability of working slopes. **Section 13.5.1** provides further information on the geotechnical stability for spoil, rejects and coal seam.

During the mining operations, the stability of pit and spoil dump slopes will be reviewed and designs amended as necessary. These periodic reviews will be compared against engineering standards and experiences based at similar coal mines in the region, assessing slope geometries with respect to consequence of slope failure and type of slope.

19.1.10 19.1.11 Success Criteria

In general, areas which are able to be rehabilitated should be returned to a self-sustaining native ecosystem with species composition and distribution similar to an analogue site or another suitable alternative approved by the EPA.

The EA for the existing Isaac Plains Coal Mine requires IPCM to complete an investigation of proposed areas of disturbance and submit a report to the administering authority proposing acceptance criteria to meet the rehabilitation outcomes in **Table 19-3** by 30 June 2010.

Table 19-3 Final Land Use and Rehabilitation Approval Schedule

	Disturbance type					
	Residual Voids	Waste rock dump(s)	Sediment/Supply Dams	Infrastructure	ROM area	Road(s) and tracks
Pre-mine land use	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing
Post-mine land use	Water storage	Native Ecosystem	Water storage	Grazing	Grazing	Grazing or to remain as farm access upon agreement with landholder
Post-mine land capability classification	V	V	V	IIV	II - IV	III or V
Projective cover range (%)	N/A	70 %	N/A	70 %	70 %	N/A

An assessment report, to be undertaken by a Registered Professional Engineer of Queensland (RPEQ), of geotechnical issues and erosivity of the proposed final landforms, including final voids, will be completed by 30 June 2010 to demonstrate long-term landform stability. Reference is to be made to the Queensland Mining Guidelines (or subsequent reprints) in making this assessment. **Table 19-4** outlines the current EA final landform criteria for the existing Isaac Plains Coal Mine to be adopted for the IIPP.

Table 19-4 Landform Design

Disturbance Type	Maximum Slope Range %	Existing Isaac Plains Coal Mine Projected Surface Area (ha)	Expansion Area Projected Surface Area (ha)
External wall	15 % (8.5°)	150	176
Low Wall	73 % (36°)	92	100

19.2 DECOMMISSIONING

A mine closure plan will be developed well in advance of closure and decommissioning. This plan will document how disturbed areas will be rehabilitated to meet closure and relinquishment requirements. It will be developed in consultation with appropriate stakeholders and the EPA.

19.2.1 Spoil Dumps

Both in-pit and out-of-pit spoil dumps will be rehabilitated and decommissioned together with the infrastructure area once the final rehabilitation success criteria (to be developed) has been achieved². Refer to **Section 13.5.1** for further information on the rehabilitation of spoil.

19.2.2 Mine Infrastructure

The infrastructure to be left on-site following mine closure will depend on landowner requests. However, it is currently envisaged that all buildings, offices, plant equipment, workshops, the septic systems and transpiration trenches, stockpiles and associated facilities will be decommissioned and removed from site.

Any hydrocarbon contaminated soil identified within the infrastructure and operational areas will be disposed of at an approved facility or bioremediated on-site. Compacted areas will be ripped, recontoured, topsoiled (where required) and reseeded.

All building structures not required by the background land owner after mining has ceased, will be decommissioned. Cement footings will be removed and disposed of appropriately prior to the sites being revegetated. The option of recycling cement footings will be assessed by IPCM at the time of decommissioning.

19.2.3 Water Management Structures

All water management structures will be made available for use for the background landowner after mining has ceased or will remain on-site for native fauna. Water management structures expressly required to be removed by the landowner will be decommissioned. Dams required to be removed will be decommissioned and the walls removed and/or the excavation backfilled and fully rehabilitated.

19.2.4 Creek/Gully Diversions

The diversions of Smoky Creek and Conrock Gully will be permanent and therefore will not require decommissioning.

19.2.5 Flood Levees

The Smoky Creek and Billy's Gully levees will remain in place at the completion of mining to protect rehabilitated spoil and other impacted areas. The Isaac River levee to the east of the highwall will be re-profiled on closure to blend in with natural surface. The levee to the west will remain buttressed within the final landform (refer to **Figure 19-2**). Maintenance of the remaining levees will be the responsibility of IPCM until surrendered with an ongoing requirement for landowner maintenance.

19.2.6 Access/Haul Road (including the underpass of the Peak Downs Highway)

If required by the background land owner the main access/haul road and underpass of the Peak Downs Highway will remain after mining has ceased. It would improve access particularly during wet weather.

Should roads not be required by the background owner, they will be rehabilitated to blend in with the surrounding landforms.

² IPCM are committed to completing an appropriate investigation and submitting a report to the administering authority by 30 June 2010 (PoO, 2007).



19.2.7 Rail Corridor

IPCM will retain the rail corridor if requested by QR. Should there be no further use of the rail corridor, the tracks will be dismantled and the area will be ripped and rehabilitated in the same fashion as other impacted areas of the IIPP.

19.2.8 Fine Coal Management Cells

The fine coal management cells will be decommissioned and rehabilitated at the completion of mining. The cells will be dried, excavated, a suitable amount of the compacted clay base removed and the walls demolished to form a gently undulating area. The area will be subsequently topsoiled, ripped and seeded with the species described in **Section 19.1.7**.

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20

ENVIRONMENTAL MANAGEMENT PLAN

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT



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RTI DL RELEASE - IIPP



20 ENVIRONMENTAL MANAGEMENT PLAN

This Environmental Management Plan has been developed as a 'stand alone' section in accordance with the requirements of the ToR for the IIPP EIS. There is therefore some repetition of information provided in earlier sections of the EIS.

20.1 INTRODUCTION

This Environmental Management Plan (EM Plan) has been prepared by Isaac Plains Coal Management Pty Ltd (IPCM), operator of the existing Isaac Plains Coal Mine, for the Integrated Isaac Plains Project (IIPP), i.e. covering the existing Isaac Plains Coal Mine and the proposed Expansion Area.

The EM Plan has been prepared in accordance with the Environmental Protection Agency's (EPA) Guideline 8 *Preparing an Environmental Management Overview Strategy (EMOS) for non-standard mining projects* and the EP Act. The purpose of this EM Plan is defined in Section 202 of the EP Act.

The primary role of the EM Plan is to propose environmental protection commitments to help the administering authority decide on the conditions of the EA. This EM Plan defines the environmental protection measures for the management of impacts associated with the IIPP and also proposes new conditions for the IIPP EA to supersede the conditions contained in the existing EA (Permit # MIN100329505; 21 December 2007). (NB: The EA was recently reissued following an administrative amendment made by the EPA).

20.2 PROJECT DESCRIPTION

20.2.1 Project Ownership

The IIPP will be operated as an unincorporated joint venture with IPCM being the management company responsible for all operations undertaken as part of the IIPP on behalf of the joint venture participants, i.e. IP Coal Pty Ltd (IP Coal) (50 %) and Vale Australia (IP) Pty Ltd (Vale) (50 %). For the sake of simplicity, the term IPCM is used throughout this document to refer to the joint venture participants and the Manager of the IIPP.

20.2.2 Integrated Isaac Plains Project – Project Overview

IPCM, on behalf of the joint venture participants, has applied for MLs under the *Mineral Resources Act 1989* (MRA) for an extension to the existing Isaac Plains Coal Mine onto the southern part of EPC755, onto an adjoining area to the west known as the Kumba Designated Area (KDA)¹, and for a access/haul road linking the Expansion Area to the existing Isaac Plains Coal Mine. These areas are collectively referred to as the "Expansion Area". The proposed project, referred to as the IIPP, will comprise some changes to the existing Isaac Plains Coal Mine located on Mining Lease (ML) 70342, and activities within the Expansion Area as further described below.

The major components of the IIPP, located either wholly or partially within the Expansion Area, in addition to those identified above, will include:

- open cut pit(s);
- out-of-pit spoil dumps;
- access and haul roads;
- ROM coal stockpile;
- a dragline (initially operating in the existing Isaac Plains Coal Mine);
- mine infrastructure area including office buildings, controlled access gate and septic system and transpiration trench;
- an underpass of the Peak Downs Highway;
- a low level crossing of the Isaac River;
- water management structures; and

¹ The KDA is an area of EPC 548 that adjoins the western boundary of EPC 755 over which Kumba Australia Pty Ltd has granted exclusive rights to IPCM, for a period of 4 years, to prospect, explore and investigate the Rangal Coal Measures and to apply for additional mining tenements required to mine any resource identified within it.

- installation of flood levees as part of the pre-strip operation, at the commencement of mining.

In addition, a heavy equipment construction pad will be built at the existing Isaac Plains Coal Mine. The pad will be used initially for assembly of the dragline and then periodically over the life of the mine as needed for refurbishment work that needs to take place on the larger items of mining equipment. It is proposed that the dragline will commence operating in the existing Isaac Plains Coal Mine and on completion of mining in this area, will be walked to the Expansion Area, from the existing Isaac Plains Coal Mine, in approximately 2016.

The IIPP also includes diverting two waterways, namely Smoky Creek within the existing Isaac Plains Coal Mine site, and Conrock Gully, within the Expansion Area. The approval of the diversions within ML70342, ML Application (MLa) 70361, MLa70380, MLa70381 and EPC755 form part of the EIS.

Note: Conrock Gully is the name adopted for the formerly unnamed waterway which traverses the Expansion Area, and is consistent with that used by the landholders. The Department of Natural Resources and Water (DNRW) has determined that Conrock Gully is not classified as a watercourse under the provisions of the *Water Act 2000*.

As part of the IIPP approval process, IPCM will apply to amend the approved EA for the existing Isaac Plains Coal Mine to form a single Project Authority combining ML70342 and the MLAs for the Expansion Area, under the *Environmental Protection Act 1994* (EP Act). Therefore, this EM Plan covers the IIPP as a whole.

The existing Isaac Plains Coal Mine on ML70342, as originally planned, was referred and assessed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (referral submitted on 5 April 2005) by the Commonwealth Department of the Environment and Heritage DEH². It was decided on the 6 May 2005, by the delegate of the then Federal Minister for the Environment and Heritage, that the existing Isaac Plains Coal Mine would not to be a controlled action.

In the period since that referral, IPCM identified sufficient coal reserves in the Expansion Area that they subsequently deem feasible to proceed with the development of the Expansion Area. The coal reserves under Smoky Creek were also deemed of sufficient economic value to feasibly divert Smoky Creek to mine the underlying coal.

An EPBC Act referral for the IIPP was submitted for assessment by the DEH on 8 September 2006. On the 6 October 2006 it was decided by the delegate of the Federal Minister for the Environment and Heritage that the IIPP would not to be a controlled action.

20.2.3 Project Location, Tenure and Tenements

The existing approved Isaac Plains Coal Mine is located in ML 70342 approximately 7 km north-west of the township of Moranbah, in the Moranbah region of the central western Queensland coalfields (refer to **Figure 20-1** and **Figure 20-2**). The Expansion Area is located on EPC755, on the property, south of the Peak Downs Highway, approximately 10-12 km from Moranbah (refer to **Figure 20-3**). A significant portion of the proposed Expansion Area is located in the KDA.

The proposed access/haul road required to link the Expansion Area to the existing Isaac Plains Coal Mine will traverse EPC755, EPC602 and EPC548. Vale and IP Coal hold EPC755 while Anglo Coal (Grosvenor) Pty Ltd (Anglo Coal) and Exxaro Australia Pty Ltd (Exxaro) are the principal holders of EPC602 and EPC548 respectively. Anglo Coal Australia is conducting exploration works in EPC602 and EPC548 to ascertain the suitability of a potential underground coal mine. Accordingly, IPCM is negotiating an agreement with Anglo Coal and Exxaro to obtain consent for mine infrastructure to be established on those tenements not held by the Applicants.

² The DEH is now known as the Department of the Environment, Water, Heritage and the Arts.

CH4 Pty Ltd (CH4), a subsidiary of Arrow Energy Ltd (Arrow Energy), holds Petroleum Lease application (PLa) 222 over part of the KDA, Petroleum Lease (PL) 196 over the existing Isaac Plains Coal Mine and PL191 over a section of the proposed access/haul road in the vicinity of the Peak Downs Highway. An Authority to Prospect (EPP) 364 (held by AGL Energy Ltd (99%) and CH4 (1%)) covers the remainder of the Expansion Area. The occurrence of petroleum tenements over the proposed MLs has relevance to the ML application process under the MRA whereby the Applicants are required to consult with the petroleum tenement holders, and need their consent for the grant of the MLs where they are overlapped by PLs. Existing agreements between the parties give CH4 priority to coal seam gas where the PLs overlap the proposed ML area, but Arrow Energy has determined that no appreciable methane reserves are present and it currently has no plans for the commercial capture of gas in the area.

The Expansion Area is located within the Nebo Shire Council Local Government Area (LGA), while the existing Isaac Plains Coal Mine, on ML70342, is located within the Belyando Shire Council LGA.³

The existing Isaac Plains Coal Mine is located on Lot 3 GV252 (Freehold – Rural A), Lot 2 RP90445 (Freehold – Rural A), Lot 4 CP903281 (Lands Lease – Rural) and an unnamed road. Smoky Creek and Billy's Gully are both located on Lot 3 GV252.

The Expansion Area traverses Lot 5 GV132 (Freehold – Rural Agricultural Protection), Lot 6 SP174999 (Freehold – Rural Agricultural Protection), Lot 9 GV33 (Reserve – Special Purpose Zoning for camping, water and roads) and Lot 8 GV196 (zoned as a Reserve – Special Purpose Zoning, however, it is strategically designated as Rural Agricultural Protection). The principal landholdings are Lot 5 and Lot 6.

Figure 20-4 and **Figure 20-5** illustrate the tenure of the IIPP and surrounding area and **Figure 20-6** and **Figure 20-7** illustrate the tenements over the IIPP.

The Expansion Area is south of the Isaac River and is currently accessed via Winchester Road. As part of the IIPP, an access/haul road is proposed to be constructed which will act as the primary access servicing the Expansion Area. The access/haul road will include a low level crossing of the Isaac River and the construction of an underpass beneath the Peak Downs Highway.

The southern boundary of the Expansion Area is bordered by Cherwell Creek, a tributary of the Isaac River. Neither Cherwell Creek nor the Isaac River require diversion. An unnamed watercourse known locally as Conrock Gully, also a tributary of the Isaac River, passes through the middle of the Expansion Area in a general west-east direction.

The IIPP includes the diversion of two waterways, namely Smoky Creek within the existing Isaac Plains Coal Mine site and Conrock Gully within the Expansion Area. The Smoky Creek diversion within ML70342 is not a currently approved activity.

The nearest residences to the IIPP are as follows:

- sch4p3(3) Prejudice the protection of an individuals right to privacy of Cherwell Creek, less than 1 km south of the proposed Expansion Area boundary and approximately 1 km from the planned southern extent of the open cut development;
- sch4p3(3) Prejudice the protection of an individuals right to privacy of the proposed access/haul road crossing of the Peak Downs Highway, 2 km from the existing Isaac Plains Coal Mine and 7 km from the expansion area;
- sch4p3(3) Prejudice the protection of an individuals right to privacy of the Expansion Area and 3 km from the existing Isaac Plains Coal Mine;
- sch4p3(3) Prejudice the protection of an individuals right to privacy of the existing Isaac Plains Coal Mine and 13 km from the expansion area;
- the sch4p3(3) Prejudice the protection of an individuals right to privacy of the Expansion Area and 6 km from the expansion area, on the Poitrel ML; and
- sch4p3(3) Prejudice the protection of an individuals right to privacy for the expansion area and 16 km from the Peak Downs Highway underpass.

³ NB: Since the release of the EIS for public comment, Belyando, Nebo and Broadsound Shires have been amalgamated. This revised EIS has not been amended to reflect this as the intention of this version of the EIS is to address comments from stakeholders at the time of public release, including both Belyando and Nebo Shire Councils.

Figure 20-2 and **Figure 20-3** illustrate the location of the nearest residences and the township of Moranbah with respect to the IIPP.

There are numerous mines within close proximity to the IIPP. Approximate distances to existing mines in the area surrounding the IIPP comprise:

- Peak Downs Mine, 8 km south-west of the existing mine and 5 km south of the Expansion Area;
- Carborough Downs Mine, 5 km east of the existing mine and 9 km north of the Expansion Area;
- Broadlea Mine, 4.5 km north-east of the existing mine and 17.5 km north of the Expansion Area;
- Poitrel Mine, 9 km south-east of the existing mine and 3 km east of the Expansion Area;
- Millennium Mine, 6 km south-east of the existing mine and 3 km north-east of the Expansion Area;
- Winchester Mine, 12 km south-east of the existing mine and 3.5 km east of the Expansion Area; and
- Moranbah North Mine, 7 km north-west of the existing mine and 20.5 km north-west of the Expansion Area.

Figure 20-8 illustrates the location of the aforementioned mines.

There are no areas designated as National Parks, State Forests or conservation zones within the IIPP area, or within the adjacent area.

20.2.4 Relevant Stakeholders

The list of affected and interested persons/parties was initially developed through research on the IIPP area and through discussions with EPA. This list is provided below.

20.2.4.1 Affected Persons/Parties

Property Owners

- sch4p3(3) Prejudice the protection of an individuals right to privacy

Traditional Owners

- Barada Barna, Kabalbara and Yetimarla People (BBKY)

State Controlled Land - Peak Downs Highway

- Department of Main Roads
 - Rockhampton
 - Mackay
 - Brisbane

Others

- Kumba Australia Pty Ltd
- Arrow Energy NL Pty Ltd
- Anglo Coal (Grosvenor) Pty Ltd
- Exxaro Australia Pty Ltd
- BHP Mitsui Coal Pty Ltd

20.2.4.2 *Interested Persons/Parties*

- Department of Natural Resources and Water
 - Mackay
 - Brisbane
- Department of Mines and Energy - Rockhampton
- Department of Local Government, Planning, Sport and Recreation
 - Mackay
 - Brisbane
- Department of Communities - Mackay
- Queensland Health - Mackay
- Queensland Transport - Townsville
- Agforce – Brisbane
- SunWater – Biloela
- Nebo-Broadsound Landcare Group – Mackay
- Capricorn Conservation Council – Rockhampton
- Nebo Shire Council – Nebo
- Belyando Shire Council – Moranbah
- Department of Housing – Brisbane
- The Coordinator-General – Brisbane
- Environmental Protection Agency – Emerald
- Department of Emergency Services - Brisbane
- Queensland Health
- Department of Primary Industries and Fisheries – Rockhampton
- Queensland Police Service, Central Police Region – Rockhampton
- CHRRUP – Emerald
- Fitzroy Basin Association – Rockhampton
- Sunfish (Queensland) – Mackay Regional Branch
- Clermont Fish Stocking Group Inc.
- Emerald Fish Stocking Group Inc.
- MacKenzie River Fish Stocking Association Inc.

From the outset, IPCM have recognised the importance of consultation with and involvement of local stakeholders to be an integral component of the planning and approvals process for the IIPP.

This process commenced with the identification and early engagement of stakeholders in order to identify broad issues of concern. Consultation with local community and interest groups will extend from the planning phase, through the IIPP operations to final rehabilitation. This process also included meetings with Council representatives, interest group meetings and other meetings designed to encourage and facilitate community involvement and/or education in relation to the IIPP and open cut coal mining as a whole.



The community consultation process also included a review process which:

- provided the broader community with opportunities to provide input; and
- ensures that the various management plans evolve over time to reflect changing community values and advances in scientific knowledge.

The community and stakeholder involvement process provided an opportunity for community issues and concerns to influence the nature of the IIPP. All feedback was recorded and, where appropriate, has been used to refine IPCM's management processes, monitoring and future rehabilitation efforts for the IIPP.

20.3 MINING ACTIVITIES

Based on the current resource estimates and mine planning, ROM coal production from the IIPP will increase from the currently approved rate of 1.9 Mtpa up to approximately 4 Mtpa ROM coal for a period of approximately 15 years. IPCM commenced development of the Isaac Plains Coal Mine in late 2005 and coal production commenced in the third quarter of 2006. Mined coal from the Expansion Area will be hauled north across the Isaac River over a new low level crossing, and through an underpass of the Peak Downs Highway, to the CHPP on ML70342 (refer to **Figure 20-2** and **Figure 20-3**). Processed and washed coal from the IIPP will be railed to Dalrymple Bay Coal Terminal and exported. The existing Isaac Plains Coal Mine CHPP has the capacity to accommodate the planned ROM coal production of raw 4 Mtpa, with the increased throughput from the IIPP being achieved through increased operational hours, i.e. the CHPP will not require an upgrade to process the increased volume of coal. NB: The CHPP was approved based on modelling for a 24 hr, 7 days per week operation.

20.3.1 Mining

The IIPP will be developed as an open cut coal mine involving the production of ROM coal from one or more active mining areas concurrently. The ROM coal will be transported to the CHPP at the Isaac Plains Coal Mine to be crushed, sized and washed, before being railed to Dalrymple Bay Terminal for export. Approximately 25% of the coal produced will be coking coal, 25% thermal coal and the remaining 50% of coal being PCI.

A combination of truck and shovel and dragline mining methods will be used to achieve the planned production of up to raw 4 Mtpa ROM coal.

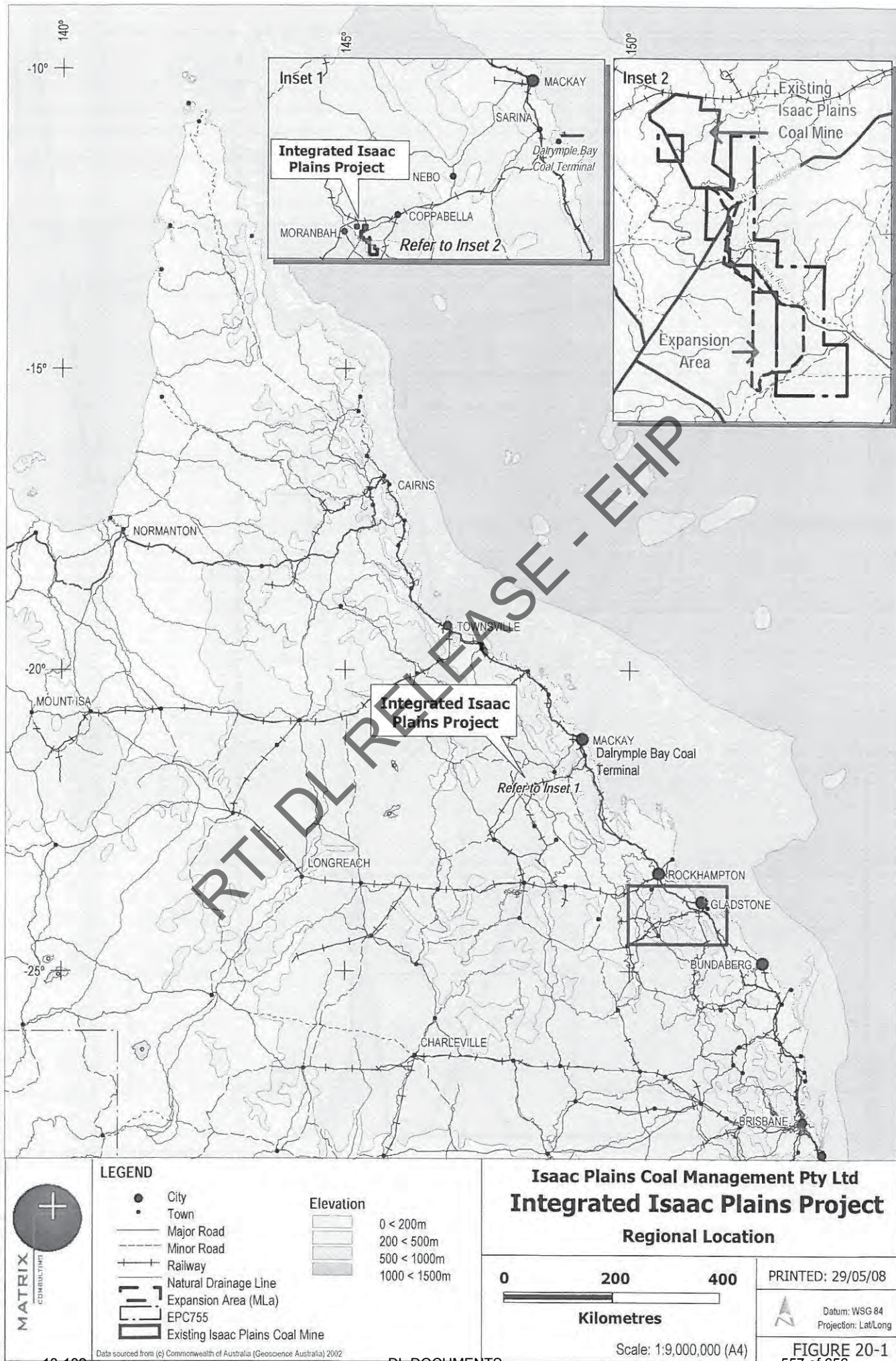
The proposed mining operations will entail:

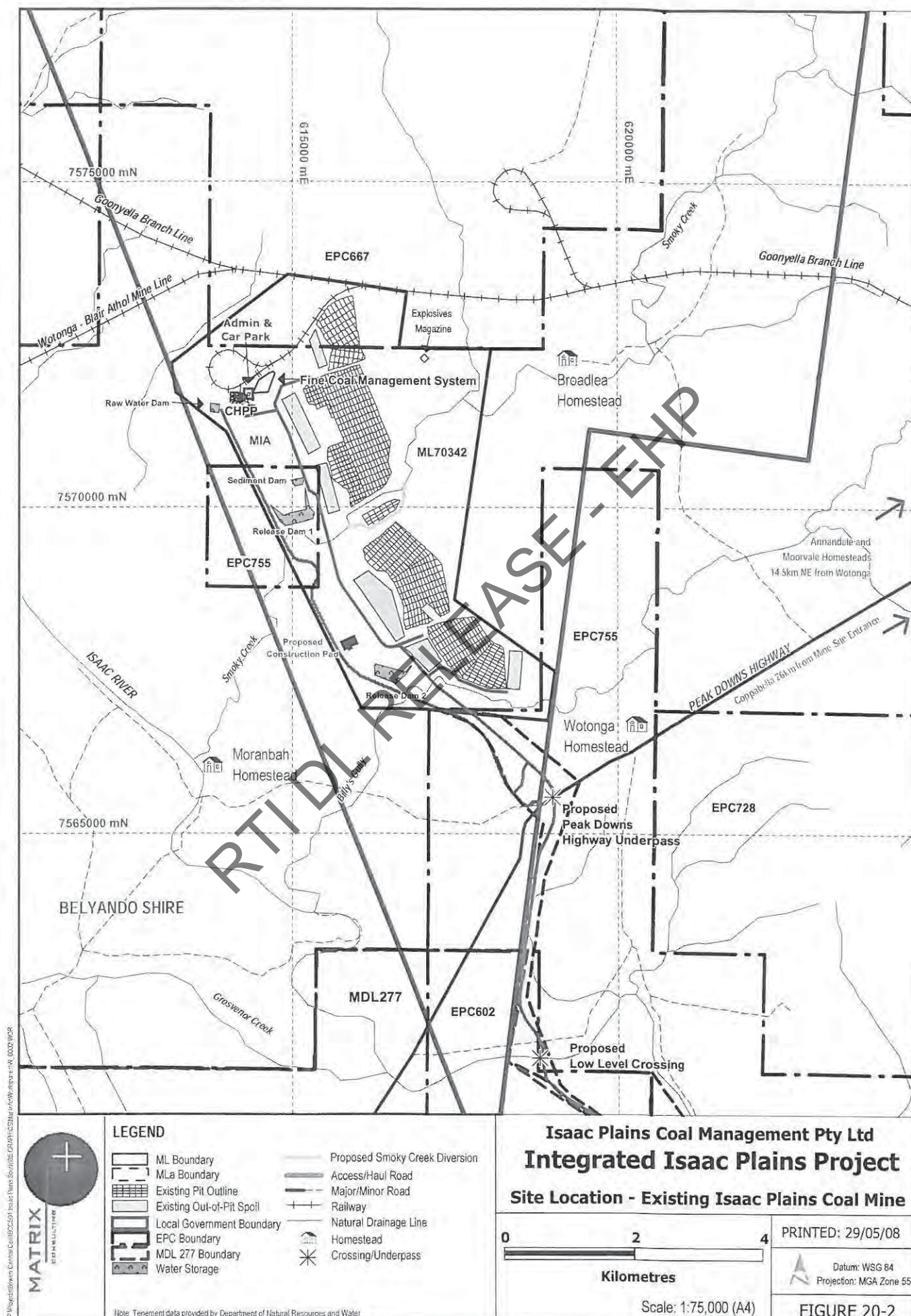
- progressive clearing of the vegetation occurring on those areas to be disturbed;
- salvage and stockpiling of topsoil from disturbed areas for future use in rehabilitation;
- blasting and removal of waste rock;
- removal of coal; and
- site rehabilitation.

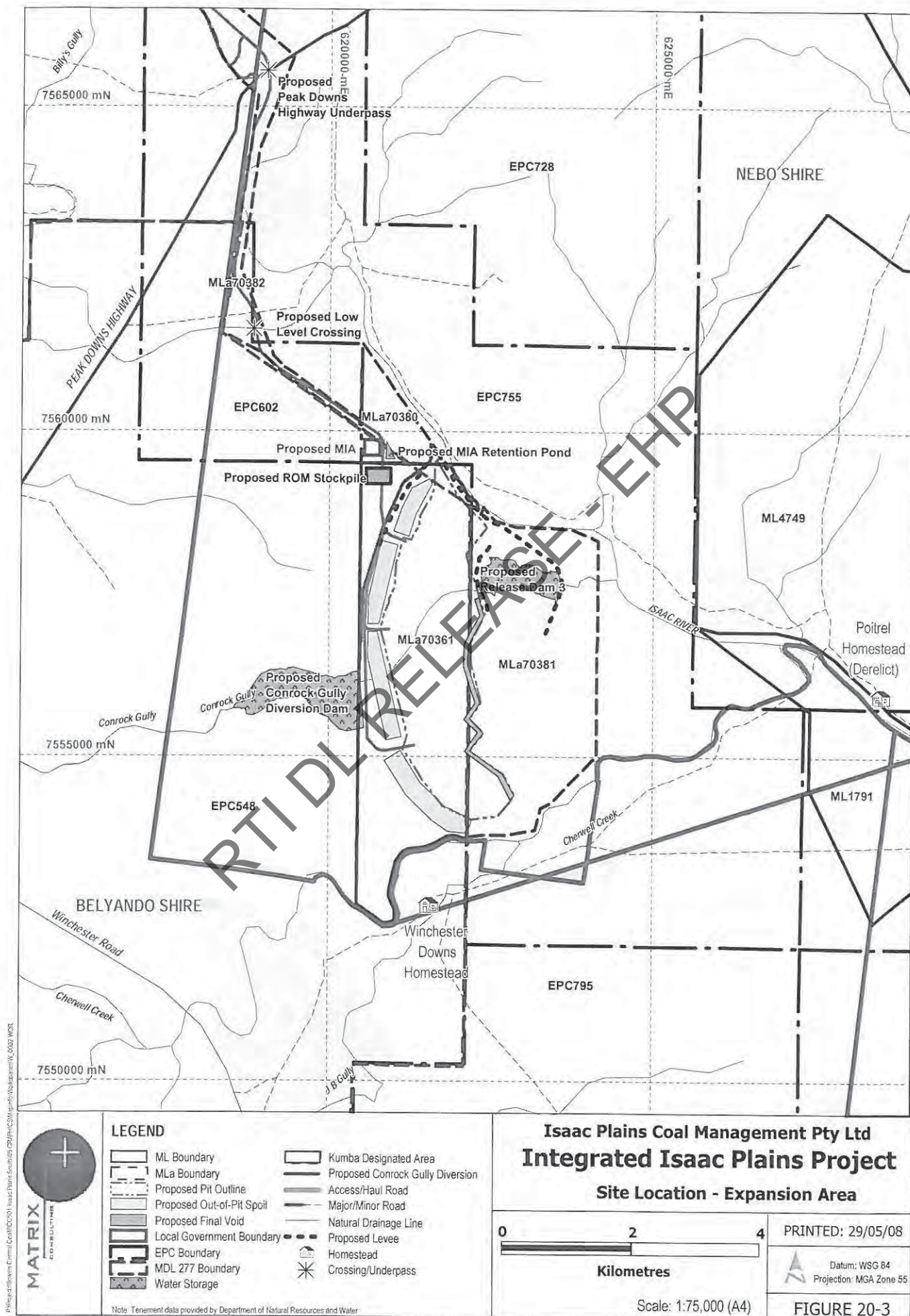
Mining within the Expansion Area will require the development of an initial box-cut and out of pit spoil dump in order to open up the pit. Subsequent removal of the overburden will be carried out by dragline and truck and shovel methods. Overburden material will initially be placed out-of-pit, with in-pit emplacement undertaken once an adequate area of mined-out pit, is available. To maintain safe operation of the Expansion Area pit and mine infrastructure area during mining operations, a levee will be constructed to prevent encroachment of floodwaters from the Isaac River (refer to **Figure 20-3**). The levee height will be up to 1 m above the 1 % AEP flood height.

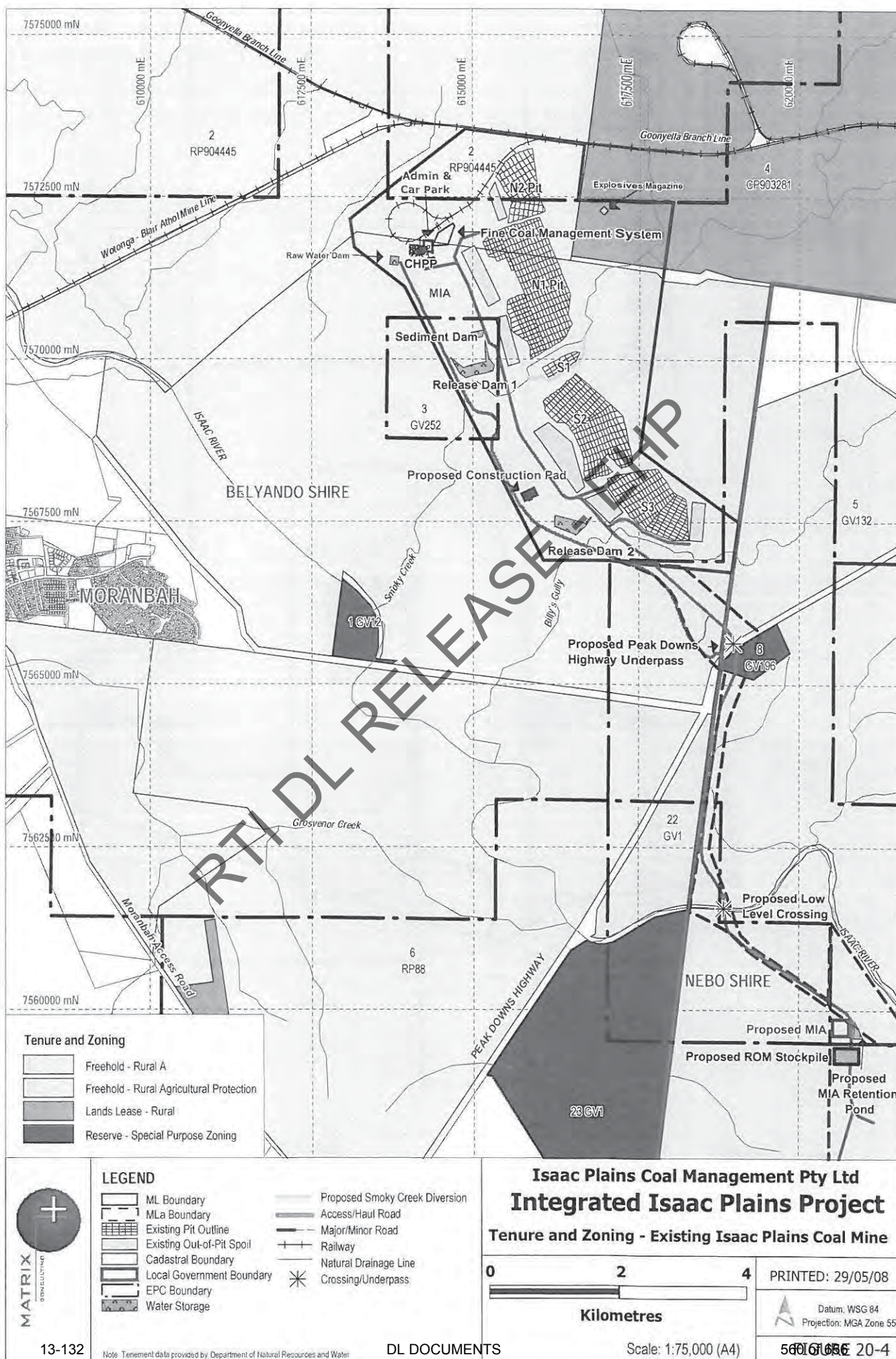
Once mining has been completed in the Expansion Area, the levee will be removed and the pit on the flood plain (defined as the 202 m AHD contour) will be filled in leaving only the rehabilitated spoil dump. Details and conceptual diagrams of the end of mine landform are provided in **Section 20.9.3**. The pit to the south of the 202 m contour outside the floodplain will remain as a residual void.

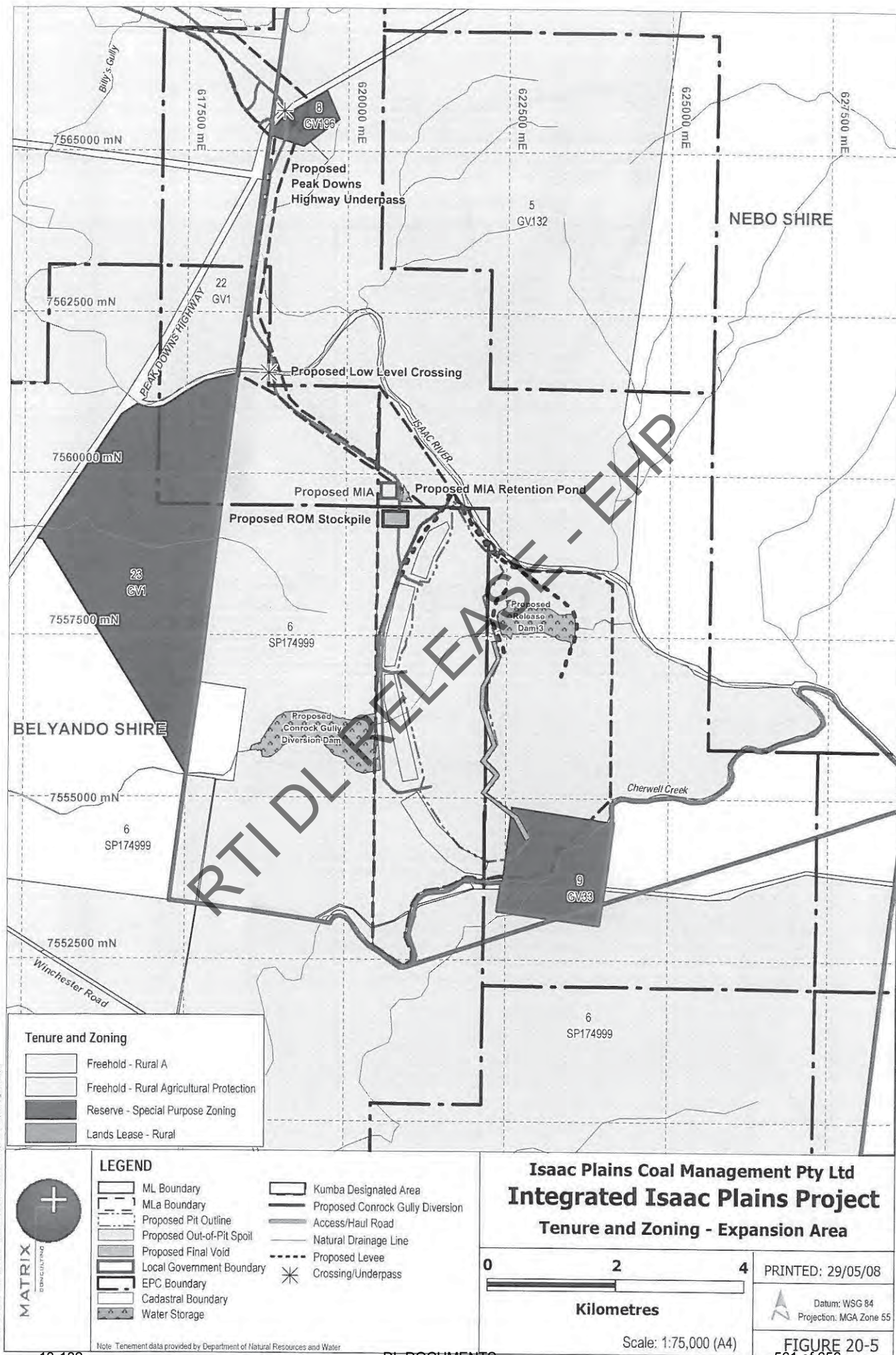
At the existing Isaac Plains Coal Mine a residual void will be left for the length of each pit after mining has been completed with the exception of the S1 pit next to the Smoky Creek diversion which will be filled in using lowall material.

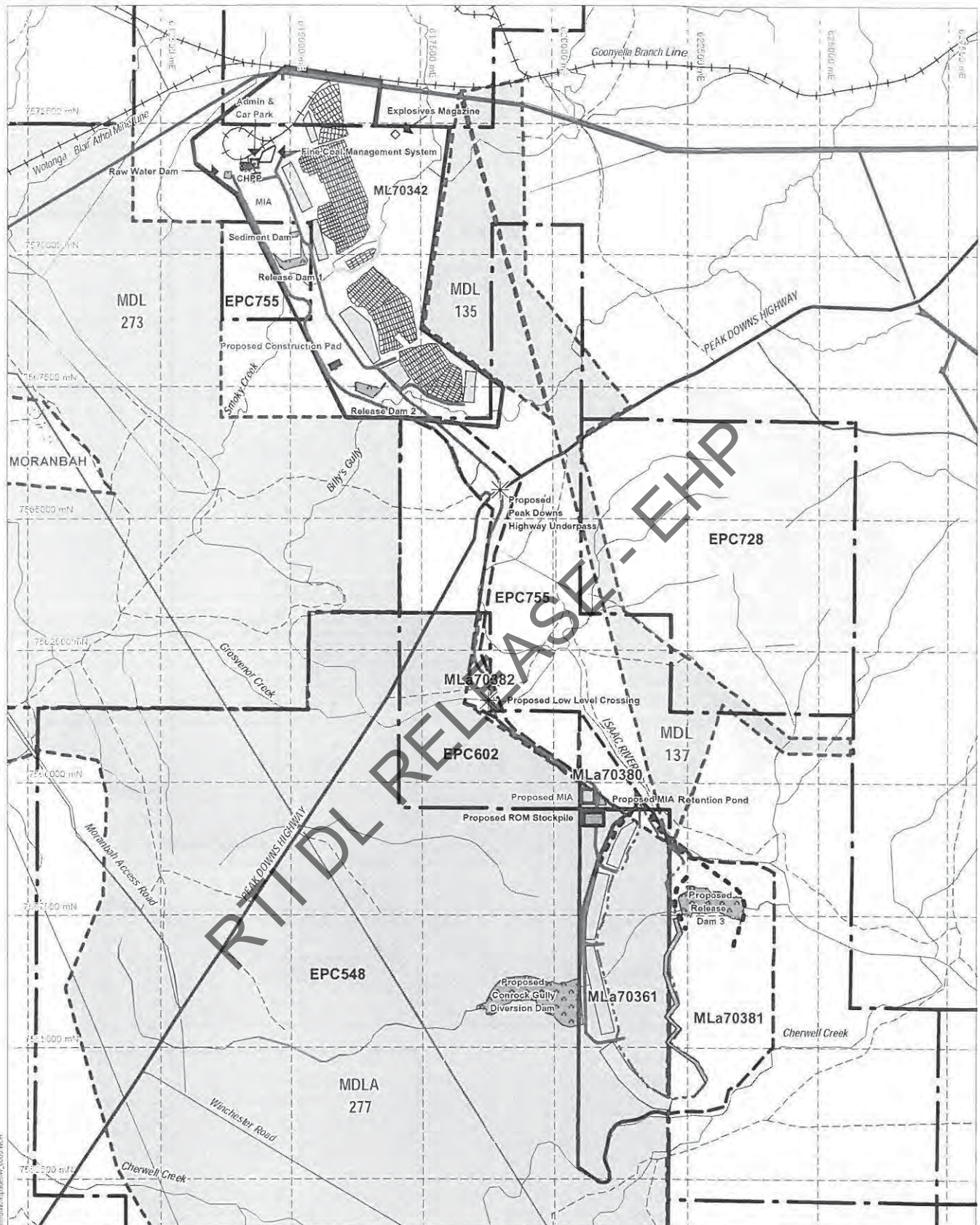












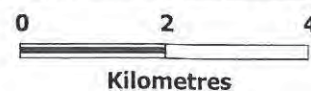
LEGEND

- ML Boundary
- MLa Boundary
- Existing Pit Outline
- Existing Out-of-Pit Spoil
- Proposed Pit Outline
- Proposed Out-of-Pit Spoil
- Proposed Final Void
- Easement
- MDL 277 Boundary
- MDLA

- Kumba Designated Area
- Water Storage
- Proposed Conrock Gully Diversion
- Proposed Smoky Creek Diversion
- Access/Haul Road
- Major/Minor Road
- Railway
- Natural Drainage Line
- Proposed Levee
- Crossing/Underpass

Note: Tenement data provided by Department of Natural Resources and Water

Isaac Plains Coal Management Pty Ltd Integrated Isaac Plains Project Mining Tenements

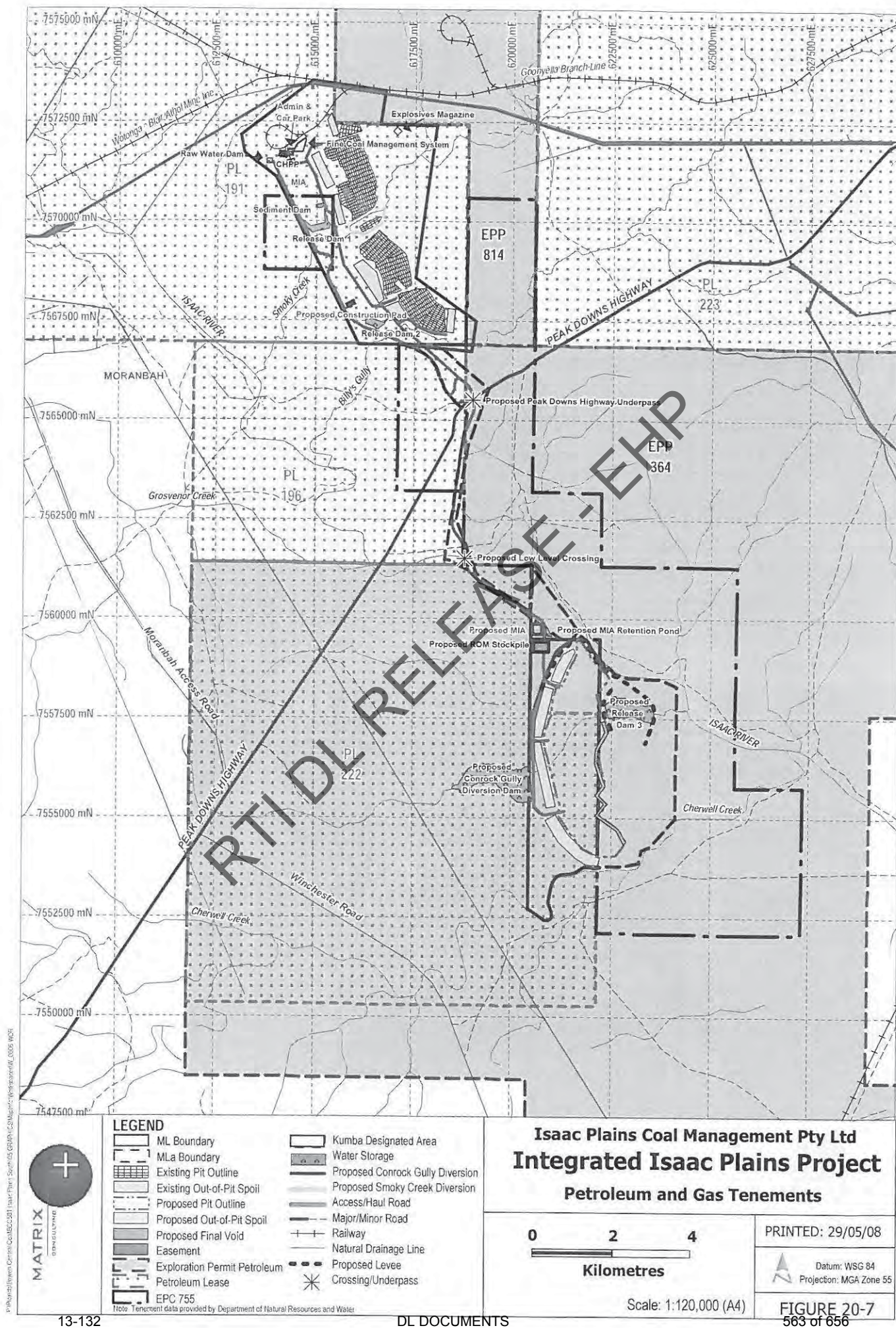


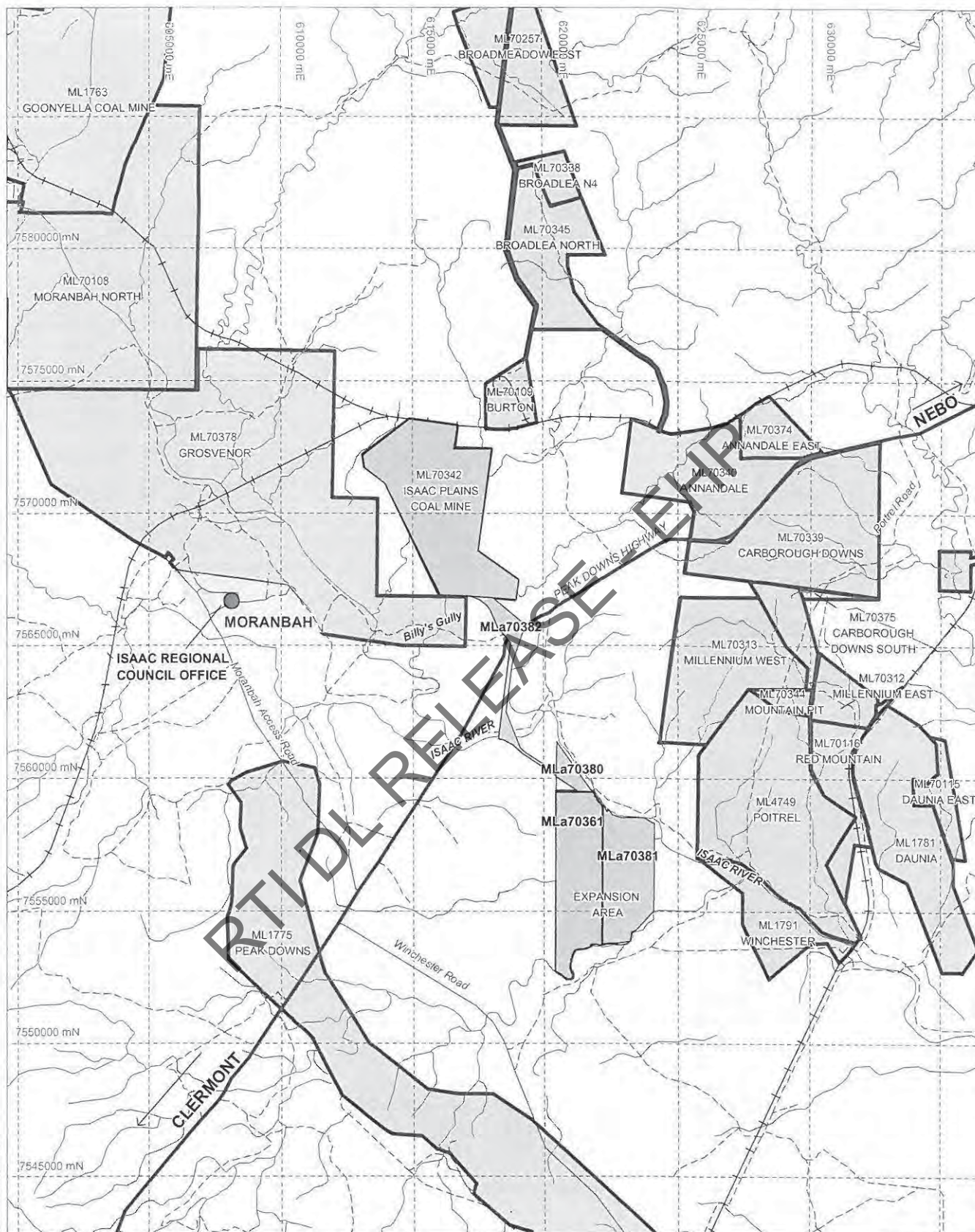
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Datum: WSG 84
Projection: MGA Zone 55

FIGURE 20-6
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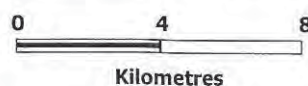


LEGEND

- Mining Lease
- Integrated Isaac Plains Project
- Moranbah
- Major/Minor Road
- Railway
- Natural Drainage Line

Note: ML data provided by Department of Mines and Energy

Isaac Plains Coal Management Pty Ltd Integrated Isaac Plains Project Mines Surrounding the IIPP



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PRINTED: 29/05/08

Datum: WGS 84
Projection: MGA Zone 55

FIGURE 20-8
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20.3.2 Coal Handling and Processing

Mined coal from the Expansion Area will be hauled north across a low level crossing of the Isaac River, and through an underpass beneath the Peak Downs Highway, to the CHPP at the Isaac Plains Coal Mine. The approved CHPP has the capacity to accommodate the planned ROM coal production of up to raw 4 Mtpa from the IIPP.

Through the use of belt filter presses, the fine coal rejects are dewatered to around 70 % solids (30 % moisture), recovering water at the CHPP and negating the need for a tailings dam. Under this system, fine coal rejects recovered from the process will then be added to the coarse reject stream and disposed of in-pit. If the fine coal rejects are of sufficient quality, they will be blended back into the product coal stream. However, through early operations at the existing Isaac Plains Coal Mine, IPCM have identified the need to develop an alternative system to manage the fine rejects as a contingency to failure of the belt filter press, and to also improve the water recovery from the rejects circuit. This system entails a fine coal management system.

Approval for the fine coal reject management system and an approved EA was received on 25 October 2007 (taking effect 30 October 2007) via an amendment to the EA⁴. The intention of the system is to capture and process fine coal rejects only, separate from the management of coarse rejects. If the filter presses are not operating, the fine rejects will be pumped via a pipeline from the CHPP to the cells described below. Once dry, fine rejects will be hauled by trucks and dumped with coarse reject in the in-pit spoil. The moisture content will be approximately 20 %.

The main benefits to the system are as follows:

- to have an alternative fine coal rejects management system in the event of the belt filter presses failure;
- to recycle water back to the CHPP for re-use; and
- to reclaim good quality fine coal to be incorporated into the coal product stream.

The fine coal management system cells are managed such that a freeboard is maintained which has the capacity to hold a 1 in 20 year ARI three month wet season rainfall. Should rainfall exceed the capacity of these structures, excess rainfall overflow is captured by an offline wet season storage, preventing release from site. The offline wet season storage has capacity to contain a volume equal to the 1 in 20 year ARI three month wet season rainfall multiplied by the total area of the cells, spillway drain and the storage itself. Although very unlikely, potential overflows would be highly diluted from direct rainfall into the cells, minimising any water quality impacts on the surrounding environment.

20.3.2.1 Transport

Coal at the existing Isaac Plains Coal Mine is currently removed from the pit(s) by truck and shovel⁵ and is transferred to the ROM coal stockpile for processing into batches. The ROM pad is designed to allow for short-term stockpiling of pre-crushed coal. This is currently separated into two zones to enable the stockpiling of the following seams. These are:

- LHD top seam; and
- LHD bottom seam and LHL.

The stockpiles collectively have the capacity to contain approximately 150,000 tonnes or 15 days of feed coal as intermediate storage and allow for the best possible blending of ROM feed. Coal from LHD tops and LHD bottoms are processed separately on a batch washing basis. Processing batch lengths have been developed in order to optimise the process yields and minimise usage of consumables.

⁴ The EA was subsequently reissued on 21 December 2007 following an administrative amendment made by the EPA.

⁵ It is proposed construct a dragline in the near future for use at the site in conjunction with truck and shovel operations.



The introduction of the Expansion Area will require a change to the management of the pre-crusher coal. Mining in the Expansion Area will require the following seams to be individually stockpiled:

- Leichhardt (LHD);
- V1 (Vermont (VER)); and
- V2.

ROM coal from the Expansion Area will be hauled from the mine pits and separately stockpiled at the ROM coal stockpile located at the northern end of the Expansion Area. Blending will be carried out at the Expansion Area ROM stockpile area to produce a single ROM feed for the CHPP. The Expansion Area coal will be trucked along the access/haul road to the existing ROM stockpile area. If necessary, an extension to the pad at the existing Isaac Plains Coal Mine, within existing cleared areas, will be made to accommodate this coal.

20.3.3 Support Activities

Development of the Expansion Area will provide IPCM with an increased coal reserve which can be accessed largely utilising infrastructure and services that have or are currently being developed for the existing Isaac Plains Coal Mine.

Overburden blasting will be conducted in the Expansion Area to expose coal for mining (as is the case of the Isaac Plains Coal Mine). The explosives storage will remain on the existing Isaac Plains Coal Mine with explosives being transported to the Expansion Area on an as needed basis (refer to **Figure 20-2**). Blasting will be undertaken by specialist contractors. Storage of the explosives is licensed in accordance with the *Explosives Act 1999*.

IPCM propose to construct crib rooms and associated support infrastructure in the Expansion Area. Sewage will be managed by septic system at the main office with capacity for 60 equivalent persons (EP). As with the system at the existing Isaac Plains Coal Mine, this system will be installed *in lieu* of a package sewage treatment plant. The treated sewage is pumped to a transpiration trench on site.

20.3.4 Workforce Requirements

An operational workforce of 70 persons is employed at the existing Isaac Plains Coal Mine, (i.e. 1.9 Mtpa ROM coal operation), with a two shift roster, up to seven days per week.

With the introduction of mining in the Expansion Area, the increase in production from 1.9 Mtpa up to 4 ROM coal, and increased hours of CHPP operations, the workforce required will increase by 40 persons to a total of 110 persons. Mining and associated activities will be undertaken 24 hours per day consisting of two 12 hour shifts, seven days per week. Administration staff working hours are 7 am to 5 pm Monday to Friday.

In addition to staff required for mining operations, approximately 20 persons (potentially peaking at 40 persons for approximately three months to six months) will be required for the construction of the access/haul roads within the Expansion Area and between the Expansion Area and the existing Isaac Plains Coal Mine (including construction of the underpass of the Peak Downs Highway). Construction activities will be completed in a period of approximately three to six months. Construction workers will work during daylight hours only.

Assembly of the dragline will also require a peak workforce of up to 70 persons during the 12 month construction phase.

20.3.5 Workforce Accommodation

Accommodation for the majority of operational and construction personnel will be provided at the MAC Coppabella camp on the Peak Downs Highway, approximately 26 km east of the IIPP and 35 km east of the township of Moranbah. IPCM has a contract with the MAC Coppabella camp for 120 rooms in Coppabella. With the increase in construction and operational personnel at the IIPP, the number of rooms will increase to a maximum of 228 rooms (pers. comm. Mr Craig Bushell, IPCM Compliance Superintendent/Site Senior Executive, 2007). An agreement has been reached with MAC Coppabella camp to allow for fluctuation in demand. This increase will accommodate the dragline construction staff. Some of the workforce, estimated to be approximately 5 %, may choose to live locally in Moranbah.

20.3.6 Workforce Transport

Mine shift workers will be transported to the IIPP site by bus from their camp accommodation as will the majority of contractors during the construction phase. The use of the bus to transport shift workers is intended to reduce the risk of fatigued drivers on the road.

An estimated 200 light vehicles (composed of staff and visitor trips) will enter and exit (i.e. sum of in: out trips) the site on a daily basis during construction. In terms of heavy/other vehicles, an estimated 60 service/deliveries vehicles and minibuses will enter and exit the site daily.

The anticipated trip distribution for traffic accessing the site is as follows:

- 95 % of traffic will be travelling to and from the east (e.g. Coppabella and Mackay); and
- the remainder of 5 % will be travelling to and from the west (e.g. Moranbah).

It is anticipated that the traffic distribution percentages will be the same during construction and full operation.

In addition, assembly of the dragline at the existing Isaac Plains Coal Mine will require a peak workforce of up to 70 persons over approximately 12 months. It is estimated that 40 % of this workforce will travel to the site by buses from the Copabella camp, supplied by IPCM with the remainder travelling in private light vehicles. An allowance for an additional 12 trade visitors per day has also been made.

20.3.7 Notifiable Activities

Notifiable activities are listed in Schedule 2 of the EP Act. Under the EP Act, landowners and local government must inform the EPA that land has been or is being used for a notifiable activity. Land that has been or is being used for a notifiable activity is recorded on the Environmental Management Register, which is maintained by the EPA. Notifiable activities that are currently carried out at the existing Isaac Plains Coal Mine and are proposed for the Expansion Area are listed below.

- **1 Abrasive blasting** - carrying out abrasive blast cleaning (other than cleaning carried out in fully enclosed booths) or disposing of abrasive blasting material.
- **7 Chemical storage** (other than petroleum products or oil under item 29) - storing more than 10 t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code.
- **14 Engine reconditioning works** - carrying out engine reconditioning work at a place where more than 500L of the following are stored—
 - o halogenated and non-halogenated hydrocarbon solvents;
 - o dangerous goods in class 6.1 under the dangerous goods code;
 - o industrial degreasing solutions.
- **23 Metal treatment or coating** - treating or coating metal including, for example, anodising, galvanising, pickling, electroplating, heat treatment using cyanide compounds and spray painting using more than 5 L of paint per week (other than spray painting within a fully enclosed booth).
- **24 Mine wastes** -
 - o storing hazardous mine or exploration wastes, including, for example, tailings dams, overburden or waste rock dumps containing hazardous contaminants; or
 - o exploring for, or mining or processing, minerals in a way that exposes faces, or releases groundwater, containing hazardous contaminants.
- **29 Petroleum product or oil storage - storing petroleum products or oil** -
 - o in underground tanks with more than 200 L capacity; or
 - o in above ground tanks with -
 - (i) for petroleum products or oil in class 3 in packaging groups 1 and 2 of the dangerous goods code—more than 2,500L capacity; or

(ii) for petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code—more than 5,000L capacity; or

(iii) for petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS 1940, The storage and handling of flammable and combustible liquids published by Standards Australia - more than 25,000L capacity.

20.3.8 Environmentally Relevant Activities

Environmentally Relevant Activities (ERAs) are defined in Schedule 1 of the *Environmental Protection Regulation 1998*. ERAs are usually industrial activities with the potential to release contaminants to the environment, for example chemical processing, waste treatment, spray painting etc. Mining and petroleum activities are also ERAs. ERAs are used to define the annual licence fees for the site. The ERAs that are currently carried out at the existing Isaac Plains Coal Mine and are proposed for the Expansion Area are listed below.

- **7(b) Chemical storage** - storing chemicals (other than crude oil, natural gas and petroleum products), including ozone depleting substances, gases or dangerous goods under the dangerous goods code in containers having a design storage volume of 1,000 m³ or more.
- **11(b) Crude oil or petroleum product storing** - storing crude oil or a petroleum product in tanks or containers having a combined total storage capacity of 50,000L or more.
- **15(a) Sewage treatment** - a standard sewage treatment works having a peak design capacity to treat sewage of 21 or more equivalent persons but less than 100 EP.
- **23(a) Abrasive blasting** - commercially cleaning equipment or structures using a stream of abrasives if the activity is carried out at a permanent location.
- **24 Boiler making or engineering** - commercial boiler making, electrical machine manufacturing or building or assembly of agricultural equipment, motor vehicles, trains, trams or heavy machinery.
- **25(b) Metal surface coating** - commercial spray painting (other than spray painting motor vehicles), powder coating, enamelling, electroplating, anodising or galvanising in works having an annual throughput of metal products of 2,000 t or more but less than 10,000 t.
- **28 Motor vehicle workshop** - operating a workshop or mobile workshop in the course of which motor vehicle mechanical or panel repairs are carried out in the course of a commercial or municipal enterprise (other than on a farm or under a mining tenement) or on a commercial basis.
- **42 Mineral processing** - commercially processing, classification, mixing or concentration of mineral ores to produce mineral concentrates in works having a design production capacity of more than 100,000 t/yr.
- **62 Concrete batching** - producing concrete or a concrete product by mixing cement, sand, rock, aggregate or other similar materials in works (including mobile works) having a design production capacity of more than 100 t/yr.



20.4 GENERAL

IPCM understand that there are several general conditions which are required to be adhered to in an EA for the IIPP.

20.4.1 Proposed EA Conditions

Proposed EA Conditions	
Financial Assurance	
A1-1	<p>Provide a financial assurance in the amount and form required by the administering authority prior to the commencement of activities proposed under this environmental authority.</p> <p>NOTE: The calculation of financial assurance for condition A1-1 must be in accordance with Guideline 17 and may include a performance discount. The amount is defined as the maximum total rehabilitation cost for complete rehabilitation of all disturbed areas, which may vary on an annual basis due to progressive rehabilitation. The amount required for the financial assurance must be the highest Total Rehabilitation Cost calculated for any year of the Plan of Operations for the IIPP and calculated using the formula: (Financial Assurance = Highest Total Annual Rehabilitation Cost x Percentage Required).</p>
A1-2	<p>The financial assurance is to remain in force until the administering authority is satisfied that no claim on the financial assurance is likely.</p> <p>NOTE: Where progressive rehabilitation is completed and acceptable to the administering authority, progressive reductions to the amount of financial assurance will be applicable where rehabilitation has been completed in accordance with the acceptance criteria defined within this environmental authority.</p>
Maintenance of measures, plant and equipment	
A2-1	<p>The environmental authority holder must ensure:</p> <ol style="list-style-type: none"> that all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority are installed; that such measures, plant and equipment are maintained in a proper condition; and that such measures, plant and equipment are operated in a proper manner.
Monitoring	
A3-1	Record, compile and keep for a minimum of five years all monitoring results required by this environmental authority and make available for inspection all or any of these records upon request by the administering authority.
A3-2	Where monitoring is a requirement of this environmental authority, ensure that an appropriately qualified person conducts all monitoring.
Storage and handling of flammable and combustible liquids	
A4-1	Spillage of all flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm (other than trivial harm) and maintained in accordance with Section 5.8 of <i>AS 1940 - Storage and Handling of Flammable and Combustible Liquids of 2004</i> .
A4-2	Spillage of all chemicals must be contained within an on-site containment system and controlled in a manner that prevents environmental harm.
Notification of Emergencies and Incidents	
A5-1	As soon as practicable after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this environmental authority, the administering authority must be notified of the release by telephone, facsimile or email.
A5-2	<p>The notification of emergencies or incidents as required by condition number (A5-1) must include but not be limited to the following:</p> <ol style="list-style-type: none"> the holder of the environmental authority; the location of the emergency or incident; the number of the environmental authority; the name and telephone number of the designated contact person; the time of the release; the time the holder of the environmental authority became aware of the release; the suspected cause of the release; the environmental harm caused, threatened, or suspected to be caused by the release; and actions taken to prevent any further release and mitigate any environmental harm caused by the release.

A5-3	Not more than fourteen (14) days following the initial notification of an emergency or incident, written advice must be provided of the information supplied in accordance with condition number (A5-1) in relation to: <ul style="list-style-type: none"> a) proposed actions to prevent a recurrence of the emergency or incident; and b) outcomes of actions taken at the time to prevent or minimise environmental harm.
A5-4	As soon as practicable, but not more than six (6) weeks following the conduct of any environmental monitoring performed in relation to the emergency or incident, which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this environmental authority, written advice must be provided of the results of any such monitoring performed to the administering authority.
Definitions	
A6-1	Words and phrases used throughout this Environmental Authority are defined in the Definitions section of this document. Where a definition for a term used in this Environmental Authority is sought and the term is not defined within this document, the definitions in the <i>Environmental Protection Act 1994</i> , its Regulations and Environmental Protection Policies must be used.

20.5 AIR

The EPP (Air) commenced on 1 February 1998. The objective of the policy (Part 2, Section 5) is to achieve the object of the EP Act in relation to Queensland's air environment. The EPP (Air) defines the unreasonable release of a contaminant to the air environment as meaning the release of odours, dust, smoke or other atmospheric contaminants that:

- cause unlawful environmental harm; and
- is unreasonable having regard to the following matters:
 - o its characteristics;
 - o its intrusiveness;
 - o other releases of contaminants at the place affected by the release;
 - o where the effects of the release of the contaminant can be noticed; and
 - o the order in which the person releasing the contaminant started to carry out the activity from which the release is made, and persons affected by the release started to carry out other activities that may be affected by the release of the contaminant.

Schedule 1 of the EPP (Air) nominates relevant air quality indicators and goals. The relevant air quality indicators for the IIPP are:

- total suspended particulate (TSP) concentration of 90 $\mu\text{g}/\text{m}^3$ averaged over a year; and
- a concentration of particulate matter with an aerodynamic diameter of less than 10 μm (PM10) of 150 $\mu\text{g}/\text{m}^3$ averaged over 24 hours, and 50 $\mu\text{g}/\text{m}^3$ averaged over a year.

The EPA Guideline "Preparing an Environmental Management Overview Strategy (EMOS) for Non-Standard Mining Projects" contains design limits for the release of dust and particulate matter. It states that dust or particulate matter or both resulting from a mining activity must not cause an environmental nuisance, at any sensitive or commercial place. The maximum permissible measured dust levels comprise:

- dust deposition of 120 $\text{mg}/\text{m}^2/\text{day}$, averaged over one month; and
- PM10 suspended in the atmosphere of 150 $\mu\text{g}/\text{m}^3$ over a 24 hour averaging time, at a sensitive or commercial place downwind of the operational land.

IIPP aims to meet the indicator criteria through the implementation of this EM Plan.

20.5.1 Environmental Values

The environmental values to be enhanced or protected within the IIPP area are the qualities of the air environment that are conducive to:

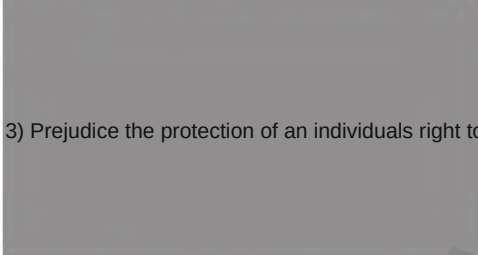
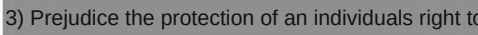
- the wellbeing of the community or a part of the community, including its social and economic amenity; or

- the wellbeing of an individual without unreasonable interference from intrusive dust.

Existing air pollution is mostly confined to dust generating activities. The principal current sources of particulate emissions include:

- traffic on the various local gravel roads;
- general farming traffic (tractors, trucks, light vehicles);
- farming activities (in particular dust from cultivated areas);
- cattle;
- smoke from occasional grass/bush fires; and
- activities at the surrounding mines including rail load-out and rail movement activities.

Moranbah is the closest township to the IIPP; approximately 7 km from the existing Isaac Plains Coal Mine and 10-12 km from the Expansion Area. As previously noted in **Section 20.2.3** the closest residences to the IIPP are as follows:

- 
- 
- 
- sch4p3(3) Prejudice the protection of an individuals right to privacy
- 
- 

Homesteads labelled S1 to S4 are the nearest sensitive receptors to the IIPP. **Figure 20-2** and **Figure 20-3** illustrate the locations of surrounding homesteads.

Section 20.2.3 also lists the numerous mines within relatively close proximity to the IIPP as follows:

- Peak Downs Mine;
- Carborough Downs Mine;
- Broadlea Mine;
- Poitrel Mine;
- Millennium Mine;
- Winchester Mine; and
- Moranbah North Mine.

In addition to the above, Burton's Mallowa Train Load-Out is located to the north-east of the existing Isaac Plains Coal Mine.

Figure 20-8 illustrates the location of each of the mines listed above in relation to the location of the IIPP.

20.5.2 Potential Impacts

20.5.2.1 Dust

The potential sources of dust emissions from the IIPP include:

- clearing vegetation and removal of topsoil;
- drilling and blasting overburden;
- removing and relocating overburden;
- extracting and handling coal;
- coal crushing, stockpiling and rail load-out;
- gas emissions from mobile plant exhaust;

- wind erosion of stockpiles and areas of bare soil; and
- vehicle movement on unpaved roads.

In addition to these activities, dust generation will occur through wind erosion of stockpiles and areas of bare soil. Vehicle generated dust is also partially wind generated. The main emission during coal rail transport is wind generated dust.

Sources of dust emissions from the IIPP are distributed over a range of 18 km, from the pit in the Expansion Area, to the CHPP in the existing Isaac Plains Coal Mine to the north, connected by the access/haul road. Dust is produced in this area by different activities that generate dust in varying concentrations. The likely levels of dust emissions at the nearest sensitive receptors have been predicted through modelling. In most cases, the change in the dust levels is determined to be comparatively minor.

It is noted that locations S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S24, S25, S26, S27, S28, S29, S30, S31, S32, S33, S34, S35, S36, S37, S38, S39, S40, S41, S42, S43, S44, S45, S46, S47, S48, S49, S50, S51, S52, S53, S54, S55, S56, S57, S58, S59, S60, S61, S62, S63, S64, S65, S66, S67, S68, S69, S70, S71, S72, S73, S74, S75, S76, S77, S78, S79, S80, S81, S82, S83, S84, S85, S86, S87, S88, S89, S90, S91, S92, S93, S94, S95, S96, S97, S98, S99, S100, S101, S102, S103, S104, S105, S106, S107, S108, S109, S110, S111, S112, S113, S114, S115, S116, S117, S118, S119, S120, S121, S122, S123, S124, S125, S126, S127, S128, S129, S130, S131, S132, S133, S134, S135, S136, S137, S138, S139, S140, S141, S142, S143, S144, S145, S146, S147, S148, S149, S150, S151, S152, S153, S154, S155, S156, S157, S158, S159, S160, S161, S162, S163, S164, S165, S166, S167, S168, S169, S170, S171, S172, S173, S174, S175, S176, S177, S178, S179, S180, 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However, the modelling assumptions are conservative in that it is assumed none of the PM10 dust generated within the pit will remain (trapped) within the pit and dust from access/haul roads outside the pit are uncontrolled, i.e. worst case scenario, whereas in practice they will be regularly watered.

It is noted that the contours for the PM10 and TSP concentrations are virtually identical at all the sensitive receptors, including the township of Moranbah. The reason is the heavier fractions of dust (represented by the fraction heavier/larger than PM10) falls out of the air fairly close to the source. Lighter fraction PM10 behaves more like a gas and remains in the air for a much longer period of time. It is also noted that the dust concentration contours for operations comprising either truck and shovel or dragline are virtually identical. This is an expected result as the emissions database illustrates that these sources contribute less than 1 % of the total emission sources from the IIPP. Therefore, even though the dragline has higher dust emissions than truck and shovel, it does not significantly influence the overall dust levels from the IIPP activities due to its small contribution to emissions.

Dust emissions from rail transportation were not specifically addressed in this assessment. QR are currently undertaking studies to reduce emissions from all coal haulage operations on the rail network. IPCM will assess the need for, and the options arising from, the QR investigations in order to minimise coal dust emissions during rail transportation. The increase in product coal being railed from the site to DBCT results in an increase from three trains per week to six trains per week. This is an increase in the contribution of coal dust emissions on the Goonyella System from approximately 2.2% to 4.6% per annum (based on total coal throughput at Hay Point Terminal (HPT) of 86.3 Mt in 2006-07). There is no change to the total tonnage hauled on the Goonyella line since tonnage is limited by the terminal throughput, which is already at capacity. Since coal dust emissions are related to tonnage hauled then there is unlikely to be any significant change to dust emissions from the Goonyella system. However, total emissions for the Goonyella rail system are expected to remain constant since the total tonnage hauled on the system is limited by the terminals throughput (i.e. HPT and DBCT).

20.5.2.2 Greenhouse Gas

The principal direct and indirect sources of greenhouse gas emissions from the mining activities at the IIPP are as follows:

- the consumption of electricity;
- the consumption of diesel (oxides of carbon, nitrogen and sulphur would also be emitted in vehicular emissions however these emissions are minor in comparison);
- methane emissions from ROM and product coal and some low concentrations of methane emissions at very low concentrations at the coal face (the concentration of methane is not likely to exceed 1 %, and consequently is not considered to have an adverse effect on air quality); and
- overburden and coal blasting.

20.5.3 Environmental Protection Objectives and Control Strategies – Air Quality

Environmental Protection Objectives And Control Strategies – Air Quality	
Environmental Value	Existing ambient air, with some elevated particulate concentrations during dry periods from fire and surrounding grazing lands and existing mining activities on site and in surrounding areas.
Environmental Protection Objective	Maintain ambient air quality levels and ensure sensitive receptors are not adversely affected. The release of dust or particulate matter or both resulting from the mining activities will not cause an environmental nuisance, at any sensitive or commercial place.
Performance Indicators/Criteria	No unlawful nuisance air quality levels at sensitive receptors. Number of air quality related complaints.
Control Strategies & Commitments	<p>Dust Controls</p> <p>All internal roads and unsealed external roads in the vicinity of residences traversed by vehicles associated with IIPP will be watered on an as needs basis. In particular, a 2 km section of the haul route between the Expansion Area and the CHPP, north-north-west of the ROM coal stockpile, should be regularly watered. The rate of watering should be increased during dry periods or during periods of high winds.</p> <p>Vehicular access within the site should be strictly limited to authorised vehicles and designated routes, i.e. bitumen and major haul/access roads.</p>

Environmental Protection Objectives And Control Strategies – Air Quality

Limit the internal speed on unsealed roads to 80 km/h on the southern part of the access/haul road, slowing to 60 km/h 1 km before the Peak Downs Highway underpass, then 60 km/h for remainder to CHPP/MIA/active pits.

Dump truck routes should be kept as short as practicable.

Spoil will be removed and dumped as soon as practicable after blasting, i.e. drying time will be limited where practicable.

Avoid topsoil stripping and replacement on days when the wind speed is sufficient to carry visible dust beyond the mine lease boundary.

Vehicles (other than mining machinery) should not be permitted on overburden dumps except for the purposes of rehabilitation.

Exposed areas should be rehabilitated (with grasses and vegetation) at the earliest possible timeframe. Rehabilitation will be completed in accordance with **Section 20.9.3** and the PoO for the IIPP.

Drop heights of coal and overburden from mining machinery will be kept to a minimum.

IPCM will establish tall vegetation around dust generating areas within the IIPP to encourage dust fallout.

Avoid burning of cleared vegetation where practicable. If vegetation is required to be burnt, ensure that wind is not blowing toward sensitive receptors.

Provide dust suppression sprays at locations in coal handling facilities that produce excessive dust (e.g. crusher, conveyor and coal stockpiles).

IPCM will conduct further detailed air quality assessment of the operations during initial stage of mining in the Expansion Area to identify and develop adequate controls to mitigate or negate adverse impacts on the protection of an individual's right to privacy.

A shut-down procedure will be implemented at the site in the event of significant and sustained adverse meteorological conditions. The procedure will be set up for use at the commencement of mining activities in the Expansion Area.

Complaints/Monitoring

When requested by the administering authority, IPCM will undertake dust and particulate monitoring within a reasonable and practicable timeframe to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place. The results will be notified within 14 days to the administering authority following completion of monitoring.

If the IPCM can provide evidence through monitoring that the following limits are not being exceeded then the holder is not in breach of their objective:

- a) dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with AS 3580.10.1 Methods for sampling and analysis of ambient air - Determination of particulates - Deposited matter - Gravimetric method of 1991; and
- b) a concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre (μm) (PM10) suspended in the atmosphere of 150 micrograms per cubic metre over a 24 hour averaging time, at a sensitive or commercial place downwind of the operational land, when monitored in accordance with:
 - particulate matter - Determination of suspended particulate PM10 high-volume sampler with size-selective inlet - Gravimetric method, when monitored in accordance with AS 3580.9.6 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM (sub) 10 high volume sampler with size-selective inlet - Gravimetric method of 1990; or
 - any alternative method of sampling PM10, which may be permitted by the 'Air Quality Sampling Manual' as published from time to time by the administering authority.

NOTE: IPCM will propose which monitoring method is appropriate in accordance with the above required monitoring.

If monitoring indicates exceedance of the above limits IPCM will:

- a) address the complaint including the use of appropriate dispute resolution if required; and
- b) immediately implement dust abatement measures so that emissions of dust from the activity do not result in further environmental nuisance.

Record complaints in site complaints/incidents register.

IPCM will maintain the existing dust deposition monitoring network for the foreseeable future and assess the monthly depositional records. These results will be critically reviewed on an as-required basis to determine if the mining activities are causing an increase in dust deposition above that predicted by the modelling completed as part of the EIS for the IIPP. Results will be analysed along with prevailing meteorology and mining rates/mining processes.

Environmental Protection Objectives And Control Strategies – Air Quality

sch4p3(3) Prejudice the protection of an individual's right to privacy	<p>Real-time low volume dust samplers will be installed in two locations, one between the existing Isaac Plains Coal Mine and the township of Moranbah and the other between the Expansion Area Pit and the township of Moranbah. The monitors will be installed as close to the homestead as practical. These monitors allow for ongoing monitoring of dust levels at these locations which may occur as a result of activities at the IIPP. The dust monitors are also fitted with wind speed/direction logger and a filter which permits subsequent analysis to verify the origin of dust components and will be linked via telemetry to the site communications system.</p> <p>The real-time monitors allow for analysis of dust levels and permit correlation of dust exposure with wind direction. This method of monitoring will enable IPCM to carry out a regular review of the daily dust data to determine whether additional controls would be required, especially in relation to the operations in the southern section of the Expansion Area pit.</p> <p>Further detailed air quality assessments of the operations will also be carried out during mining in the northern end of the Expansion Area pit when actual data will be available to better characterise the sources and refine control strategies for mining in the south in close proximity to the homestead.</p>
sch4p3(3) Prejudice the protection of an individual's right to privacy	<p>IPCM will conduct field verification for dust emissions from the dragline bucket during mining operations and will compare these results against modelled results. Should emissions be found to be excessive, appropriate control strategies will be developed in conjunction with the administering authority.</p>
	<p>Greenhouse Gas Emissions</p> <p>Use fuel and electricity as efficiently as possible and require contractors to conduct preventative maintenance on equipment and engines to reduce excessive greenhouse gas emissions.</p> <p>Ensuring equipment is maintained to retain high levels of energy efficiency.</p> <p>Minimising clearing – to minimise loss of vegetation sinks.</p> <p>Minimising burning of vegetation – to minimise emissions to the atmosphere.</p> <p>Greenhouse awareness training as part of site inductions to make employees aware of the science of global warming and efforts to minimise emissions.</p> <p>Promoting recycling.</p> <p>Diesel efficiency considerations will be included in assessments of new mobile and fixed equipment – the less diesel used the less CO₂ emitted during combustion.</p> <p>Electrical efficiency considerations will be included in assessments of new mobile and fixed equipment – the less electricity used the lower the externally emitted CO₂ level per tonne of coal produced.</p> <p>Participation in the Australian Government's Energy Efficiency Opportunities (EEO) program.</p> <p>Development and maintenance of an inventory of Greenhouse emissions and sinks to be aware of the extent of site emissions.</p> <p>Record site diesel and electricity use and explosives use to determine annual greenhouse gas emissions.</p> <p>Record all emissions as required by the National Pollution Inventory (NPI).</p> <p>Burning of waste vegetation from land clearing activities will not be undertaken without the appropriate permit. Neighbours will be notified at least 24 hours prior to burning of vegetation and no burning will take place if the average forecast wind speed is greater than 10 knots.</p> <p>Vale may consider participating in the Australian Government's Energy Efficiency Opportunities (EEO) program which came into effect in mid 2006. This program encourages large energy-using businesses to improve their energy efficiency by requiring businesses, using more than 0.5 Petajoules a year of energy, to identify, evaluate and report publicly on cost effective energy savings opportunities. The initial public report will be required by the end of 2008.</p>

20.5.4 Proposed EA Conditions

Proposed EA Conditions	
Dust Nuisance	
B1-1	Subject to Conditions (B1-2) and (B1-3) the release of dust or particulate matter or both resulting from the mining activity must not cause an environmental nuisance, at any sensitive or commercial place.
B1-2	When requested by the administering authority, dust and particulate monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within 14 days to the administering authority following completion of monitoring.

Proposed EA Conditions	
B1-3	<p>If the environmental authority holder can provide evidence through monitoring that the following limits are not being exceeded then the holder is not in breach of (B1-1):</p> <ul style="list-style-type: none"> a) Dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with AS 3580.10.1 Methods for sampling and analysis of ambient air - Determination of particulates - Deposited matter - Gravimetric method of 1991; and b) <u>The net contribution of the mine to the ambient concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre (µm) (PM10) suspended in the atmosphere of 50 micrograms per cubic metre over a 24 hour averaging time for more than five times per year, at a sensitive or commercial place downwind of the operational land, when monitored in accordance with:</u> b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre (µm) (PM10) suspended in the atmosphere of 150 micrograms per cubic metre over a 24 hour averaging time, at a sensitive or commercial place downwind of the operational land, when monitored in accordance with: <ul style="list-style-type: none"> - Particulate matter - Determination of suspended particulate PM10 high-volume sampler with size-selective inlet - Gravimetric method, when monitored in accordance with AS 3580.9.6 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM (sub) 10 high volume sampler with size-selective inlet - Gravimetric method of 1990; or - Any alternative method of sampling PM10, which may be permitted by the 'Air Quality Sampling Manual' as published from time to time by the administering authority. <p>NOTE: The monitoring method is appropriate in accordance with condition (B1-3) (a) or (b) or both will be determined by IPCM.</p>
B1-4	<p>If monitoring indicates exceedence of the relevant limits in Condition (B1-3), then the environmental authority holder must:</p> <ul style="list-style-type: none"> a) address the complaint including the use of appropriate dispute resolution if required; and b) to immediately implement dust abatement measures so that emissions of dust from the activity do not result in further environmental nuisance.

20.6 WATER

Under the EPP Water, 'waters' has the meaning of bed and bank of waters and 'surface waters' means water other than groundwater, i.e. surface water meaning water above the ground surface and groundwater meaning water below the ground surface.

The term 'waterway' is used generically throughout this EM Plan and includes 'watercourses' defined under the Water Act and 'drains' that do not meet with watercourse criteria under the Water Act.

20.6.1 Surface Water

20.6.1.1 Environmental Values

The IIPP is located within the Fitzroy Basin (refer to **Figure 20-9**). The IIPP is dissected by the Isaac River, a major river system of the Fitzroy Basin catchment. The existing Isaac Plains Coal Mine is located to the north of the Isaac River and the Expansion Area to the south.

The Isaac River catchment upstream of the IIPP comprises mainly scattered to medium dense bushland, grazing land and with the township of Moranbah, located approximately 7 km from the existing Isaac Plains Coal Mine. Several coal mines already exist in this catchment upstream of the site, including Moranbah North, Goonyella, Riverside, North Goonyella, Burton and Broadlea, and several downstream, including Carborough Downs, South Walker Creek, Broadmeadow, Millennium, Moorvale and Coppabella (refer to **Figure 20-8**).

Smoky Creek and a drainage line known locally as Billy's Gully traverse the existing Isaac Plains Coal Mine and are tributaries to the Isaac River. IPCM are proposing to divert Smoky Creek to access economic coal reserves beneath the waterway.

The Expansion Area is bounded to the north by the Isaac River and south by Cherwell Creek. Conrock Gully traverses through the centre of the proposed mine pit and will require diversion to facilitate mining.

Cherwell Creek is a major tributary of the Isaac River, and both the Isaac River and Cherwell Creek are subject to flooding, with the extent of flooding associated with the Isaac River posing a risk of flooding of the open cut Expansion Area coal pit. Flood levees will be required to reduce the flood risk from the Isaac River to the mine. Levees will be constructed prior to the commencement of mining in the Expansion Area.



Smoky Creek, Billy's Gully, the Isaac River, Cherwell Creek and Conrock Gully are all ephemeral systems with the majority of flows typically occurring intermittently following storm events in the wet season from December to March. Smoky Creek, Billys Gully, the Isaac River and Cherwell Creek are regarded as waterways for the purposes of the Water Act.

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Under Section 7 of the EPP Water, there are no particular environmental values attributed to the specific waterways located within the IIPP as they are not listed in Schedule 1. Section 7 (2) however, assigns the environmental values in receiving water to be protected under the category 'other waters' (e.g. in the IIPP area) as:

- ecosystem protection (Level 2 – disturbed ecosystems, Queensland Water Quality Guidelines (QWQG) 2006); and
- agricultural uses (Irrigation and Stock Watering).

The EM Plan aims to manage surface water resources which may be affected by the IIPP in the context of environmental values as defined by the EP Act, EPPs, ANZECC 2000 guidelines and regulations.

20.6.1.2 Water Demand

The main activities that require water are:

- coal processing;
- infrastructure requirements;
- dust suppression on haul roads and coal stockpiles; and
- infrastructure such as vehicle washdown.

Water demands were calculated based on ROM production rates, haul road length and CHPP throughput. The calculated annual water demands for the existing Isaac Plains Coal Mine and Expansion Area are shown in **Table 20-1**.

Table 20-1 Annual Water Demands (ML/year)

Activity	Existing Isaac Plains Coal Mine (ML)	Expansion Area (ML)	Total (IIPP) (ML)
Mining haul roads – dust suppression	245	291	536
Infrastructure requirements (office, wash-down)	5	2	7
Coal preparation and handling	200	240 (to be used in the existing CHPP)	440
Miscellaneous	50	20	70
Total Water usage	500	553	1,053

Based on **Table 20-1**, the annual water demands for the IIPP is 1,093 ML/yr, which is equivalent to approximately 3 ML/day.

20.6.1.3 Water Supply

Throughout the construction of the existing Isaac Plains Coal Mine, water was received from the adjacent Broadlea borefield via a pipeline network.

Since May 2006, water has been received from Eungella Dam via the Sunwater Eastern Spur pipeline located adjacent to the existing Isaac Plains Coal Mine. Water was initially received by gravity feed from the Eastern Spur Pipeline whilst pumping stations and the remainder of the pipeline were being installed.

IPCM has a water allocation from the Eungella Dam and is a foundation participant in the Burdekin Pipeline Agreement guaranteeing water supply for the IIPP from two sources. **Table 20-2** lists the IPCM water supply agreements.

Table 20-2 Water Supply Agreements

Water Agreement	Term	Quantity Per Annum	Special Conditions
Eungella Water Pipeline	01 November 2005 to 31 December 2020 i.e. 15 yrs subject to extension provisions.	540 ML-1st allocation to 01 July 2008, 380 ML additional taking total to 920 ML	Agreement is between Vale and Eungella Water Pipeline Company but assignment to IPCM is committed. However, assignment deed is pending. IPCM has been receiving water since May '06.
Burdekin River Delivery and Pipeline Transportation	15 December 2005 for a period of 20 yrs (i.e. to 2025).	920 ML (2008) 540 ML (2007)	IPCM may request extension to term of at least 10 yrs, no earlier than 3 yrs and no later than 1 year prior to the expiry date.
Eastern Spur Pipeline	For a period of 20 yrs after operations date occurs (7 days after Eungella advises stage 1 is complete, commissioned and operational).	938 ML	Commencement date occurs 7 days after Eungella advises Stage 2 is complete and operational. IPCM may request an extension for a term of at least 10 yrs, no earlier than 3 yrs and no later than 18 months prior to the expiry date.

NB: The Eastern Spur Pipeline (ESP) delivers both the Burdekin and Eungella water to the project site from Moranbah. As the ESP is limited to 920 ML/yr, the project supply is limited to this despite the collective allocation being 1840 ML/yr.

20.6.2 Potential Impacts

20.6.2.1 Surface Water Hydrology

Potential impacts on surface water hydrology from the IIPP are summarised in **Table 20-3** below.

Table 20-3 Aspects/Potential Impacts – Surface Water Hydrology

Aspect	Purpose	Potential Impact
Construction and operation of the mine within the Expansion Area.	-	Run-off from large areas of disturbed ground, including haul roads, waste rock dumps, pre-strip areas, together with a ROM coal stockpile and water extracted from mine pit highwalls. Contaminants from these areas have the potential for localised impacts on Cherwell Creek and the Isaac River within and immediately downstream, of the mine site. There is also the potential for regional impacts in the lower reaches of the Isaac and Connors River system, both located within the Fitzroy Basin.
Diversion of Conrock Gully to the Isaac River/Conrock Gully Dam.	To enable access to economic coal reserves beneath Conrock Gully and to enable mining of the Expansion Area as a continuous pit.	Redirection of flows into Isaac River approximately 4 km upstream of the current confluence. Erosion and scour of the diversion has the potential to cause sedimentation if not appropriately engineered. Inundation area upstream of diversion dam. Reduction/attenuation of streamflow due to storage. Provision of water for stock watering.
Construction of a levee approximately 4.2 km in length on the western side of the Isaac River from 1 km upstream of the proposed pit to the southern side of Conrock Gully. The levee height will be up to 1 m above the 1 % AEP flood height.	To protect mining operations in the Expansion Area from flooding.	Changes in flood patterns, increasing upstream and downstream flood risks and, potentially, erosion and scour.
Diversion of Smoky Creek - northern bank of the diversion will run alongside the outer spoil dump of Pit S1 with the southern bank excavated into the earth opposite Pit S2.	To enable access to economic coal reserves beneath Conrock Gully and to enable mining of the expansion area as a continuous pit.	Erosion and scour of the diversion could cause sedimentation if not appropriately engineered.

Aspect	Purpose	Potential Impact
Low level crossing at or above bed level of the Isaac River.	To enable ROM coal to be hauled on internal roads to the CHPP located at the existing Isaac Plains Coal Mine approximately 14 km to the north.	The potential for obstruction of flow and fish passage and also sedimentation of structures. Construction at or just above the bed level will be required rather than a culvert due to the sediment loads within the River, while not obstructing flows. Potential for disturbance of fauna corridors. Potential for interruption to subsurface alluvial groundwater bed flows.
Dragline crossing of Isaac River (approximately 2016).	On completion of mining the existing Isaac Plains Coal Mine, it will be necessary to 'walk' the dragline south across the Isaac River to the Expansion Area. Both dragline and truck and shovel methods will be employed for the IIPP.	Potential disturbance to the bed and banks of the Isaac River.
Backfilling of void from floodplain and buttressing the levee into the spoil dump.	To further eliminate the risk of overtopping the levee and/or levee failure and to provide flood protection to the final void south of the 202 m AHD contour.	Some erosion and scour of the levee and/or backfilled area could cause sedimentation if not appropriately engineered.

20.6.2.2 Mine Water Management System

Overview

The activities associated with the IIPP have the potential to impact on water quality from the sources summarised in **Table 20-4**.

Table 20-4 Potential Water Contamination Sources

Sources	Potential Contaminants
Overburden dump and coal stockpile	Run-off containing suspended solids and dissolved salts.
Pit	Suspended solids and dissolved salts
Infrastructure	Petroleum hydrocarbons, detergents, degreasers suspended solids
Septic system	Coliform bacteria and nutrients
Fine Coal Management System	pH, arsenic and Cu

To minimise the potential for impacts on the water quality of waterways downstream of the IIPP, a mine water management system has been designed and is in operation for the existing Isaac Plains Coal Mine and a conceptual design has been prepared for the Expansion Area. The design philosophy for the mine water management system is to manage water in three types of catchments based on water quality:

- **'Clean'** – surface runoff from areas where water quality is unaffected by mining operations. Clean water includes runoff from undisturbed areas and any fully rehabilitated areas;
- **'Dirty'** – surface runoff water from areas that are disturbed by mining operations. This runoff may contain silt and sediment or high salt concentrations, but does not contain contaminated material. However, this runoff must be of sufficient quality prior to discharge into natural water courses, if required; and
- **'Contaminated'** – surface water from areas affected by mining operations and potentially containing chemicals of various types used in the mining operations. There are restrictions on the use and release of this water. Contaminated water areas include sumps, stockpile areas, service bays and fuel storage areas. Rainfall and resulting runoff from these areas are also potentially contaminated and therefore must be managed to avoid discharge of potentially contaminated water into the natural water courses.

A water balance model was used to design the mine water management system. The model identified water supply and discharge requirements based on water demands to operate the mine and water generated through the operations.

The general principles to manage surface water for the various construction and mining phases of the IIPP are as follows:

- the fullest separation possible of clean, dirty and contaminated water runoff;
- minimise the area of surface disturbance, thus minimising the volume of dirty or contaminated runoff;
- contain and reuse on site any dirty water runoff that has high sediment or salinity concentrations whenever possible. If not, release it in a controlled manner in compliance with adopted water quality compliance criteria;
- collect and contain all potentially contaminated water on site. Recycle this water for use on the site without releasing it to the natural watercourses. If not, treat this water to adopted water quality compliance criteria prior to release into the surrounding environment; and
- maximise the use of on-site water and thus minimise the need for external water.

In relation to the diversions, the main mechanism of potential impact on water quality comes from the physical characteristics of the flow (i.e. hydraulics). Appropriate engineering design will reduce these potential impacts.

Existing Isaac Plains Coal Mine

A mine water management system was conceptually designed and included in the Environmental Management Overview Strategy (Matrix+ Consulting, November 2005) lodged in support of obtaining the environmental authority under the *Environmental Protection Act 1994* in 2005.

The existing Isaac Plains Coal Mine has two lawful release points, including:

1. Release point 1 (W2) – from Release Dam 1 (RD1) into Smoky Creek; and
2. Release point 2 (W4) – from Release Dam 2 (RD2) into Billy's Gully.

In order to protect downstream water quality, controlled releases will only occur when existing flows in Smoky Creek and Billy's Gully respectively, are large enough to enable a minimum dilution ratio to satisfy the criteria that discharges should result in less than a 10 % increase in background water quality. This ensures that salts, sediments and other contaminants contained in mine water can be accommodated by the natural hydrological system, by diluting these to levels that do not cause environmental harm.

A design dilution ratio was calculated (refer to **Table 20-5**) based on estimates of the water quality contained within the release dams and from the water quality of the Isaac River (i.e. where there is sufficient data available and which Smoky Creek and Billy's Gully ultimately report to). In relation to the water quality contained within the release dams, the limiting water quality parameter for coal mines in the Bowen Basin is conductivity, due pit water inflows and saline soils. As pit water inflows comprise direct rainfall, inflows from aquifers above the coal seam and inflows from the coal seams, the estimated conductivity of mine water was based on a weighted average of the total dissolved solids (TDS) concentrations and flow volumes for groundwater inflows to the pits, direct rainfall over the pit and runoff and from the coal stockpiles and spoil emplacements. The estimated in-pit conductivity is similar to values observed at operational mines in the area.

Table 20-5 Calculation of Dilution Ratio – Existing Isaac Plains Coal Mine

	Conductivity (µS/cm)
Background Level (Isaac River)	511
Estimated pit water conductivity (from groundwater quality data)	7788
Target Conductivity (10 % above background)	562
Thus $511Q_1 + 7788Q_2 = 562Q_3$. Solve equation for $Q_2:Q_1$	
Dilution Ratio	140:1

A water management system has been approved and implemented which:

- segregates clean water from entering the project area via a system of diversion drainage lines and levees;
- reduces runoff from spoil emplacements by shaping and progressive rehabilitation using a system that encourages internal pondage and drainage of appropriately designed sediment control structures and then into the site release dams. The crest and plateaux of the dumps will be shaped to mimic the pre-mine landform of undulating topography common to the Brigalow Belt;
- redirects run-off from areas that involve soil disturbance into sedimentation dams located at the lower end of the catchment of disturbed areas. Sediment dams are to be designed in accordance with the Institute of Engineers Australia, Queensland Division (IE Aust) Soil Erosion Guidelines for Queensland Construction Sites (1996);
- contains run-off from the coal handling and preparation plant area, haul roads, and un-rehabilitated areas;
- bunds the mine infrastructure area to prevent external flows entering the area, capturing and directing run-off from within the area to a dam, using the water collected in the dam for washdown, and containing and treating washdown waters via an oil/water separator. All hydrocarbon and petroleum products shall be bundled in accordance with AS1940 Storage and Handling of Flammable and Combustible Liquids;
- appropriately treats on-site sewerage via a package treatment plant/septic tanks/land irrigation system;
- re-uses water from the water management system to meet on-site demands, thereby reducing the need for discharging the water;
- controls the (infrequent) discharges of mine water to Smoky Creek and Billy's Gully under high flow conditions, with sufficient dilution (minimum 140:1) to avoid adverse environmental impacts;
- designs the mine water management system (in the rare and unexpected event of flood failure) to overflow to the pit, rather than to the natural drainage system;
- contains fine coal rejects and water in the unlikely event of cell failure of the fine coal management system; and
- contains discharge from dewatering of the belt press filters and tailings dam in the fine coal management system.

Figure 20-10 illustrates the mine water management system for the existing Isaac Plains Coal Mine.

All dams are designed to provide full containment of storm events up to the 1 in 10 year, 24 hour event from their respective catchments. Note that almost all mine water will be recycled rather than discharged. Controlled mine water discharges will only occur during a limited number of high flow events.

Because mining methods will include via truck and shovel method, box-cut spoil and internal spoil areas can be reshaped during placement. Runoff from the external box-cut slope will drain externally with the spoil dumps to be shaped to encourage internal ponding. External runoff from these areas will be controlled by sediment dams designed in accordance with the sediment and erosion control guidelines (IE Aust, 1996) with a typical length to width ratio of 3:1, combined with storage to contain the 24 hour, 1 in 10 year event. This allows sufficient settling time to reduce sediment loads to acceptably low levels.

During initial phases of rehabilitation, it is expected that dissolved solids in the runoff may be high. During this period, runoff treated in sediment dams will report to the mine water management system. After a sufficient period (nominally four years) to allow revegetation and leaching of salts from the upper soil profiles, grab sampling of outflows of sediment dams will be undertaken to confirm that concentrations of salts in the runoff are within acceptable levels in receiving waters. When this is verified, outflows from the sediment dams will be directed into the natural drainage system and will no longer be part of the mine water management system.



Groundwater inflows into active pits are captured in sumps and pumped as required to either a pit dewatering dam, or directly into a release dam.

The results of the geochemical testing indicates that overburden at the existing Isaac Plains Coal Mine indicates that overburden and coarse rejects will be non-acid forming, however fine coal rejects are considered potential acid forming (PAF).

As noted in **Section 20.3.2**, through the use of belt filter presses, the fine rejects are dewatered to around 70 % solids (30 % moisture), recovering water at the CHPP and negating the need for a tailings dam for the development of the existing Isaac Plains Coal Mine. Under this system, fine coal rejects recovered from the process will then be added to the coarse reject stream and disposed of in-pit. However, through early operations, IPCM have identified the need to develop an alternative system to manage the fine rejects as a contingency to failure of the belt filter presses, and to also improve the water recovery from the rejects circuit. This system entails a fine coal management system. The fine coal management system consists of engineer designed cells to allow for separation of the fines and the supernatant, with the supernatant reused in the CHPP. For further detail refer to **Section 20.3.2**.

Expansion Area

A conceptual mine water management system has been designed for the Expansion Area. The Expansion Area features the same aspects of the mine water management system as the existing Isaac Plains Coal Mine, however has less operational sources of potential contaminants as the Expansion Area will not require a CHPP or rail loop.

The conceptual mine water management system for the Expansion Area is illustrated in **Figure 20-11**. During the construction and operation of the mine within the Expansion Area, drainage from operational areas will include run-off from large areas of disturbed ground, including haul roads, waste rock dumps, pre-strip areas, together with a ROM coal stockpile and water extracted from mine pits. Contaminants from these areas have the potential for localised impacts on Cherwell Creek and the Isaac River within and immediately downstream of the Expansion Area site. Similar to the existing Isaac Plains Coal Mine, all mine water will be contained in Release Dam 3 (water collected in the MIA Retention Pond to be pumped to the Release Dam 3) and releases will only occur under controlled conditions when existing flows in the Isaac River are large enough to enable a minimum dilution ratio to satisfy the criteria that discharges should result in less than a 10 % increase in background water quality. If water from the MIA Retention Pond is not required, and the quality of the captured runoff meets the water quality compliance criteria, water from the MIA Retention Pond water may be pumped directly to the Isaac River.

The proposed release points from the Expansion Area are as follows:

- release point 3 – from Release Dam 3 (RD3) into the Isaac River; and
- release point 4 – from MIA Retention Pond (MRP1) into the Isaac River.

A design dilution ratio was calculated (refer to **Table 20-6**) based on estimates of the water quality contained within Release Dam 3 and the MIA Retention Pond and from the water quality of the Isaac River. In relation to the water quality contained within Release Dam 3 and the MIA Retention Pond, the limiting water quality parameter for coal mines in the Bowen Basin is conductivity, due to pit water inflows and saline soils. As pit water inflows comprise direct rainfall, inflows from aquifers above the coal seam and inflows from the coal seams, the estimated conductivity of mine water was based on a weighted average of the total dissolved solids (TDS) concentrations and flow volumes for groundwater inflows to the pits, direct rainfall over the pit and run-off and from the coal stockpiles and spoil emplacements. The estimated in-pit conductivity is similar to values observed at operational mines in the area.

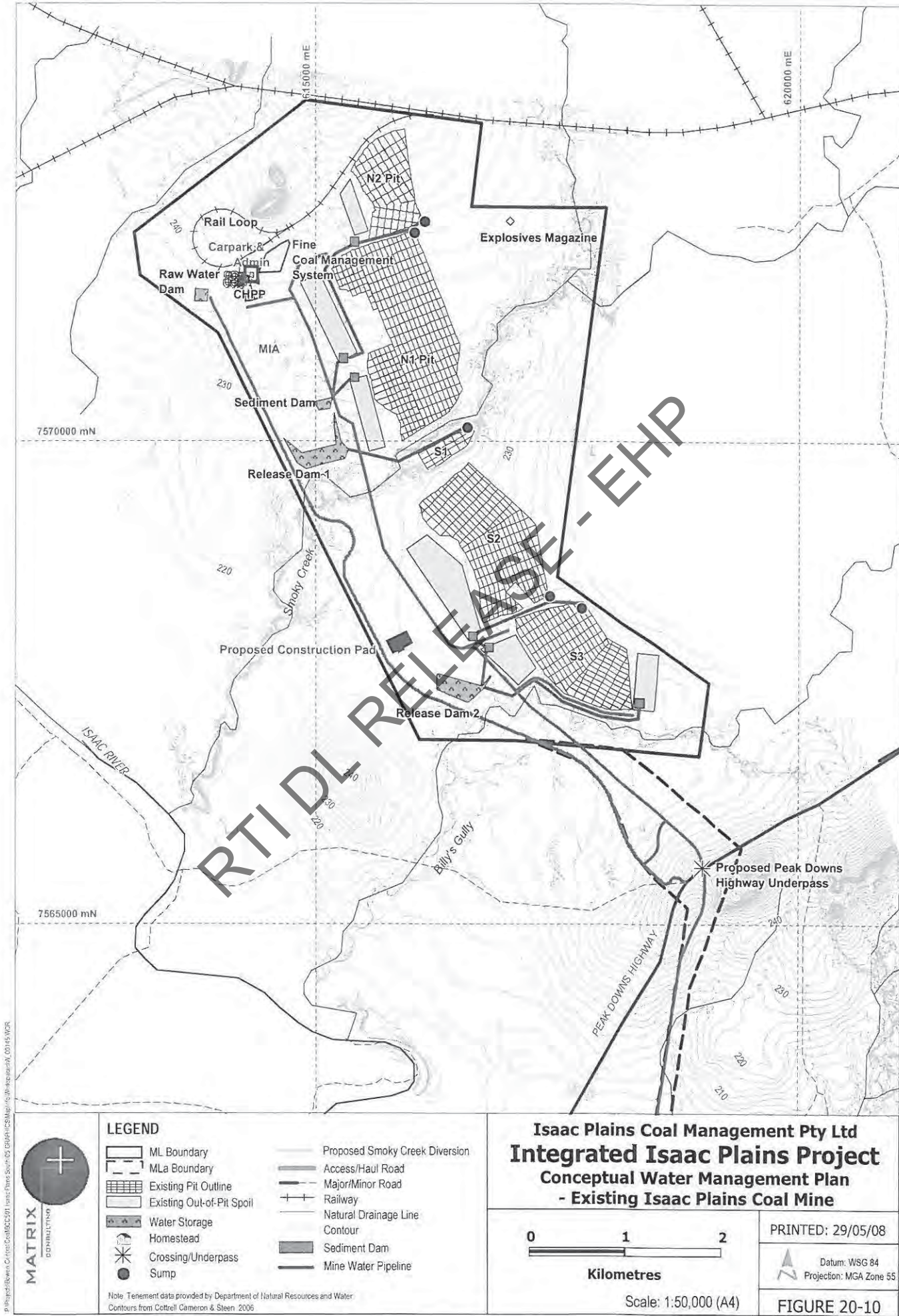
Table 20-6 Calculation of Dilution Ratio – Expansion Area

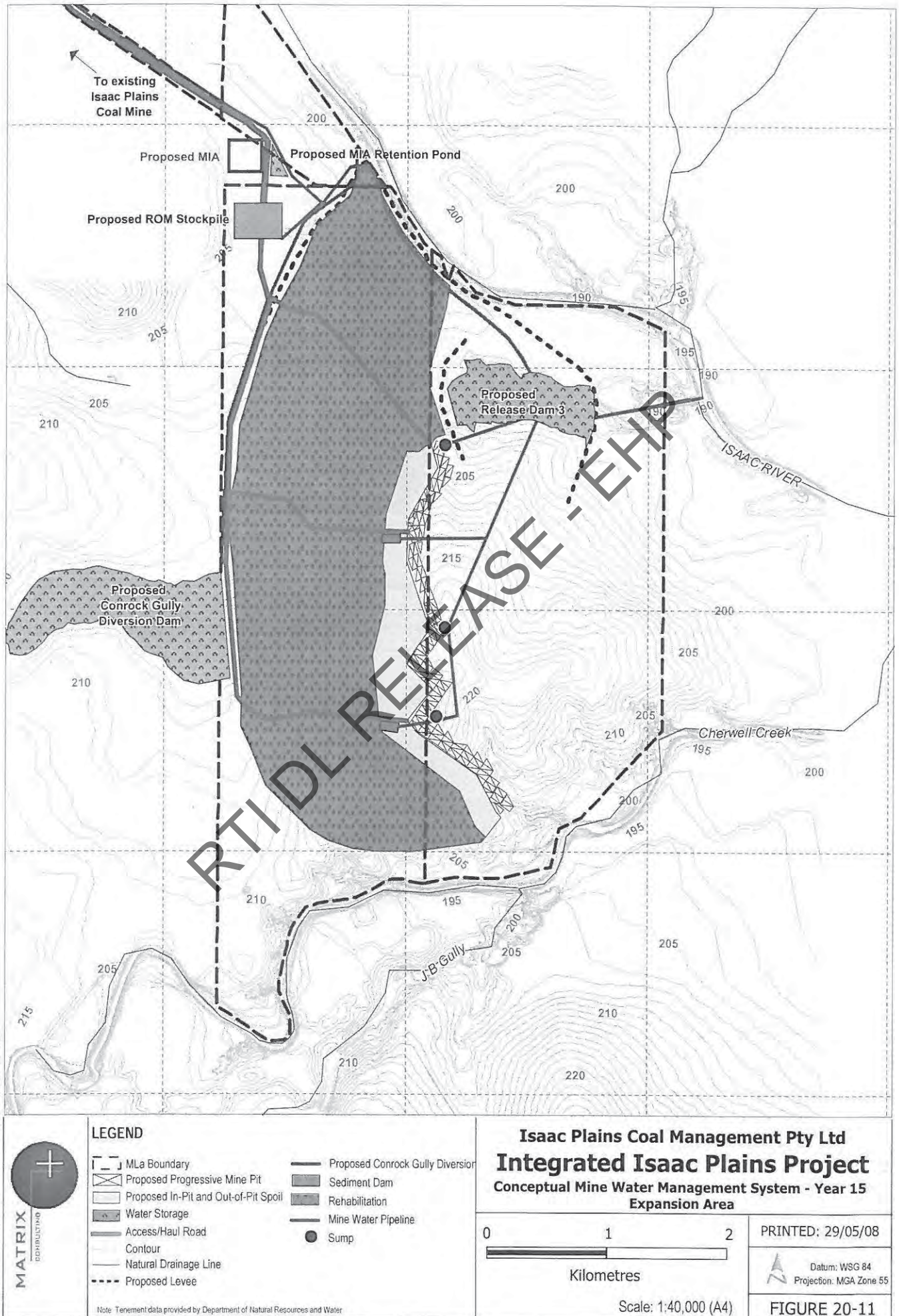
	Conductivity (µS/cm)
Background Level (Isaac River)	404
Estimated pit water conductivity (from groundwater quality data)	5,700
Target Conductivity (10 % above background)	445
Thus $511Q_1 + 7788Q_2 = 562Q_3$. Solve equation for $Q_2:Q_1$	



Dilution Ratio	1:130
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20.6.3 Groundwater

The IIPP lies within the Central Queensland coalfields. A subartesian aquifer system occurs within the Permian Rangal Coal Measures and provides modest water supplies for agriculture and livestock. Regionally, the Permian subartesian aquifer has poor or patchy water-bearing characteristics.

20.6.3.1 Environmental Values – Existing Isaac Plains Coal Mine

Groundwater in the vicinity of the proposed open cut pits is typically intercepted within 30m below ground surface in Permian sandstone/siltstone units; between approximately 40m and 125m below ground surface in the LHD Coal Seam; and typically beneath the coal seam within Permian lithic sandstone units. Water levels within bores installed within and below the coal seam typically rise to within approximately 30m of the ground surface.

Groundwater is hosted within strata of sandstone, conglomerate, mudstone, shale and coal. Groundwater is also potentially present within unconsolidated sediments such as sand and gravel, present along Smoky Creek and the Isaac River.

Based on the field assessment undertaken in this study, a total of 3 aquifers exist within the region. These include:

- Quaternary Alluvium;
- Tertiary Basalt; and
- Permian Sedimentary Rock and Coal.

Quaternary Alluvium

There are two alluvial deposits in and around the Mine Study area (EPC 755); each near Smoky Creek and the Isaac River respectively. The Quaternary alluvium comprises of clay, silt, sand, gravel, soil and residual deposits. Groundwater use is limited from these deposits and the potential groundwater resource is not known. Extraction rates of approximately 0.5 L/s have been noted by the owner of the bore.

Thin Smoky Creek alluvial deposits cross the northern portion of the Mine Study Area (EPC 755), from north-east to south-west; whilst the Isaac River alluvial deposits cover the southern section of the EPC (south of the proposed Mine Pit area).

Tertiary Basalt

Tertiary basalt crops out near the north-east corner of the EPC 755 boundary and along the eastern boundary near the proposed pit. This geological unit has a small horizontal coverage across EPC 755, and may host a shallow groundwater system.

Typically, basalt is characterised by a network of cooling fractures that are discontinuous, and the resultant groundwater yield is sporadic. The groundwater resource of the Tertiary basalt unit is not known.

Permian Sedimentary Rock and Coal

The Permian sedimentary rock and coal sequence has the largest regional coverage around the EPC 755 and underlies the alluvium and basalt cover.

The sedimentary rock comprises sandstone, siltstone, mudstone, shale and coal. The sedimentary rock crops out near the centre of the EPC 755 and continues towards the north-east corner. Groundwater extraction from the Permian units is limited, and extraction rates are limited to approximately 0.5 L/s.

Drill hole logs indicate V-notch flow rates range between 0.15 L/sec at 78 m (E7550027R) and 5.0 L/sec at 126 m (E7550050R). In addition, faulted zones may provide additional groundwater flow. Dry drill holes predominately fall within the proposed pit limits. Dry drill holes typically extend to a depth of 50 m and no more than 77 m. These dry holes may reflect the absence of groundwater within the upper sedimentary rock units.

Aquifer Recharge

Recharge of the groundwater system occurs via surface water infiltration into the groundwater system. Recharge to the aquifers in the region occurs predominately in the topographically higher areas and along creek beds during and immediately following rainfall events.

Recharge to the Tertiary basalt aquifer typically occurs in areas of thin soil cover or out crop (typically upland areas) where groundwater can readily move downwards into the aquifer via permeable zones including fractures, joints and vesicles. Recharge also occurs along creek beds, where basalt crops out, and enables direct infiltration of surface water into the aquifer during and following rainfall events.

The Permian sedimentary rock aquifer receives recharge at locations where the unit crops out or subcrops. In addition to this, the aquifer receives recharge via leakage from overlying, adjoining and in some instances, underlying aquifers. Due to the limited availability of hydrogeological data for the area, aquifer recharge rates are not known for the Isaac Plains Mine Site. However, a range between 1-7% of average yearly rainfall is expected for the Moranbah area, based on ranges observed in other areas of Central Queensland.

20.6.3.2 Environmental Values - Expansion Area

Within the Expansion Area, a general 'dryness', i.e. a poor supply, is present that is similar to that experienced in the existing Isaac Plains Coal Mine.

The major geological units in the Expansion Area have been delineated by resource drilling. These are, from shallowest to deepest:

- Tertiary sediment (1-20 m thick) and river alluvium (10-23 m thick);
- Permian Rangel Coal Measures, including:
 - sandstone, siltstone, mudstone, tuff, conglomerate;
 - LHD coal seam (~2.3 m thick), and
 - VER coal seam (5-7 m thick).

Quaternary Alluvium and Tertiary Sediments

The Tertiary sediments are 1-20 m thick (average 8 m) and are mostly unsaturated (i.e. 'dry'). They occur in the hills of the Expansion Area where the terrain is higher. Alluvium occurs along the Isaac River and to a lesser degree along Cherwell Creek. These alluvial sediments comprise a fining-upward sequence of unconsolidated sand, silt, clay, gravel and lithic fragments. The alluvium may extend to a distance up to 750 m from water courses, however, the lateral extent may be highly variable. The river alluvium is likely to have a relatively high permeability and relatively high specific groundwater yield. The particle size of the river alluvium ranges from fine sand to gravel.

Permian Rangel Coal Measures

In the Expansion Area, the Permian-age sedimentary rocks dip to the east (2-6 degrees) and include inter-bedded sandstone, siltstone and lesser amounts of carbonaceous mudstones, coal and tuff.

The Rangel Coal Measures typically have a relatively low permeability and poor water-holding properties (i.e. a relatively low specific yield). A weathered zone extends to 15-30 m below ground level (mBGL). The weathered zone is also considered to have poor water-holding properties.

The Permian Coal Measures contain groundwater within two coal seams: the LHD Seam and the underlying VER. The seams dip to the north-east across the site. Typically, the VER is stratigraphically located approximately 25 m below the LHD. In the north of the Expansion Area the LHD and VER seams 'coalesce' into a single, thicker seam (5-6 m thick). The coal seams are shallowest (approximately 150-175 mAH) on the western side of Expansion Area and deepest (approximately 45-95 mAH) at the north-eastern side of the Expansion Area. The Fort Cooper Coal Measures are located immediately beneath the first ply of the VER coal seam.

Sedimentary rocks of the Rangel Coal Measures typically have a low average hydraulic conductivity because of inter-bedding with fine-grained siltstones and mudstones which have very low hydraulic conductivity. Higher hydraulic conductivity sedimentary rock may be encountered within the faulted and fractured zones.

Fault Zones

Faulting is extensive throughout the Expansion Area and is most clearly denoted by changes in coal seam thicknesses and elevations. The regional Isaac Thrust Fault system is a major thrust fault that trends along the Isaac River to the northeast of the proposed pit area near Conrock Gully (JB Mining Services and Hewitt, 2005). Numerous north-north-west trending thrust faults and orthogonal transverse faults occur throughout the Expansion Area. Thrust faults located in the middle to northern section of the Expansion Area have caused throws of up to 25 m. Deeper weathering profiles may be associated with faulted zones within the Permian coal measures. Groundwater yields from the coal measures may also be affected by faulting.

Groundwater Occurrence

Groundwater occurs within the Quaternary alluvium, primarily within prior channels of the Isaac River, and within the Permian coal seams, which are expected to act as the primary conduit of groundwater within the Rangal Coal Measures.

Alluvium

An area towards the north of the Expansion Area contains the thickest section of alluvial sediment. The thickness of alluvium in this area generally ranges between 12 to 20 m. The base of the alluvium in this area generally ranges between 185 to 190 mAH (although there may be deeper paleo-channels that are not indicated by the available drilling data).

There are limited groundwater level data for the alluvium unit of the Expansion Area. However, records taken from existing monitoring bores indicate an average groundwater level within the alluvial aquifer of approximately 188 m AH. In this case, the saturated thickness tends to be very shallow averaging 3 m. It is considered that areas of deeper paleo-channel alluvial sediment may contain a more significant saturated thickness.

Owing to the heterogeneous nature of the alluvial aquifers, groundwater level fluctuations will not be uniform or systematic across the aquifer.

Rangal Coal Measures

Based on exploration drilling results, the Rangal Coal Measures located in the Expansion Area contain little or no groundwater similar to that of nearby mines (the existing Isaac Plains Coal Mine (north) and Poitrel Coal Mine (east)). Groundwater is absent in most exploration holes located within the Permian coal measures south of Conrock Gully. Where groundwater was encountered, yields were low. Hence, it is unlikely that coal units within the area south of Conrock Gully will yield significant groundwater during pit excavation.

Drill holes located north of Conrock Gully were also found to be generally dry. An exception to these findings occurred in association with the Isaac Thrust Fault within the coal measures to the north-east of the proposed pit area. As such, it is possible that any faulted-fractured zones intersected by mining operations could potentially yield a greater volume of groundwater. The groundwater modelling of this assessment considers this effect in a 'wet-case scenario'.

The hydraulic conductivity of the coal seams is generally lower than the overlying units. Lateral drainage through the alluvium will occur in preference to vertical drainage to the coal seam. The coal measures are fully saturated (i.e. in a confined state). During mining this confined groundwater is expected to drain into the pits as seepage.

20.6.3.3 Potential Impacts – Existing Isaac Plains Coal Mine

Potential groundwater drawdown around the pit was assessed as part of the approval process in 2005 using the Dupuit Equation. The Dupuit Equation is an analytical method for analysing steady groundwater flow in an unconfined aquifer. Within the mine pit limit, a near-pit decline in groundwater levels of up to 40 m is expected over the 9 year mine life of the existing Isaac Plains Coal Mine. Hydraulic conductivity values and pre-existing regional groundwater contours suggest that the drawdown cone will result in a radius of influence of approximately 2 km from the pit perimeter. The assumption of block averaged hydraulic conductivity, resulting in a conceptually homogenous and isotropic aquifer formation near the pit, gives rise to the anticipated drawdown contours.

Regional impacts are generally expected to be observed to the east and west of the mine site. However, the major thrust fault (Isaac Thrust) located immediately east of the deposit may limit the extent of groundwater drawdown impact in the east. No operational bores are located within two kilometres of the pit, thus it is unlikely that operational bores will be affected by groundwater drawdown associated with the mine development.

Groundwater levels in the area are expected to recover over time once the mining operations cease. Initially, there will be a higher groundwater gradient between surrounding areas and the pit, and this will result in a more rapid flow of groundwater into the pit. As the pit fills post mining through a combination of groundwater seepage and rainfall, this gradient flattens and less groundwater flows into the pit from surrounding areas. Recharge in these surrounding areas begins to take effect and the groundwater levels eventually begin to rise again. Recovery rates will depend on annual rainfall, with drought periods extending the recovery period and wet years shortening the recovery period. Eventually a state of equilibrium will be reached.

Analytical chemistry results indicate that groundwater in each of the major water-bearing systems (Permian sandstone/siltstone, LHD Coal Seam and Permian lithic sandstone) are of similar quality to each other with respect to EC, TDS, pH, metals and major ions. Any mixing between systems induced by mining activities is not likely to result in a decline in the quality of groundwater within an individual aquifer.

A review of groundwater quality data in the area has indicated that groundwater is unsuitable for uses such as stock watering or domestic supply. Rainfall, and any runoff from rehabilitated areas that drain into the final void, will add volumes of water at better quality than groundwater inflows. This dilution will be partly offset by evaporative losses, which will serve to increase the concentrations of salt within the final void water.

20.6.3.4 Potential Impacts - Expansion Area

The Expansion Area will become an open pit mine excavated using dragline and truck-and-shovel to remove the LHD, the underlying VER and their sub-plies. This will result in the removal of the overlying strata and the localised dewatering of aquifers as mining progresses. The depth of the pit will therefore extend to the base of those VER coal seams being mined which is located 30-80 m below ground. Groundwater inflow to the pit void will be collected in sumps constructed on the floor of the pit. The disturbed fill is 'uncompacted' and fractured, resulting in changes in hydraulic conductivity, specific yield and bulk volume.

Potential impacts on groundwater by open cut mining include changes to:

1. water-table levels/potentiometric surface levels;
2. groundwater flow patterns; and
3. bore water-levels and yields.

Groundwater bores within the footprint of the pit will no longer exist.

Additionally, mining activities may also inadvertently change the chemistry of groundwater via induced groundwater mixing and/or surface water mixing. To help estimate mine-induced groundwater flow and drawdown patterns, a numerical model was developed. Impacts on groundwater quality were interpreted qualitatively.

During mining operations, water quality within aquifers surrounding the Expansion Area is expected to remain the same as pre-mining water quality for these aquifers. No change in water quality during mining operations (as compared to pre-mining) is expected for the following reasons:

- during mining operations, groundwater will be continually extracted from the pit to ensure a safe working environment within the pit. Extraction of groundwater from the pit will create a depression in the potentiometric surface at this location, and groundwater surrounding the mine pit will travel towards this depression. The net movement of groundwater towards the pit during mine operation will prevent the movement of potentially poorer quality water (that may have been impacted by mining) from moving away from the mine operation area and into the surrounding aquifers; and



- aquifers outside of the mine pit area will continue to receive recharge via the same processes that occurred pre-mining.

Groundwater quality data also suggests that groundwater in the alluvial aquifer and the Rangel Coal Measures are of similar quality with respect to pH, TDS, major ions and metals. Hence any inadvertent mixing of groundwater (during mining) is unlikely to result in a deterioration of water quality in either aquifer.

During mine operations, water quality within aquifers surrounding the mine pit will continue to be suitable for the same purposes applicable during the pre-mining period.

The main features of the final landform after mining ceases will consist of waste rock dumps to the west, and a final void in the east, south of the 202 mAHD contour. The final void will be approximately 3,700 m long, approximately 70 m wide (at the base) and have an approximate depth of 80 m.

The final void will collect and accumulate water from groundwater ingress, direct rainfall into the void and from overland surface flows from the slopes of the waste dumps draining into the void. All undisturbed catchment flows will be diverted around the void.

The different hydrogeological parameters of the backfill material combined with the high rate of evaporation within the final void will create a different final equilibrium potentiometric surface than was present prior to mining. This will result in residual drawdown immediately surrounding the mined area when the potentiometric surface reaches an equilibrium level.

Although water quality in the final void is expected to deteriorate over time post-mining, this reduction in water quality is not expected to impact the surrounding aquifers. Water present within the final void (post-mining) will not flow out of the final void and into the regional aquifer for the following reasons:

- high evaporation rates over the final void will result in the final void water level being lower than the potentiometric levels within the surrounding aquifers. Evaporation over the surface of the final void water body causes a permanent sink in the regional potentiometric surface within the vicinity of the final void;
- groundwater will flow under pressure towards the final void along a hydraulic gradient, from areas of high pressure head to areas of low pressure head (i.e. the final void). Accordingly, the permanent depression of the potentiometric surface within the vicinity of the void acts like a sink and will not permit water within the final void to flow outwards into the regional system; and
- the local and regional aquifers will be replenished by rainfall on groundwater recharge zones, and are not expected to change in quality from pre-mining levels.

The long-term final void water level is predicted to be 114 (±9) m AHD or approximately 20 (±9) m deep at its deepest location. TDS modelling predicts that after mine closure the final void water TDS concentration will increase steadily taking approximately 6 years to exceed the ANZECC (2000) stockwater guideline TDS of 2,500 mg/L. Extrapolating further into the future, the model predicts that in approximately 110 years the void water TDS concentration will approach that of seawater (35,000 mg/L).

The mining activities are not expected to have a detrimental impact to the groundwater quality in the vicinity of the Expansion Area. Hence, the post mining groundwater quality within both the alluvium and the Rangel Coal Measures surrounding the mining area are expected to remain the same as pre-mining groundwater quality.

20.6.4 Environmental Protection Objectives and Strategies - Water

Environmental Protection Objectives And Control Strategies - Water	
Environmental Value	Biological and structural integrity of on site and downstream waterways. Maintain groundwater quality and levels throughout the site and surrounding areas.
Environmental Protection Objective	To take all reasonable and practicable measures to avoid degradation of the environmental values of waterways and groundwater aquifers within the vicinity of the IIPP.
Performance Indicators/Criteria	<u>Existing Isaac Plains Coal Mine</u> Water quality downstream, after initial mixing should not exceed 10 % above background water quality.

Environmental Protection Objectives And Control Strategies - Water

	<p>(EC, pH and turbidity)</p> <p>Expansion Area</p> <p>Water quality downstream after initial mixing should not exceed historical 80th percentile Isaac River concentrations unless upstream water quality is greater than the 80th percentile historical concentration. Under these conditions, the water quality downstream should not exceed the upstream water quality concentrations.</p> <p>Treated Sewerage Effluent:</p> <ul style="list-style-type: none"> • BOD 5 mg/L; • Suspended Solids 30 mg/L; • pH 6.5 – 8.5; • Free Residual Chlorine 1 mg/L; and • Faecal Coliforms 1000 thermotolerant coliforms/100mL. <p>Where required, water sampling to be undertaken in accordance with Water Quality Sampling Manual, EPA (3rd edition, 1999).</p> <p>Laboratory analyses to be undertaken by a NATA-accredited laboratory.</p>
Control Strategies/Commitments	<p>General</p> <p>All runoff water from disturbed areas will be captured and managed on site within the surface water management system.</p> <p>Implementation of a Mine Water Management System that achieves the following functions:</p> <ul style="list-style-type: none"> • diversion of clean water from undisturbed areas away from disturbed areas; • directing rainfall run-off from all disturbed areas and sediment dams for settlement of suspended solids; • directing all pit area water to the release dams RD1, RD2 and RD3; • managing controlled releases from release dams to surface waters to achieve less than a 10% increase in background water quality recommended performance criteria. Site specific background water quality will be collected following an overflow event; and • re-use of collected water as part of operations (e.g. dust suppressant on roads, vehicle washdown). <p>Infrastructure at the existing Isaac Plains Coal Mine managed as follows to prevent the release of contaminants to the environment:</p> <ul style="list-style-type: none"> • workshop housed on a cement pad with an oil/water separator; • chemical storage within the workshop is bunded in accordance with AS1940⁷; • portable lubrication system is self bunded; • two waste oil tanks are bunded in accordance with AS1940; • process diesel fuel tank (capacity 26,000 L) bunded in accordance with AS1940; • diesel fuel tanks (capacity 32,000 L) bunded in accordance with AS1940; • fuel storage - 2 x 58,000 litre diesel self-bunded fuel tanks – bunded in accordance with AS1940; • fuelling station – cement pad complete with bunding, sump and oil water separator. (Truck refuelling is via service trucks at various locations around the site – spill kits are located on refuelling vehicles); • light and heavy vehicle washdown pad which includes sediment control, oil/water separator and adequate bunding; • a septic system with a transpiration trench at the main administration offices with capacity for 20 equivalent persons (EP); • a septic system with a transpiration trench at the train load-out with capacity for 5 EP; • fuelling station – cement pad complete with bunding, sump and oil water separator. (Truck refuelling is via service trucks at various locations around the site); • MIBC (Methylisobutylcarbinol) tank (capacity 26,000 L) bunded in accordance with AS1940; and • flocculent storage silo, stored next to MIBC tanks and process diesel tanks bunded in accordance with AS1940. <p>Infrastructure within the Expansion Area managed as follows to prevent the release of contaminants to the environment:</p> <ul style="list-style-type: none"> • workshop – housed on a cement pad and oil/water separator; • chemical storage within the workshop bunded in accordance with AS1940;

⁷ AS 1940 - Storage and Handling of Flammable and Combustible Liquids of 2004.

Environmental Protection Objectives And Control Strategies - Water

- portable lubrication system is self bunded;
- diesel fuel tanks – 2 x 58,000 L self-bunded storage tanks in accordance with AS1940;
- fuelling station – cement pad complete with bunding, sump and oil water separator. (Truck refuelling will be via service trucks at various locations around the site);
- light and heavy vehicle washdown pad which includes sediment control, oil water separator and adequate bunding; and
- a septic system at the main office/mine infrastructure area with capacity for 60 EP. As with the system at the existing Isaac Plains Coal Mine, this system will be installed *in lieu* of a package sewage treatment plant. The treated sewage from this system will be pumped out to the workshop dam on a regular basis.

The mine pits will be dewatered with water pumped out and stored in the release dams.

Runoff from spoil dumps will be directed to sediment dams. This water will then be directed to the release dams until such time as the spoil dumps are sufficiently rehabilitated.

Prediction of residual void water quality will be assessed prior to site decommissioning and rehabilitation.

If water monitoring detects acidic conditions in water storages, then lime dosing can be undertaken as required for neutralisation.

Expansion Area controlled release rules:

- all pumping from the open pits, MIA Retention pond and sediment dams to Release Dam 3 will cease when the available flood storage below the spillway crest level falls below the 10 % AEP 24 hour duration storm volume (minus losses). For the first year, the 10 % AEP 24 hour duration storm volume is 400 ML. (However, the minimum flood storage volume will reduce as the dam catchment becomes mined);
- no controlled releases will be made when the stored volume in Release Dam 3 is less than 500 ML;
- no releases will be made when the Isaac River flow is less than 1,000 ML/day and a median EC of 180 $\mu\text{S/cm}$;
- a maximum release of 30 ML/day will be made from Release Dam 3 to ensure the combined Isaac River and release water quality at WQ6 downstream of the mine does not exceed the adopted water quality compliance criteria presented in the table below;
- when the water quality in the Isaac River at WQ5 upstream of the Expansion Area exceeds the adopted water quality compliance criteria for pH, EC and Total Suspended Solids (TSS) outline below, the quality of water released from the Expansion Area must not exceed the quality of water in the Isaac River at WQ5; and
- Release Dam 3 water quality releases will be limited to a pH of 6 to 9 and a maximum EC of 5,000 $\mu\text{S/cm}$.

The release points, RP1 and RP2 and water quality sites WQ5 and WQ6 will be monitored for flow and quality during a release event to ensure the water quality compliance criteria area achieved. Details of the operational rules of the dams will be determined once the pipe outlet configuration has been designed and presented as part of the Plan of Operations for IIPP.

If the stored water collected in the MIA Retention Pond meets the water quality compliance criteria, i.e. a pH of 6 to 9 and a maximum EC of 5,000 $\mu\text{S/cm}$, and flow is recorded at WQ5 upstream of the mine, the MIA Retention Pond water will be released to the Isaac River. When there is no Isaac River flow recorded at WQ5, the water will be pumped to Release Dam 3.

	pH	EC ($\mu\text{S/cm}$)	TSS (mg/L)
80 th percentile Concentration (Isaac River)	7.8	320	3,722.5

The discharge of all mine-affected receiving waters to result in less than a 10 % increase in background water quality (EC, pH and turbidity), after the initial mixing zone.

Diversions

Development of stable diversion channels for Conrock Gully and Smoky Creek to ensure there is no increase in sediment load discharged to the Isaac River from the diversions. Detailed design plans will be prepared and included in the Plan of Operations prior to undertaking the works.

The chosen option for the Conrock Gully Diversion has been selected as the optimal balance of excavation requirements and height of the diversion dam spillway (and hence impoundment area). To minimise the impoundment area and subsequent loss of flows through evaporation requires a deeper diversion channel. Hence while the channel will be designed using natural channel principals, the diversion channel will be longer with a flatter bed shape.

The detailed design plans will also be submitted in support of obtaining approvals for the Smoky Creek Diversion under the *Water Act 2000*. (Conrock Gully is not a defined watercourse).

Detailed design plans of the Conrock Gully dam and diversion will be prepared and included in the relevant PoO for the time period in which IPCM propose to undertake the works.

Environmental Protection Objectives And Control Strategies - Water
Low Level Crossing

The crossing will be designed to allow coal to be hauled from the Expansion Area to the existing Isaac Plains Coal Mine primarily haul trucks. The crossing is proposed to be an over topping low level crossing accommodating only low flow events of less than a 1 in 2 year occurrence interval. The crossing will also allow for the dragline to be 'walked' across the Isaac River on completion of mining the existing Isaac Plains Coal Mine, nominally in the year 2016. This will require the Isaac River crossing to be widened by adding bed sand or gabions to increase the width. The additional material will be removed once the dragline has crossed. These provisions will be confirmed with the EPA and DNRW prior to moving the dragline.

Construct low level cross of the Isaac River at or just above bed level to minimise obstruction to flow and to allow sediment to pass over during both high and low flow events.

Impose speed limits on the low level crossing of the Isaac River to minimise the spillage of coal. Conduct weekly inspections for spillage of coal and collect any spillages accordingly.

Minimise obstruction to streamflow when conducting widening works for walking the dragline across the Isaac River. Obtain Water Act and Plan of Operations approval prior to undertaking the works and prepare detailed plans in support of obtaining the necessary approvals.

Provisions are to be made for the safe movement of fauna in the vicinity of the low level crossing of the Isaac River. This includes the provision of 'dry culverts' or pipe/box culvert structures, and/or the erection of fencing along the margin of the riparian corridor in the vicinity of the crossing to direct fauna into the safe passage area and prevent fauna crossing the road. As part of the detailed design of the low level crossing, flood studies will be assessed to ensure that appropriate fauna passageways are provided.

Surface Water Monitoring

Surface water monitoring will be conducted at the Expansion Area in accordance with the following as outlined in the table below at the locations illustrated in **Figure 20-12** and **Figure 20-13**.

Surface Water Quality Monitoring

Location	Parameters	Frequency
Existing Isaac Plains Coal Mine		
W1 W2 W3 W4	pH, EC, TSS	Once daily during discharge events
Treated effluent storage pond	5-day BOD Suspended Solids Total Phosphorous Total Nitrogen Thermotolerant coliforms/100mL pH	Monthly
Expansion Area		
RP1	pH, EC and TSS	Once daily during discharge events
RP2	pH, EC and TSS	Prior to release to the Isaac River
Upstream of the Expansion Area (ES1)	Flow Rate and EC	Continuous
Upstream and Downstream of the Expansion Area on both Isaac River and Cherwell Creek (WQ5, WQ6, WQ7 and WQ8)	pH, EC and/or Total Dissolved Solids, Turbidity, Total Suspended Solids, Metals, Anions and Cations	Event-Based (grab samples)
On-site Water Storages (MS1, MS2, MS3 and MS4); MS 1 only	Water levels, pH, EC and/or Total Dissolved Solids, Turbidity, Total Suspended Solids, Metals, Anions and Cations As, Co, Fe, Se, Sb and Zn	Monthly until baseline is established and then quarterly and during releases Monthly
In pit (Expansion Area)	pH	Monthly

Environmental Protection Objectives And Control Strategies - Water		
Groundwater		
In the event that groundwater fluctuations in excess of 2 m/yr are detected and the fluctuations are not the result of pumping from licensed bores, the EPA must be notified within 14 days.		
Location	Parameters	Frequency
Existing Isaac Plains Coal Mine		
Burton Coal Bore 2	Water level	Quarterly
Swamp Bore 1		
DNR 13060284		
Expansion Area		
Near Field 1	Water levels EC	Water levels will be monitored continuously for a period of 12 months and then every six months Every six months
Near Field 2	Water levels EC	Every three months for a period of 12 months and then every six months Every six months
Near Field 3 and 4 and 584s, 584d, 593 and 594	Water levels pH, EC and TDS, major cations and major anions, total nitrogen, ammonia, total phosphorous and reactive phosphorous, Al, As, Cd, Cu, Pb, Hg, Se and Zn	Every three months for a period of 12 months and then every six months Every six months
Regional 1, 2, 3 and 4	Water levels Regional 2 and 4 only - pH, EC and TDS, major cations and major anions, total nitrogen, ammonia, total phosphorous and reactive phosphorous, Al, As, Cd, Cu, Pb, Hg, Se and Zn	Monthly Annually
*Stock Watering Bores 12 and 20	Water levels	Every three months for a period of 12 months and then annually
*Stock Watering Bore 18	Water levels, abstraction rates, EC	Every three months for a period of 12 months and then annually
Groundwater level fluctuation and water chemistry monitoring will be undertaken in groundwater bores surrounding the mining operations. The proposed operational phase groundwater monitoring program is outlined below at the locations illustrated in Figure 20-13 and Figure 20-14 .		
*After the initial monitoring period, any stock water bores believed to be unreliable due to poor construction, age, corrosion and other factors may be removed from the monitoring program.		

20.6.5 Flood Protection Levees

20.6.5.1 Levee Construction Material

The alignments and typical cross sections of the Q500 and PMF levees are illustrated in **Figure 20-15**. The Q500 levee is approximately 8.3 km long and has a constructed volume of 325,000 m³. The PMF levee is approximately 8.9 km long and has an additional volume of 1.6 Mm³ (in addition to the initial Q500 levee volume).

There is approximately 260 Mm³ of overburden available from the Expansion project. Based on logs from the exploration drill holes there is estimated to be approximately 25 Mm³ of clay overburden material that is likely to be suitable for levee construction. This material is located near the surface over the entire mining excavation area. The top of the clay layer varies from the surface down to a depth of approximately 10 m. The clay layer has a thickness ranging from 1 m to 10 m.

Based on these quantities suitable clay will be available near the surface at the commencement of operations to construct the Q500 levee. Mine planning and overburden dump scheduling will be conducted to ensure that suitable additional volumes of clay material are available and accessible in the final spoil dump for the construction of the PMF levee at mine closure.

Geochemical characterisation of clay spoil indicates that this material ranges from slightly to moderately sodic (**Appendix J**). Soil testing of potential levee construction material will be conducted to avoid the use of any highly sodic material in levee construction. If necessary, dependant on the test results, any sodic material used in levee construction will be treated with soil conditioner, such as dolomite, to restore the ionic balance. Constructed levees will also be topsoiled and grassed to minimise the potential for erosion of any sodic material.

20.6.5.2 Levee Stability

The Q500 operational levee will be inspected annually by a suitably qualified engineer. The annual inspections will include an evaluation of the stability of the levee in relation to erosion and long-term stability. These annual inspections will enable the development of a dataset to quantify the risk of failure of the post-mine PMF levee. This will involve a visual inspection of the levee and recording any significant erosion and associated remedial works.

20.6.5.3 Isaac River Buffer Zone

As discussed in Section 10.8 a minimum buffer of 50 m will be maintained between the top of the highbank of the Isaac River and the upstream toe of the levee banks. This buffer will ensure the preservation of vegetation in the vicinity of the river bank. In addition, a minimum total buffer distance between the top of the highbank and the crest of the mining excavation of 100 m will be maintained.

The PMF levee footprint, in the vicinity of the river, will be up to approximately 75 m wide. In addition, a drainage corridor of 20 m will be maintained between the crest of the mining excavation and the downstream toe of the levee.

The New South Wales Department of Infrastructure, Planning and Resources' *Stream/Aquifer Guidelines* dated 2005, do not specify a minimum buffer distance between an open cut mine and river banks for ephemeral streams, like the Isaac River. The proposed minimum buffer distance of 100 m has been demonstrated to be stable at operating open cut mines with similar river bank/geological bedding plane orientations, such as Ensham Mine. The Curragh Mine has different and less stable river bank/geological bedding plane orientations compared to IIPP and is therefore not a relevant comparison for stability issues.



LEGEND

- Town
- Major/Minor Road
- Railway Line
- Natural Drainage Line
- MLA and ML Boundary
- Water Gauging Station
- Existing Water Monitoring Site
- Proposed Water Monitoring Site
- Broadlea Monitoring Sites

Isaac Plains Coal Management Pty Ltd
Integrated Isaac Plains Project
Water Gauging Stations and Monitoring Sites

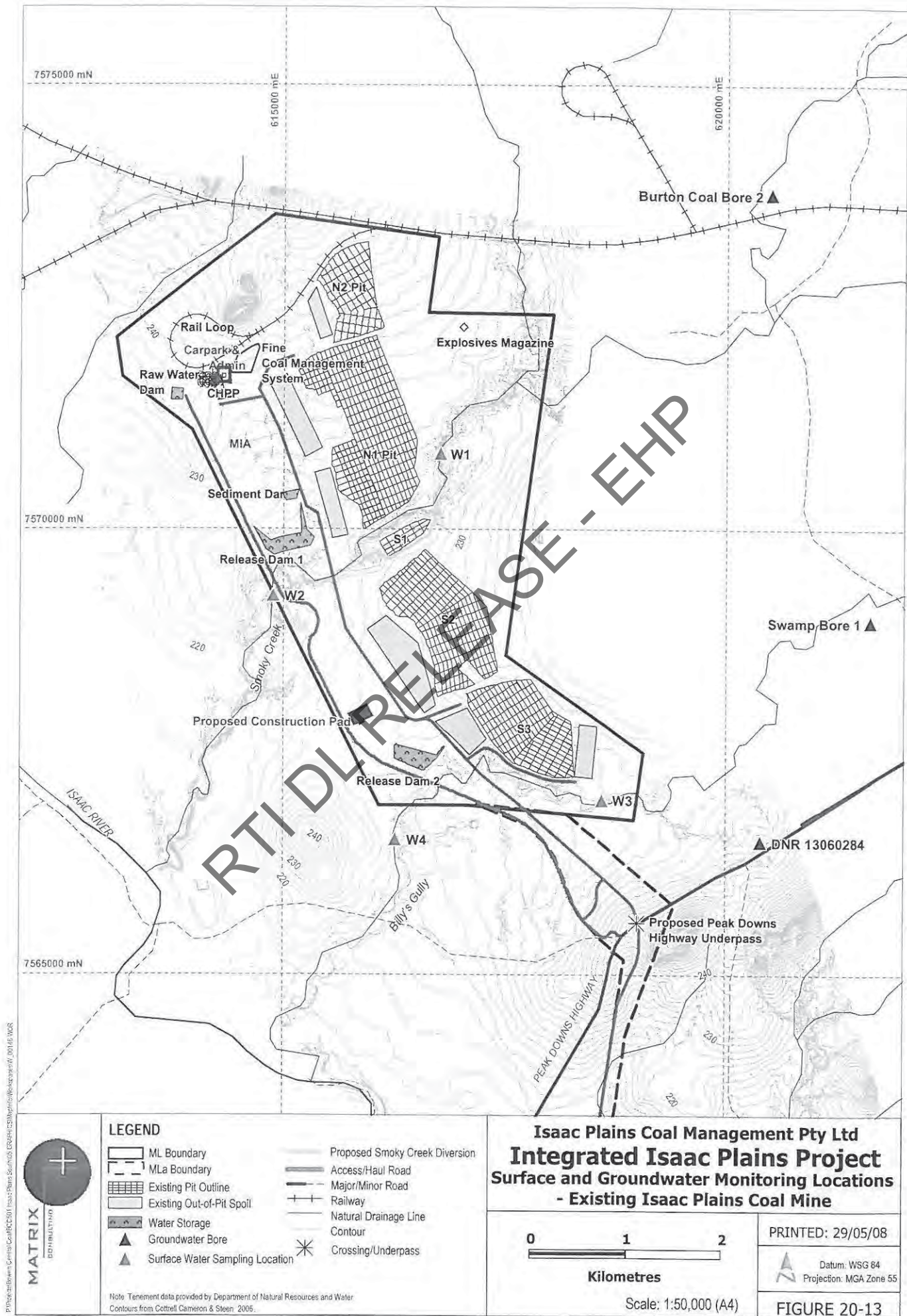
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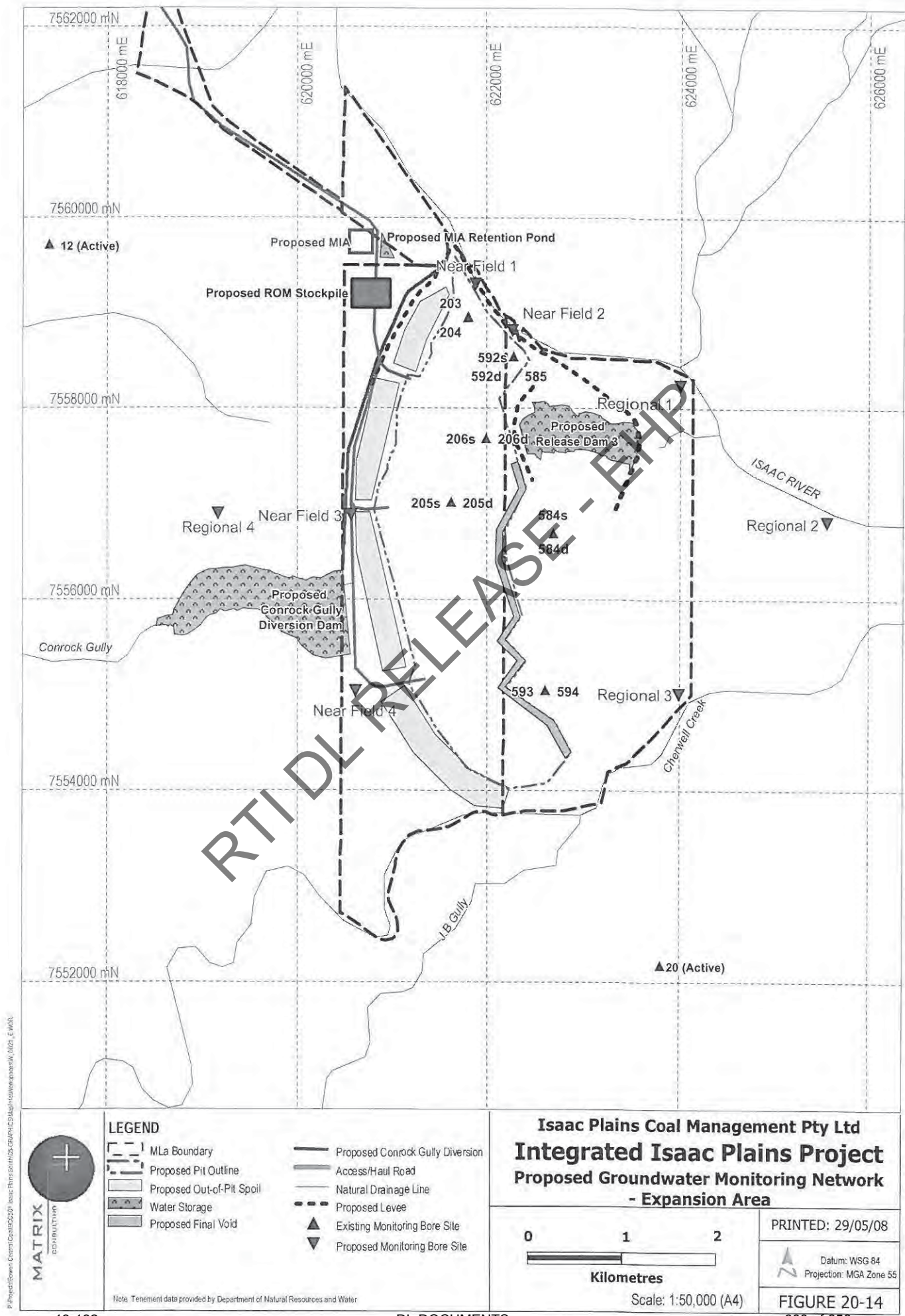
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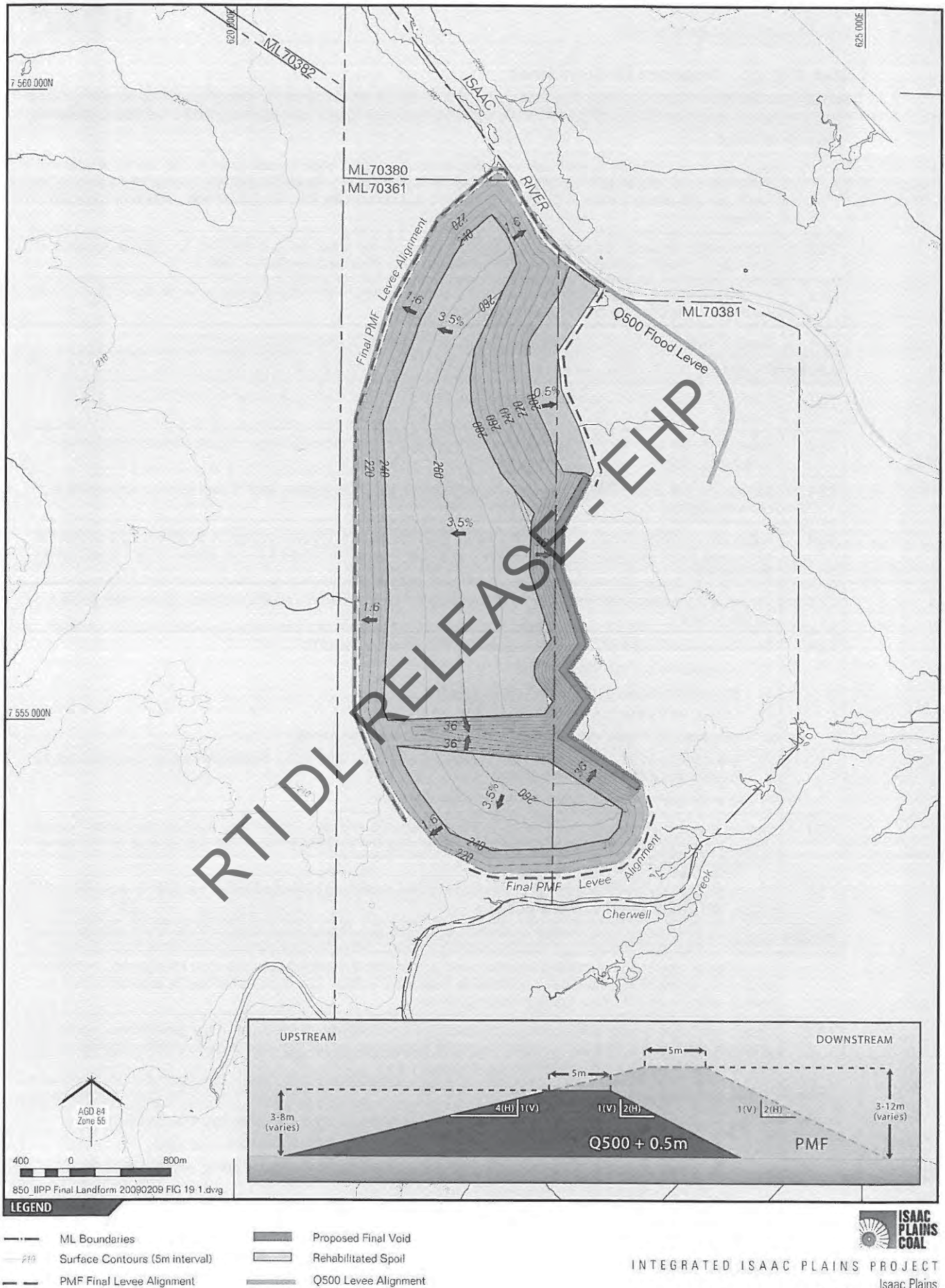
PRINTED: 29/05/08



Datum: WGS 84
 Projection: Lat/Long







20.6.520.6.6 Proposed EA Conditions

Proposed EA Conditions	
Release to Waters	
C1-1	Receiving waters affected by the release of process water or storm water contaminated by the mining activities or both must be monitored at the locations as shown in Attachment 1 – Figure 1 illustrated in Figure 20-12 and Figure 20-13 and frequencies defined in Schedule C - Table 1 and comply with the contaminant limits defined in Schedule C - Table 1.
C1-2	Contaminants must only be released to waters from the release points W2 and W4, RP1 and RP2 as specified in Schedule C - Table 1 and in compliance with the release limits shown in Schedule C - Table 1.
C1-3	Contaminants must not be released by the conduct of the mining activities to any waters or the bed and banks of any waters except as provided for by condition (C1-1).
C1-4	Effective erosion protection and sediment control measures must be implemented and maintained.
Sewage Effluent	
C2-1	All effluent released from the treatment plant must be monitored at the frequency and for the parameters specified in Schedule C - Table 2.
C2-2	Sewage effluent used for dust suppression or irrigation must not exceed sewage effluent release limits defined in Schedule C - Table 2
C2-3	Sewage effluent used for dust suppression or irrigation must not cause spray drift or over spray to any sensitive or commercial place.
C2-4	Subject to Conditions (C2-1) to (C2-3) inclusive, sewage effluent from sewage treatment facilities must be reused or evaporated and must not be directly released from the sewage treatment plant to any waters or the bed and banks of any waters.
C2-5	The effluent irrigation areas must have a separation distance of at least 30 meters from any groundwater bores and surface waters.
C2-6	The irrigation of treated effluent must be carried out in a manner such that: <ul style="list-style-type: none"> a) vegetation is not damaged; b) soil erosion and soil structure damage is avoided; c) there is no surface ponding of treated effluent; d) percolation of treated effluent beyond the plant root zone is minimised; e) the capacity of the land to assimilate nitrogen, phosphorus, salts, water and organic matter (as measured by oxygen demand) is not exceeded; and f) and the quality of groundwater is not adversely affected.
C2-7	Notices must be prominently displayed on any treated effluent irrigation area warning staff and the public that the area is irrigated with treated effluent and not to use or drink the treated effluent. These notices must be maintained in a visible and legible condition.
C2-8	The daily volume of contaminants released to land must be determined by an appropriate method, for example a flow meter, and records kept of such determinations.
Groundwater	
C3-1	Groundwater affected by the mining activities must be monitored at the locations shown in Attachment 1 - Figure 2 and at the locations and frequencies specified in Schedule C - Table 3, and be carried out in accordance with the latest edition of the EPA Water Quality Sampling Manual.
C3-2	In the event that groundwater fluctuations in excess of 2 metres/year are detected at the groundwater monitoring locations nominated in Schedule C - Table 3 and the fluctuations are not the result of pumping from licensed bores, the EPA must be notified within 14 days.
Water Management Plan	
C4-1	A water management plan must be developed by 30 June 2009 requiring, but not limiting the following details: <ul style="list-style-type: none"> a) identify on a site plan which dams will contain raw, clean, mine, potable and hazardous water; b) specify the storage capacity of the facility and the likely standing water volume during normal operation; c) specify the freeboard and maximum depth limits of the dams; d) detail the maintenance program for the dam and monitoring programs to detect triggers for maintenance; e) detail the water quality monitoring regime of each containment facility; f) identify on-site and off-site stormwater flow directions; and g) identify stormwater diversions to prevent water entering the mine;

Proposed EA Conditions	
	<ul style="list-style-type: none"> h) detail the design and monitoring of sediment detention structures; i) identify diversions and drains on site, and distinguish types of water being redirected; j) clearly demonstrate how clean water generated on site is kept separate from contaminated water; k) identify the drains that contribute to the discharge of water from the site, and the quality and quantity of water discharging from the site; l) detail how management of off site water releases will be conducted to minimise sediment and salinity releases and minimize the potential for soil and spoil erosion, soil contamination and acid rock drainage, particularly with regard to first flush flows following rainfall events; m) divide the site into individual catchments based on the identified drains and catchment facilities; n) identify a discharge scenarios during nominal events (such as 1 in 10, 20 and 50 ARI events) in order to calculate discharge volumes at each catchment and consequence on the receiving environment of these events to ensure protection of the environmental values of the receiving waters downstream as it relates to the activity; o) diversions and drains directing stormwater and process water into these storage facilities; p) identify which storage facilities pump into other storages or mine pits; q) details of pumping facilities; r) maintenance of dams, including desilting programs; s) incorporate a risk management approach to how changing weather patterns will effect frequency of floods, drought; and t) incorporate review and monitoring of the water management system and hydrological processes performance indicators.
All Dams	
C5-1	The holder of this environmental authority must ensure that dams are designed, constructed, operated and maintained in accordance with accepted engineering standards.
C5-2	Except for dams affected by condition C5-3, the hazard category of dams must be assessed by a suitably qualified and experienced person prior to their construction, and then not less frequently than on an annual basis.
C5-3	The hazard category of dams constructed prior to grant of this environmental authority, must be assessed by a suitably qualified and experienced person within six months of this environmental authority taking effect, and not less frequently than on an annual basis.
C5-4	Where the hazard category of a dam is assessed as significant or high, the holder of the environmental authority must act immediately to ensure: <ul style="list-style-type: none"> a) the administering authority is advised of the current location and details of that dam, and b) that dam meets the hydraulic performance required of the assessed hazard category within six months of that assessment.
C5-5	The condition of dams must be monitored for early signs of loss of structural or hydraulic integrity, based on the advice of a suitably qualified and experienced person. The methods of monitoring and frequency of monitoring shall be as assessed by that suitably qualified and experienced person, based on the hazard category and particular circumstances of each dam.
C5-6	In the event of early signs of loss of structural or hydraulic integrity, the holder of this environmental authority must immediately take action to prevent or minimise any actual or potential environmental harm, and report in writing any findings and actions taken to the administering authority within 28 days.
C5-7	The holder of this environmental authority must decommission each dam to a situation where ongoing environmental harm is prevented.
C5-8	As a minimum, dams must be decommissioned such that they: <ul style="list-style-type: none"> a) no longer contain flowable substances; b) become stable landforms; and c) comply with the rehabilitation requirements of this environmental authority.
Regulated Dams – Location and Basic Specifications	
C6-1	The following regulated dams are to be located within the control points defined in Schedule C- Table 4.
C6-2	The following regulated dams are to be constructed and used in accordance with Schedule C - Table 5.
C6-3	The following regulated dams are to be designed, constructed and operated in accordance with Schedule C - Table 6.

Proposed EA Conditions	
Regulated Dams – Certification and Operation	
C7-1	The holder of this environmental authority must not commence construction of a regulated dam unless: <ul style="list-style-type: none"> a) the holder has submitted to the administering authority two copies of a design plan, together with the certification of a suitably qualified and experienced person that the design of the regulated dam is fit for purpose, compliant in all respects with this environmental authority and in accordance with engineering best practice, and b) at least 28 days has passed since the submission of the design plan.
C7-2	When construction or modification of any regulated dam is complete, or within 12 months of a dam becoming a regulated dam by virtue of C5-2 or C5-3, the holder of this environmental authority must submit to the administering authority two copies of a set of 'as constructed' drawings, together with the certification by a suitably qualified and experienced person that the dam 'as constructed' is fit for purpose, compliant in all respects with this environmental authority, and in accordance with engineering best practice.
C7-3	The holder of this environmental authority must ensure that there is always a current operational plan for each regulated dam, which may form part of other plans required by legislation.
C7-4	The holder of this environmental authority must ensure that, where a current operational plan covers decommissioning and rehabilitation, those operations are consistent with the objectives in any design plan for the dam.
C7-5	The holder of this environmental authority or approval must notify the administering authority when the level in any regulated dam reaches the mandatory reporting level (MRL).
Regulated Dams – Annual Inspection and Report	
C8-1	The holder of this environmental authority must arrange for each regulated dam to be inspected annually by a suitably qualified and experienced person, in accordance with conditions C8-2 to C8-5 below.
C8-2	The annual inspection may be conducted as early as 1 st September each year, but not later than 1 st November each year, except that the assessment of adequacy of available storage in a dam must be based on dam levels observed within the month of October in the year that the inspection is conducted.
C8-3	At each annual inspection, the condition of each regulated dam must be assessed, including the structural, geotechnical and hydraulic adequacy of the dam and the adequacy of the works with respect to dam safety.
C8-4	At each annual inspection, the adequacy of the available storage against the design storage allowance must be assessed, and a mandatory reporting level must be determined and marked on each regulated dam.
C8-5	For each inspection, two copies of a report certified by the suitably qualified and experienced person, including any recommendations to ensure the integrity of each regulated dam must be provided to the administering authority within 28 days of the inspection.
Levees - Certification and Operation	
C9-1	The holder of this environmental authority must not commence construction or modification of any levee unless: <ul style="list-style-type: none"> a) the holder has submitted to the administering authority two copies of a design plan, together with the certification of a suitably qualified and experienced person that the design of the levee is compliant with this environmental authority; and a)b) at least 20 business days has passed since the receipt of those documents, or the administering authority has advised the holder that those documents are compliant with this condition.
C9-2	When construction or modification of any levee is complete the holder of this environmental authority must submit to the administering authority two copies of a set of 'as constructed' drawings, together with the certification by a suitably qualified and experienced person that the levee 'as constructed' is fit for the purpose stated in the design plan, and is compliant with this environmental authority.
C9-3	The operational plan shall, as a minimum, cover all matters relevant to the operation and maintenance of the levee so that compliance with the requirements of this environmental authority is maintained.
Levees - Annual Inspection and Report	
C10-1	The holder of this environmental authority must arrange for each levee to be inspected annually by a suitably qualified and experienced person to assess the following: <ul style="list-style-type: none"> a) the condition of the levee, including the structural, geotechnical, erosion, stability and hydraulic performance of the levee; and a)b) the adequacy of the works with respect to the safety of the levee.
C10-2	At each annual inspection any actions recommended by a suitably qualified and experienced person must be conveyed immediately to the holder of this environmental authority.

C10-3	The holder of this environmental authority must, within a reasonable period of time, act upon the recommendations or the outcomes required by the recommendations arising from an annual inspection of the condition and adequacy of a levee.
C10-4	For each annual inspection, two copies of a report certified by a suitably qualified and experienced person, including any recommended actions to be taken to ensure the integrity of each levee, must be provided to the administering authority by 1 December.

Schedule C - Table 1 (Authorised water release points and water contaminant release limits)

Monitoring point	GDA 94	GDA 94	Parameter	Minimum	Maximum	Monitoring Frequency
W1	616648	7570677	pH	-	-	Once daily during discharge events
			Electrical Conductivity ($\mu\text{S}/\text{cm}$)	-	-	
			Total Suspended Solids (mg/L)	-	-	
W2	614811	7569122	pH	6.5	8.5	
			Electrical Conductivity ($\mu\text{S}/\text{cm}$)	-	W1 + 10%	
			Total Suspended Solids (mg/L)	-	W1 + 10%	
W3	618488	7566780	pH	-	-	
			Electrical Conductivity ($\mu\text{S}/\text{cm}$)	-	-	
			Total Suspended Solids (mg/L)	-	-	
W4	616301	7566347	pH	6.5	8.5	
			Electrical Conductivity ($\mu\text{S}/\text{cm}$)	-	W3 + 10%	
			Total Suspended Solids (mg/L)	-	W3 + 10%	
RP1	624432	7557746	pH	-	9	Once daily during discharge events
			Electrical Conductivity ($\mu\text{S}/\text{cm}$)	-	5,000	
			Total Suspended Solids (mg/L)	-	-	
RP2	621709	7559931	pH	6	9	Prior to release to Isaac River
			Electrical Conductivity ($\mu\text{S}/\text{cm}$)	-	5,000	
			Total Suspended Solids (mg/L)	-	-	
ES1	621148	7560629	Flow rate	-	-	Continuous
			Electrical Conductivity ($\mu\text{S}/\text{cm}$)	-	-	
WQ5	621432	7560207	pH, EC and/or Total Dissolved Solids, Turbidity, Total Suspended Solids, Metals, Anions and Cations	-	-	Event-Based (grab sample)
WQ6	625262	7557079	pH	-	WQ5 or 7.8	Event-Based (grab sample)
			Electrical Conductivity ($\mu\text{S}/\text{cm}$)	-	WQ5 or 320	Event-Based (grab sample)
			Total Suspended Solids (mg/L)	-	WQ5 or 3,722.5	Event-Based (grab sample)
WQ7	619611	7553024	pH, EC and/or Total Dissolved Solids, Turbidity, Total Suspended Solids, Metals, Anions and Cations	-	-	Event-Based (grab sample)
WQ8	625342	7555019	pH, EC and/or Total Dissolved Solids, Turbidity, Total Suspended Solids, Metals, Anions and Cations	-	-	Event-Based (grab sample)

Monitoring point	GDA 94	GDA 94	Parameter	Minimum	Maximum	Monitoring Frequency
MS1	623469	7557505	pH*	6	9	Monthly until baseline is established and then quarterly and during releases
			Electrical Conductivity ($\mu\text{S}/\text{cm}$)*	-	5,000	
			Water levels, Total Dissolved Solids, Turbidity, Total Suspended Solids, Metals, Anions and Cations	-	-	
			As, Co, Fe, Se, Sb and Zn	-	-	Monthly
MS2	621101	7559584	Water levels, pH, EC and/or Total Dissolved Solids, Turbidity, Total Suspended Solids, Metals, Anions and Cations	-	-	Monthly until baseline is established and then quarterly and during releases
MS3	621563	7559272				
MS4	622003	7553830				
In pit (Expansion Area)	Will progress south as mining progresses		pH	-	-	Monthly

* Assuming that the Isaac River is flowing at the minimum flow threshold of 1,000 ML/day at the median EC of 180 $\mu\text{S}/\text{cm}$ to ensure compliance at WQ6 with the adopted receiving water quality compliance criteria of pH of 7.8, EC of 320 $\mu\text{S}/\text{cm}$ and TSS of 3,722.5 mg/L.

Schedule C - Table 2 (Sewage treatment effluent quality targets for dust suppression and irrigation)

Monitoring point	Quality characteristics	Release Limit			Frequency
		Minimum	50th Percentile	Maximum	
Treated effluent storage pond	5-day Biological Oxygen Demand (mg/L)	-	-	20	monthly
	Suspended Solids (mg/L)	-	-	30	
	Thermotolerant coliforms (CFU/100mL)	-	100	1000	
	Total Phosphorus (mg/L)	-	5	15	
	Total Nitrogen (mg/L)	-	10	30	
	pH	6.5	-	8.5	

Schedule C - Table 3 (Groundwater monitoring locations and frequency)

Monitoring point	GDA 94	GDA 94	Monitoring Frequency	
Burton Coal Bore 2	620384	7573599	Quarterly	
Swamp Bore 1	621518	7568790		
DNR 13060284	620271	7566322		
Near Field 1	621885	7559305	Water levels	Water levels will be monitored continuously for a period of 12 months and then every six months
			EC	Every six months
Near Field 2	622270	7558817	Water levels	Every three months for a period of 12 months and then every six months
Near Field 3	620556	7556885		
Near Field 4	620600	7555041	EC	Every six months
584s	622696	7556692	Water levels	Every three months for a period of 12 months and then every six months
584d	622696	7556692		

Monitoring point	GDA 94	GDA 94		Monitoring Frequency
593 594	622612	7555053	pH, EC and TDS, major cations and major anions, total nitrogen, ammonia, total phosphorous and reactive phosphorous, Al, As, Cd, Cu, Pb, Hg, Se and Zn	Every six months
	622612	7555052		
Regional 1 Regional 2 Regional 3 Regional 4	624002	7558238	Water levels	Monthly
	625555	7556814		
	623995	7555015	Regional 2 and 4 only - pH, EC and TDS, major cations and major anions, total nitrogen, ammonia, total phosphorous and reactive phosphorous, Al, As, Cd, Cu, Pb, Hg, Se and Zn	Annually
	619173	7556894		
*Stock Watering Bore 12	617377	7559710	Water levels	Every three months for a period of 12 months and then annually
*Stock Watering Bore 20	623797	7552173		
*Stock Watering Bore 18	622909	7558529	Water levels, abstraction rates, EC	Every three months for a period of 12 months and then annually

Schedule C — Table 4 (Location of Regulated dams)

Name of Regulated Dam	Latitude (GDA 94)	Longitude (GDA 94)
Cell 1	614553	7571813
Cell 2	614517	7571810
Cell 3	614480	7571807
Wet Season Storage	614377	7571790

Schedule C — Table 5 (Specification of Regulated Dams)

Name of Regulated dam	Hazard Category	Maximum surface area of dam (ha)	Maximum volume of dam (m ³)	Maximum depth of dam (m)	Use of dam
Cell 1	Significant	0.52	7850	3.8	Temporary storage of fine coal tailings
Cell 2	Significant	0.50	7550	3.8	Temporary storage of fine coal tailings
Cell 3	Significant	0.48	7750	3.9	Temporary storage of fine coal tailings
Wet Season Storage	Significant	1.0	26500	4.0	Wet season overflow storage

Schedule C — Table 6 (Hydraulic Performance of Regulated Dams)

Name of Regulated Dam	Spillway Capacity	Design Storage Allowance	Mandatory Reporting Level
	Diversion Capacity (Levees) AEP	(N/A for levees) AEP	(N/A for levees) AEP
Cell 1	1:1000 AEP	0	1:20 AEP 72 hr rainfall
Cell 2	1:1000 AEP	0	1:20 AEP 72 hr rainfall
Cell 3	1:1000 AEP	0	1:20 AEP 72 hr rainfall
Wet Season Storage	1:1000 AEP	1:20 AEP for 3 month wet season rainfall	1:20 AEP 72 hr rainfall

20.7 NOISE & VIBRATION

20.7.1 Noise

Noise from coal mining and related activities such as coal transportation and processing has the potential to disturb nearby residents in the absence of an adequate buffer distances or intervening barriers, or if there are inadequate source controls. At sufficiently loud levels, noise can be intrusive and adversely affect amenity.

The *Environmental Protection (Noise) Policy 1997* (EPP Noise) provides the framework for the management of obtrusive nuisance noise and vibration in Queensland under the EP Act. The EPP Noise does not set limits but:

- outlines the environmental values to be enhanced or protected;
- specifies environmental acoustic objectives;
- outlines the decision making process for managing noise and vibration; and
- sets out the community consultation processes for acoustic management.

The EPA is primarily responsible for regulating noise in Queensland and, in July 2004, approved and released Ecoaccess Guideline "Planning for Noise Control". The Guideline contains methods and procedures that are applicable for setting conditions relating to noise emitted from industrial premises, commercial premises and mining operations, and are intended for planning purposes. The Guideline is applicable to sounds from all sources, individually and in combination, which contribute to the total noise from a site.

This Guideline also includes criteria for estimating the probability of sleep disturbance from transient noise, such as heavy truck or rail operations, for various window types and settings. It may be used for assessing noises that contain impulsive components but it is not suitable for assessing noise that consists solely of discrete impulses, for example gunfire or blasting.

The procedure takes into account:

- the control and prevention of background noise creep in the case of a steady noise level from equipment such as that caused by ventilation fans and other continuously operating machinery;
- the containment of variable noise levels and short-term noise events, such as those caused by forklift trucks and isolated hand tools, to an 'acceptable' level above the background noise level; and
- the setting of noise levels that should not be exceeded to avoid sleep disturbance.

The methodology to set suitable limits identified in the EPA Ecoaccess Guideline "Planning for Noise Control" is a multi-step process involving measurement, comparison against acceptable maxima and correcting the measurements for the amount of leeway available between the acceptable/desirable levels and the measurements.

The Guideline *Assessment of Low Frequency Noise*, also released by the EPA, categorises items such as boilers, pumps, transformers, cooling fans, compressors, oil and gas burners, foundries, wind farms, electrical installations, diesel engines, ventilation and air-conditioning equipment, wind turbulence and large chimney resonance as sources of high level noise having a frequency content of less than 200 Hz as these sources exhibit a spectrum that characteristically shows a general increase in sound pressure level with a decrease in frequency.

Annoyance, due to low frequency noise, can be high, even though the noise level measured in dB(A) is relatively low. Typically, annoyance is experienced in the otherwise quiet environs of residences, offices and factories adjacent to, or near, low frequency noise sources. Generally, low level/low frequency noises become annoying when the masking effect of higher frequencies is absent. This loss of high frequency components may occur as a result of transmission through the fabric of a building, or in propagation over long distances. Where a noise emission occurs exhibiting an unbalanced frequency spectra, the overall sound pressure level inside residences should not exceed 50 dB (Linear) to avoid complaints of low frequency noise annoyance.

20.7.1.1 *Environmental Values*

The environmental values to be enhanced or protected under the EPP (Noise) are the qualities of the acoustic environment that are conducive to:

- the wellbeing of the community or a part of the community, including its social and economic amenity; or
- the wellbeing of an individual, including the individual's opportunity to have sleep, relaxation and conversation without unreasonable interference from intrusive noise.

The principal current sources of noise emissions include:

- traffic on the various local roads;
- general farming traffic (tractors, trucks, light vehicles);
- cattle; and
- activities at the surrounding mines including rail movements and rail siding facilities.

Section 20.5.1 lists the nearest existing mines and the nearest sensitive receptors to the IIPP.

20.7.1.2 *Potential Impacts*

The major operational noise and vibration sources at the IIPP will result from:

- dragline or truck and shovel operation in the pit;
- rockdrilling and blasting;
- coal haulage trucks between the Expansion Area ROM stockpile and CHPP, comprising B-doubles with prime mover and trailer configurations that would satisfy the ADR28 certification;
- dump trucks, loaders dozers etc; and
- various surface earth working machines.

There is also a railway line to Peak Downs 10 km, to the east and south of the site. The Peak Downs Highway is 5 km north of the Expansion Area.

The existing environment, with respect to noise and vibration, has been monitored over a number of years. Analysis suggests that traffic noise is still the major source of noise that is experienced by residences within several hundred metres of the Peak Downs Highway, despite the significant development of mines within the area. It is anticipated that construction and operational mine noise from the large number of mines in the area may be heard at some residences during the quieter periods of the evening and night. The calculated noise levels from activities within the pit and coal haulage complies with the noise level criteria during the day at all noise sensitive locations and for either shovel or dragline operations.

The calculated noise levels from pit operations complies with the day, evening and night noise level criteria at noise sensitive locations S2, S3 and S4 for either shovel or dragline operations.

However, as the operations progress to the southern half of the Expansion Area pit, the noise levels during the evening and night exceed the noise level criteria at S1, mainly because of haul trucks on top of the out-of-pit spoil.

20.7.2 **Vibration**

The main sources of vibration at the IIPP are likely to be from rock drilling and blasting. The EPA is primarily responsible for regulating noise and vibration in Queensland and has developed a number of guidelines. Those that are relevant to the management of noise and vibration at the IIPP are listed below.

EPA Ecoaccess Guideline - Noise and Vibration from Blasting

Blasting operations have the potential to cause excessive noise and vibration impacts on the community. Excessive levels of structural vibration caused by ground vibration can result in damage to, or failure of,

a structure if not appropriately managed. However, people are able to detect vibration at levels much lower than those required to cause even superficial damage to the most susceptible structures.

The criteria set out in the Ecoaccess guideline "Noise and Vibration from Blasting", assist in minimising annoyance and discomfort that may be caused by blasting from activities such as mining, quarrying, construction and other operations which involve the use of explosives for fragmenting rock.

Further, all blasting must be carried out in a proper manner by a competent person in accordance with industry accepted standards to minimise the likelihood of adverse effects being caused by the impact of airblast overpressure and ground-borne vibration in noise-sensitive places, or to people living in or using the surrounding area.

Blasting Hours of Operation Criteria

Blasting at the existing Isaac Plains Coal Mine is currently approved under the existing EA, between the hours of 9 am and 7 pm Monday to Sunday. Blasting is not approved for other times and public holidays. Blasting outside these hours should only be approved where:

- blasting during the preferred times is clearly impractical (blasting on such occasions should be limited in number and more strict airblast overpressure and ground vibration limits should apply); or
- there is no likelihood of persons in a noise sensitive place being affected because of the remote location of the blast site.

IPCM however, generally conducts blasting only between the hours of 9 am to 3 pm, Monday to Friday, and from 9 am to 1 pm on Saturdays. Blasting should not generally take place on Sundays or public holidays. These criteria would also be applicable to the IIPP.

Noise criteria

At the existing Isaac Plains Coal Mine blasting activities must be carried out in such a manner that if blasting noise should propagate to a noise-sensitive place, then:

- the airblast overpressure must be not more than 115 dB(linear) peak for four out of five consecutive blasts; and
- the airblast overpressure must not exceed 120 dB(linear) peak for any blast.

These criteria would also be applicable to the IIPP.

Vibration criteria

At the existing Isaac Plains Coal Mine, blasting operations must be carried out in such a manner that if ground vibration should propagate to a noise-sensitive place:

- the ground-borne vibration must not exceed a peak particle velocity of 5 mm/second for four out of five consecutive blasts; and
- the ground-borne vibration must not exceed a peak particle velocity of 10 mm/second for any blast.

These criteria would also be applicable to the IIPP.

20.7.3 Environmental Protection Objectives and Control Strategies – Noise & Vibration

Environmental Protection Objectives And Control Strategies - Noise & Vibration	
Environmental Value	Existing noise and vibration levels at sensitive receptors (local rural residences).
Environmental Protection Objective	To take all reasonable and practicable measures to avoid or minimise the potential for nuisance noise and vibration from the mining activities on noise sensitive receptors.
Performance Indicators/Criteria	<p>No unlawful nuisance noise levels at these homesteads.</p> <p>Number of noise and vibration complaints.</p> <p>Blasts will be designed to achieve airblast and ground vibration criteria at surrounding sensitive locations.</p> <p>Noise Limits at Noise Sensitive Places</p>

Environmental Protection Objectives And Control Strategies - Noise & Vibration							
Noise Descriptor dB(A) measured as	Monday to Saturday			Sundays and public holidays			
	7am – 6pm	6pm – 10pm	10pm – 7am	7am – 6pm	6pm – 10pm	10pm – 7am	
LA10, adj, 10 mins	Background + 5	Background + 5	Background + 3	Background + 5	Background + 5	Background + 3	
LA1, adj, 10mins	Background + 10	Background + 10	Background + 5	Background + 10	Background + 10	Background + 5	
NB: This table does not purport to set operating hours for the mining activities.							
Airblast Overpressure Level*							
Noise Parameter	Airblast Overpressure measured at a sensitive place						
	Monday to Sunday 9am - 7pm			Other times and public holidays			
Air blast overpressure level (dB [Lin] Peak)	Maximum 115 dB for 4 out of 5 consecutive blasts			No blasting to occur			
Air blast overpressure level (dB [Lin] Peak)	120 dB maximum			No blasting to occur			
* This table does not purport to set limits applicable to any particular explosive blast, rather sets design criteria for every explosive blast.							
Vibration Limits*							
Vibration Parameter	Vibration measured at a sensitive place						
	Monday to Sunday 9am - 7pm			Other times and public holidays			
Peak particle velocity (mm/s)	Maximum 5 mm/s for 4 out of 5 consecutive blasts			No blasting to occur			
Peak particle velocity (mm/s)	10 mm/s maximum			No blasting to occur			
*This table does not purport to set limits applicable to any particular explosive blast, rather sets design criteria for every explosive blast.							
Control Strategies & Commitments	Acoustic Controls						
	Acoustic control measures which may be incorporated into the project to achieve the performance criteria outlined above include: <ul style="list-style-type: none">• low noise specifications for all plant, equipment and vehicles;• fitment of high-performance mufflers and similar measures to vehicles, plant and equipment;• mobile equipment to be fitted with other appropriate silencing equipment as required;• all equipment will be well maintained; Operational control measures which may be incorporated into the project to achieve the performance criteria outlined above include: <ul style="list-style-type: none">• haulage operations to the CHPP will mostly be limited to daytime only and during the period Monday to Friday;• mine truck operations limited to the pit and pit to ROM (eastern side of out-of-pit spoil heaps) during the evening and night period;• design work areas to reduce noise generation and minimise the periods of time that mobile plant must reverse;• design of pit and spoil areas to avoid operation of dump trucks in open areas or elevated areas at night;• limit operational characteristic of vehicles (i.e. limit operation of air brakes except in cases of emergency);• temporary noise barriers (earth berms etc) to reduce noise at noise sensitive receptors;• use of squawker (white noise) reversing alarms or reversing strobe lights; and• appropriate programming of activities (e.g. hours of work at particular locations).						
IPCM is committed to conducting ongoing training to ensure dragline operators have the skills to operate the machine in the quietest possible manner while will be appropriately trained to ensure the dragline is operated in a way to minimise impact noise while still maintaining suitable productivity rates. In addition IPCM will conduct field verification for noise emissions from the dragline bucket							

Environmental Protection Objectives And Control Strategies - Noise & Vibration

during mining operations and will compare these results against modelled results. Should emissions be found to be excessive, appropriate control strategies will be developed in conjunction with the administering authority.

An assessment of noise from dragline sheaves will be conducted prior to commencement of dragline operations use.

In the unlikely event that night time haulage is required, and complaints are received, screening of the haul truck by either spoil heap or specially constructed mounds will be implemented as required.

A shut-down procedure (Trigger Action Response Plan (TARP)) will be implemented at the site in the event of significant and sustained adverse meteorological conditions. The procedure will be set up for use at the commencement of mining activities in the Expansion Area.

Should these measures still not allow the performance criteria to be achieved then negotiations may be entered into with the 'receiver' to provide compensation.

Blasting

Explosive blasts required for the mining activity will be designed by a competent person to achieve the criteria specified in the Airblast Overpressure and Vibration Limits tables above.

All relevant information pertaining to the design of explosive blasts for the mining activity in relation to the criteria specified in the aforementioned tables will be kept in written and diagrammatic form.

Blasting will only be carried out between 9 am to 7 pm, Monday to Sunday and no blasting will occur at other times and on public holidays. Where blasting is required outside of these times, appropriate consultation will be undertaken with directly affected residents in advance of blasting and approval obtained from the EPA. Blasting outside these recommended times should be approved only where:

- blasting during the preferred times is clearly impracticable (in such situations blasts should be limited in number and stricter airblast overpressure and ground vibration limits should apply); or
- there is no likelihood of persons in a noise-sensitive place being affected because of the remote location of the blast site.

Although not a requirement of the site EA, IPCM will monitor blasting events, i.e. blast overpressure and ground vibration, and will also video the blast event.

Complaints/Monitoring

Investigate any noise complaint expeditiously and respond to complainant.

Complaints will be recorded in the site complaints/incidents register.

Noise monitoring carried out in response to complaints and will be undertaken in accordance with the requirements of the *Environmental Protection (Noise) Policy 1997*. Results will be assessed against the Noise Limits at Noise Sensitive Places as outlined in *Guideline 8: Preparing an Environmental Management Overview Strategy for Non-standard mining projects*.

When requested by the administering authority, noise monitoring will be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within 14 days to the administering authority following completion of monitoring.

Noise monitoring will include:

- a) LAmax adj, T;
- b) relevant background sound level;
- c) the level and frequency of occurrence of impulsive or tonal noise;
- d) atmospheric conditions including wind speed and direction; and
- e) location, date and time of recording.

If monitoring indicates exceedence of the limits in tables provided above, i.e. Noise Limits at Noise Sensitive Places and Airblast Overpressure Level, then IPCM will:

- a) address the complaint including the use of appropriate dispute resolution if required; and
- b) immediately implement noise abatement measures so that emissions of noise from the activity do not result in further environmental nuisance.

The method of measurement and reporting of noise levels will comply with the latest edition of the Environmental Protection Agency's Noise Measurement Manual.

If IPCM can provide evidence through blast monitoring that the limits defined in the table provided above, i.e. Vibration Limits (refer to Performance Indicators/Criteria listed above) are not being exceeded then they are not in breach. Monitoring will include:

- a) peak particle velocity;
- b) air blast overpressure level (dB linear peak);
- c) location of the blast/s within the mining area (including which bench level);
- d) atmospheric conditions including temperature, relative humidity and wind speed and direction; and

Environmental Protection Objectives And Control Strategies - Noise & Vibration

	<p>e) location, date and time of recording.</p> <p>Mining activities will not cause environmental nuisance where noise from the mining activities does not exceed the criteria specified in the Vibration Limits table provided above.</p> <p>If monitoring indicates exceedence of the limits in the Vibration Limits table, then IPCM will:</p> <p>a) address the complaint including the use of appropriate dispute resolution if required; and</p> <p>b) immediately implement noise abatement measures so that emissions of noise from the activity do not result in further environmental nuisance.</p>
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20.7.4 Proposed EA Conditions
Proposed EA Conditions
Noise Nuisance

D1-1	Subject to Conditions (D1-2) and (D1-3) noise from the mining activity must not cause an environmental nuisance, at any sensitive or commercial place.
D1-2	When requested by the administering authority, noise monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within 14 days to the administering authority following completion of monitoring.
D1-3	<p>If the environmental authority holder can provide evidence through monitoring that the limits defined in Schedule D - Table 1 and Table 2 are not being exceeded then the holder is not in breach of Condition (D1-1). Monitoring must include:</p> <p>a) L_{Amax} adj, T;</p> <p>b) relevant background sound level;</p> <p>c) the level and frequency of occurrence of impulsive or tonal noise;</p> <p>d) atmospheric conditions including wind speed and direction; and</p> <p>e) location, date and time of recording.</p>
D1-4	<p>If monitoring indicates exceedence of the limits in Schedule D - Table 1 and Table 2, then the environmental authority holder must:</p> <p>a) address the complaint including the use of appropriate dispute resolution if required; and</p> <p>b) immediately implement noise abatement measures so that emissions of noise from the activity do not result in further environmental nuisance.</p>
D1-5	The method of measurement and reporting of noise levels must comply with the latest edition of the Environmental Protection Agency's Noise Measurement Manual.

Vibration Nuisance

D2-1	Subject to Conditions (D2-2) and (D2-3) noise from the mining activity must not cause an environmental nuisance, at any sensitive place.
D2-2	When requested by the administering authority, noise monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within 14 days to the administering authority following completion of monitoring.
D2-3	<p>If the environmental authority holder can provide evidence through monitoring that the limits defined in Schedule D - Table 3 are not being exceeded then the holder is not in breach of Condition (D2-1). Monitoring must include:</p> <p>a) peak particle velocity;</p> <p>b) air blast overpressure level (dB linear peak);</p> <p>c) location of the blast/s within the mining area (including which bench level);</p> <p>d) atmospheric conditions including temperature, relative humidity and wind speed and direction; and</p> <p>e) location, date and time of recording.</p>
D2-4	For the purposes of condition D2-1 the mining activities will not cause environmental nuisance where noise from the mining activities does not exceed the criteria specified in Schedule D - Table 3.
D2-5	<p>If monitoring indicates exceedence of the limits in Schedule D - Table 3, then the environmental authority holder must:</p> <p>a) address the complaint including the use of appropriate dispute resolution if required; and</p> <p>b) immediately implement noise abatement measures so that emissions of noise from the activity do not result in further environmental nuisance.</p>

Proposed EA Conditions	
D2-6	Every explosive blast for the mining activity shall be designed by a competent person to achieve the criteria specified in Schedule G - Table 2 and Table 3.
D2-7	All relevant information pertaining to the design of every explosive blast for the mining activity in relation to the criteria specified in Schedule D - Table 8-2 and table-Table 9-3 shall be kept in written and diagrammatic form.

Schedule D - Table 1 (Noise limits)

Noise Descriptor dB(A) measured as	Monday to Saturday			Sundays and public holidays		
	7am – 6pm	6pm – 10pm	10pm – 7am	7am – 6pm	6pm – 10pm	10pm – 7am
L _{A10} , adj, 10 mins	Background + 5	Background + 5	Background + 3	Background + 5	Background + 5	Background + 3
L _{A1} , adj, 10mins	Background + 10	Background + 10	Background + 5	Background + 10	Background + 10	Background + 5

Where "Background" means background sound pressure level measured in accordance with the latest edition of the Environmental Protection Agency *Noise Measurement Manual*.

Schedule D - Table 1 does not purport to set operating hours for the mining activities.

Schedule D - Table 2 (Airblast Overpressure Level)*

Noise Parameter	Airblast Overpressure measured at a sensitive place	
	Monday to Sunday 9am - 7pm	Other times and public holidays
Air blast overpressure level (dB [Lin] Peak)	Maximum 115 dB for 4 out of 5 consecutive blasts	No blasting to occur
Air blast overpressure level (dB [Lin] Peak)	120 dB maximum	No blasting to occur

* Schedule D Table 2 does not purport to set limits applicable to any particular explosive blast, rather sets design criteria for every explosive blast.

Schedule D - Table 3 (Vibration limits)*

Vibration Parameter	Vibration measured at a sensitive place	
	Monday to Sunday 9am - 7pm	Other times and public holidays
Peak particle velocity (mm/s)	Maximum 5 mm/s for 4 out of 5 consecutive blasts	No blasting to occur
Peak particle velocity (mm/s)	10mm/s maximum	No blasting to occur

* Schedule D Table 3 does not purport to set limits applicable to any particular explosive blast, rather sets design criteria for every explosive blast.

20.8 WASTE

Waste management involves the administration and control of all activities involving waste materials. Administration activities include but are not limited to costs, responsibilities and priorities. Other activities include prevention, elimination, reduction, recycling, treatment and disposal of the waste material in order of preference.

The *Environmental Protection (Waste Management) Regulation 2000* provides an outline of the waste management strategies for Queensland including:

- littering;
- waste receivable and disposal; and
- waste tracking and transportation.

The objective of the Regulation is to:

- minimise the impact of wastes on the Queensland environment; and

- establish a framework for minimising wastes under Ecologically Sustainable Development (ESD) principles.

IPCM is committed to minimising the impact of waste on the environment and the community wherever practicable through the adoption of the waste management hierarchy principles detailed in Section 10 of the *Environmental Protection (Waste Management) Policy 2000*. IIPP's waste management hierarchy entails:

- waste avoidance;
- waste re-use;
- waste recycling;
- energy recovery from waste; and
- waste disposal.

Cleaner production, pollution prevention and waste minimisation are important components for the overall IIPP waste management strategy. In addition to Queensland's regulatory requirements for waste management, the IIPP will be required to comply with relevant National Environment Protection Measures (NEPM) developed by the National Environmental Protection Council's (NEPC). The relevant NEPM for the IIPP is the National Pollutant Inventory (NPI) in which emissions of pollutants and wastes, whether discharged to land, air or water, on or off-lease which will be required to be considered and reported on, by IPCM for the IIPP under the requirements of the NPI.

Cleaner production refers to the continuous development and implementation of a strategy to prevent waste generation from processes and products, so as to reduce the risks to public health and safety and the environment. Furthermore, a cleaner production approach minimises the energy and materials used and the waste generated in processes, products and services to meet these objectives. IPCM recognises that cleaner production has both economic and environmental benefits and to the extent practicable, has introduced appropriate techniques into the IIPP. Similar techniques, including the selection of the re-use of waste water and recycling of products, would be extended to apply to the IIPP, with appropriate refinements on the basis of operational experience.

A continuous improvement approach will be implemented for the IIPP, by reviewing and modifying (as required) processes, materials and operating practices throughout the mine life as well as through techniques such as input substitution (consider alternative fuel sources) and improved operation and maintenance. In addition, IPCM propose to continue to develop strategies involving waste reduction, reuse and resource recovery as the preferred waste management principles for the IIPP. Rainwater runoff recovery from disturbed areas and its reuse is an example of this strategy which lessens the reliance on *in-situ* water resources.

Waste planning, such as the separation of components of the waste stream at the point of generation, will be implemented for the IIPP, and provide IPCM with the flexibility to maintain segregation of different types of waste during generation, storage and transportation.

This practice allows for the recovery of reusable or recyclable waste materials which would otherwise be disposed of or destroyed. This waste planning strategy also has the added advantage of reducing the level of risk associated with pollution generation, both on-site and off-site, that may otherwise result from inappropriately managed wastes.

20.8.1 Potential Impacts

Wastes generated by IPCM consist of the following regulated and general wastes:

- redundant equipment and plant;
- materials sent off site for disposal or recycling;
- used packaging, including chemical containers and drums;
- regulated wastes, including spent oils, greases and fuels and sewage sludge;
- contaminated personal protective equipment (PPE) including gloves and disposable overalls.;
- products no longer in use or whose expiry date has lapsed;

- products which may have come into contact with another material rendering it useless; and
- materials stored on site for which there is no future use, or its means of disposal is not apparent.

Mine wastes also have the potential to impact on the environment.

Spoil

The primary mining waste generated by the IIPP will be spoil from the open cut mining operations. Waste generated by the IIPP will also include rejects removed during the coal preparation processes which comprise a mixture of non-coal materials, e.g. rocks such as volcanics, shale, siltstone, mudstone or claystone, and sand, silts and clays which either occur naturally within the coal seam or intrude the seam or dilute the coal during mining. With an expected product yield of 83 %, an estimated 0.68 Mtpa of coal rejects will annually be produced from a ROM coal production of raw 4 Mtpa.

The results indicate that the spoil materials in the Expansion Area are expected to be predominantly non-acid forming (NAF) with a low sulphide (pyrite) content. Some of the carbonaceous materials occurring immediately above and below the LHD Coal Seam may be potentially acid forming (PAF) due to an increased sulphide (pyrite) content. Although these materials are likely to only have a low capacity to generate acid, they will need to be managed correctly in order to minimise the risk of creating acidic conditions or ARD.

The samples tested also indicate that the materials are generally non-saline to slightly saline and therefore saline conditions or salt release is not expected to be a concern for water quality or revegetation. A significant proportion of the spoil is likely to be moderately sodic and dispersive and if these materials are left exposed for long periods of time, problems with stability, erosion and revegetation may arise.

The spoil is likely to contain relatively high concentrations of Arsenic (As), Antimony (Sb) and Selenium (Se), and of these, Se is likely to be relatively soluble. Cobalt (Co) and Molybdenum (Mo) are also relatively soluble, however, these elements were not found to occur in high concentrations in the spoil.

The out-of-pit spoil dumps, containing spoil from the initial box-cuts, are not expected to present an ARD or salinity risk provided the identified low risk PAF material from immediately above and below the LHD Coal Seam is isolated. In-pit spoil dumps are not expected to present an ARD or salinity risk provided the identified low risk PAF material from immediately above and below the LHD Coal Seam is buried deep within the dumps.

Spoil materials at the existing Isaac Plains Coal Mine are also not expected to present an ARD risk with results of the geochemical test work indicating that spoil at the existing Isaac Plains Coal Mine is non-acid forming (NAF) with a low S content (<0.1 %S) and moderate neutralising capacity (average ANC of 33 kg H₂SO₄/t).

Coal Seam

The current testing program has established that some of the carbonaceous materials occurring immediately above and below the LHD Coal Seam in the Expansion Area have an increased sulphide (pyrite) content and may be PAF, however with only a relatively low capacity to generate acid.

Due to the geochemical variability of the coarse and fine rejects derived from the different coal seams within the Expansion Area, further work will be carried out based on the actual recombined co-disposal material once the Expansion Area is approved and mining commences. The program includes the collection of representative samples of both coarse and fine reject material from the CHPP over a number of days. The samples collected will initially be geochemically characterised using acid-base accounting and further geochemical testing may be required for selected samples, including modified NAG testing and leach column testing. This will enable the evaluation of appropriate management strategies for the disposal and capping of the coarse and fine reject material.

The multi-element scans indicated that Mo and Se were relatively soluble in a number of the samples tested and that Co was readily soluble in one of the samples tested, which gave an exceedance in the short-term and long-term ANZECC irrigation water quality guidelines. Elements As and Sb were detected but not found to be readily soluble.

Coal Rejects

The results from the assessment of samples indicate that some of the coarse and fine rejects from the Expansion Area operations are likely to be PAF. Some of the materials may also be significantly acid consuming. Due to the expected large variation in the acid forming characteristics of these materials, and the expected occurrence of PAF rejects from the existing Isaac Plains Coal Mine operations, further geochemical testing on the coarse and fine reject materials will be required to further evaluate the acid forming characteristics of the material and to evaluate appropriate management strategies.

Testing found that the coal rejects (coarse and fine) are expected to contain high concentrations of Se compared to the average crustal abundance. The contained Se content is expected to be relatively soluble.

If PAF materials occur in the blended coarse and fine reject material and if these materials are not managed correctly, acid generation and ARD may occur resulting in low pH conditions. If low pH conditions are allowed to occur in these materials, metal solubilities will increase resulting in unacceptable releases of at least As, Co, Fe and Se in surface water runoff and ultimately into the release dam.

Given the nature of general and regulated waste streams generated on-site, the impact on the air, water and land resources on-site are not expected to be significant.

In conclusion, waste from mine activities will be managed to ensure there are no unacceptable environmental impacts and comply with EPA statutory requirements.

20.8.2 Environmental Protection Objectives and Control Strategies - Waste

Environmental Protection And Control Strategies - Waste	
Environmental Value	Wastes are managed to ensure no environmental harm is caused.
Environmental Protection Objective	Waste will be managed to avoid adverse impacts on the health of the workforce and minimise risk of impact on land, air and water.
Performance Indicators/Criteria	<p>Volume or mass of recycled materials.</p> <p>Temporary storage and final disposal of waste types in authorised locations.</p> <p>Implementation of overburden monitoring program.</p> <p>Stock excluded from waste storage/disposal areas.</p> <p>Presence of appropriate bins and containers.</p> <p>Presence of appropriate signage.</p> <p>Waste tracking requirements from <i>Environmental Protection (Waste Management) Regulation 2008</i>.</p> <p>Contamination of soils assessed against <i>Draft Guidelines for the Assessment & Management of Contaminated Land in Queensland</i>.</p>
Control Strategies and Commitments	<p>Develop and implement a Waste Management Plan for the IIPP.</p> <p>Install containers and other facilities for receivable of various waste types. Install appropriate instructional and warning signage.</p> <p>Wastes will be classified, quantified, segregated and recorded at source to facilitate waste management.</p> <p>Where possible and practical, vegetation waste from clearing will be respread on rehabilitated areas. Vegetation waste will only be burnt as a last resort, and only if there is minimal risk of causing nuisance to neighbouring residences.</p> <p>General waste will not be burnt or allowed to burn on site unless permitted by the administering authority.</p> <p>General wastes and limited regulated wastes will be either disposed of on-site or transported off-site for disposal at appropriately licensed facilities. Regulated wastes capable of being economically recycled (e.g. waste oil, light vehicle tyres, used batteries) will be sent to a licensed recycling facility.</p> <p>Regulated waste (including waste oil but excluding sewerage sludge and abrasive blasting waste) will be removed from site by licensed regulated waste transport contractors for recycling by licensed recycler or disposal in a licensed regulated waste disposal facility under the provisions of the EP Act. Waste tracking systems will be maintained for the disposal of regulated wastes.</p> <p>Hydrocarbon contaminated materials (oily rags, oil filters etc) and waste oil will be removed by a licensed regulated waste contractor.</p>

Environmental Protection And Control Strategies - Waste

Sewage will be treated through a septic tank and transpiration trench.

Tyres stored awaiting disposal or transport for take-back and recycling, or waste-to-energy options will be stored in stable stacks and at least 10 m from any other scrap tyre storage area, or combustible or flammable material, including vegetation.

All reasonable and practicable fire prevention measures will be implemented, including removal of grass and other materials within a 10 m radius of the scrap tyre storage area.

Where no feasible recycling or waste-to-energy options are available, disposing of scrap tyres resulting from the mining activities in spoil emplacements is acceptable, provided tyres are placed as deep in the spoil as reasonably practicable. Records will be maintained illustrating the location of tyre burial.

Scrap tyres disposed within the operational land will be placed so as not to impede saturated aquifers and/or compromise the stability of the consolidated landform.

All petroleum products and other hazardous goods (chemicals) will be stored in bunded areas sized in accordance with *AS1940 Storage and Handling of Flammable and Combustible Liquids*.

Temporary field storages will be bunded, although appropriately sized earthen bunds may be used. Drums from 20 L to 205 L capacity will be placed within bunded areas when not in use.

A register of all chemicals stored on site will be developed and maintained.

All workshops and mobile refuelling trucks will be equipped with 'Spill Cleanup Equipment'.

Hydrocarbon management training will be provided to all staff working in areas where hydrocarbons are used on a daily basis such as the workshops and fleet vehicles. Hydrocarbon skimmers will be installed in workshop water sumps and will be cleaned and maintained on a regular basis.

Waste accumulating in oil/water separators will be appropriately disposed of.

Any sites that become contaminated will be investigated and managed in accordance with the requirements of the contaminated land provisions of the *Environmental Protection Act 1994*.

Any contamination of soils shall be assessed against the Draft Guidelines for the *Assessment & Management of Contaminated Land in Queensland (1998)* or subsequent versions.

Mining Waste

A significant proportion of the spoil is likely to be moderately sodic and dispersive and if these materials are left exposed for long periods of time, problems with stability, erosion and revegetation may arise. Therefore they will be progressively rehabilitated.

Post mining PAF material from immediately above and below the LHD Coal Seam will be isolated and buried deep within the in-pit spoil dumps to reduce the risk of unacceptable levels of As and Se release, and to ensure that there is decreased risk of the material dispersing (due to its moderate sodicity). In addition, for rehabilitation purposes the dumps will:

- not be placed within or on any natural watercourses; and
- require a soil cover designed to adequately protect the spoil from potential wind and surface water erosion, and for long-term vegetation support.

To reduce the risk of unacceptable As and Se release to the environment, and to ensure that the dispersiveness of the material does not increase to an unacceptable level:

- dust suppression (watering) may be required during dump construction; and
- the final landform will incorporate soil covers and drainage works to ensure long-term stability of the soil cover.

The design of the landform, including the size and location of stormwater drains, will be developed as part of a Rehabilitation Plan for the site (a requirement of the existing Plan of Operations).

Due to the possibility of displaying a PAF character, all pit floor waste scrapings will be buried deep within the in-pit spoil dumps where backfilling occurs after mining. The residual void south of the 202 m AHD countour will also fill with water, maintaining anoxic conditions on the floor of the void. The atmospheric exposure times for these materials will be kept to a minimum. Field observations and pit water quality monitoring will be implemented in order to identify the potential development of low pH conditions or ARD within the active pits. If low pH conditions are identified, water treatment, e.g. lime dosing prior to release to the surrounding environment may be required during active mining.

The current testing program has established that some of the carbonaceous materials occurring immediately above and below the LHD Coal Seam in the Expansion Area have an increased sulphide (pyrite) content and may be PAF, however with only a relatively low capacity to generate acid. If required, the additional test work on these materials would include a sulphur assay, ANC determination and modified NAG testing on additional samples occurring within 1 m of the LHD coal seam. Such samples would be collected and analysed at six-monthly intervals, or whenever rock materials at these levels are exposed during mine operations. NB: Such testing would only need to continue in the long-term if non-systematic or unpredictable variability in the parameters of concern was found at the stratigraphic horizons of interest.

Environmental Protection And Control Strategies - Waste

Coarse and fine coal rejects will be recombined and disposed of in-pit at a moisture content of approximately 30 % at the existing Isaac Plains Coal Mine along with the coal and spoils from the Expansion Area. The fine coal management system will be used as an alternative fine rejects treatment method if the current system fails or if it is planned to recover good quality fine coal from the rejects flow.

Due to the geochemical variability of the coarse and fine rejects derived from the different coal seams within the Expansion Area, further work will be carried out based on the actual recombined co-disposal material once the Expansion Area is approved and mining commences. The program includes the collection of representative samples of both coarse and fine reject material from the CHPP over a number of days. The samples collected will initially be geochemically characterised using acid-base accounting and further geochemical testing may be required for selected samples, including modified NAG testing and leach column testing. This will enable the evaluation of appropriate management strategies for the disposal and capping of the coarse and fine reject material.

Additional geochemical testing on the coarse and fine reject materials will be undertaken to further evaluate the acid forming characteristics of the material and to evaluate appropriate management strategies.

Ensure adequate management of PAF materials in the blended coarse and fine reject material to reduce the risk of acid generation and ARD, resulting in low pH conditions. Water quality monitoring will be conducted in water storages for pH, As, Co, Fe and Se, to determine whether acid generation and/or ARD is potentially occurring on site (refer to **Section 20.6.4**). Water quality monitoring will also include As, Sb and Se and Zn.

Proposed EA Conditions

Proposed EA Conditions	
Waste Management	
E1-1	All regulated waste removed from the site must be removed by a person who holds a current approval to transport such waste under the provisions of the <i>Environmental Protection Act 1994</i> .
E1-2	Regulated waste must only be removed to a facility licensed under the <i>Environmental Protection Act 1994</i> to receive such waste.
E1-3	Where possible and practical, vegetation waste from clearing shall be spread on rehabilitated areas. Vegetation waste only may be burnt as a last resort and only if there is minima risk of causing nuisance to the neighbouring sensitive receptors. General waste must not be burnt or allowed to burn on the licensed site unless permitted by the administering authority.
Storage of Tyres	
E2-1	Tyres stored awaiting disposal or transport for take-back and recycling, or waste-to-energy options must be stored in stable stacks and at least 10 m from any other scrap tyre storage area, or combustible or flammable material, including vegetation.
E2-2	All reasonable and practicable fire prevention measures must be implemented, including removal of grass and other materials within a 10 m radius of the scrap tyre storage area.
E2-3	Where no feasible recycling or waste-to-energy options are available, disposing of scrap tyres resulting from the mining activities in spoil emplacements is acceptable, provided tyres are placed as deep in the spoil as reasonably practicable.
E2-34	Scrap tyres disposed within the operational land must not impede saturated aquifers and compromise the stability of the consolidated landform.

20.9 LAND

In the absence of criteria for specifying environmental values for land in the EP Act, EP Regulations and Policies, the environmental value for the land is regarded as the maintenance of the existing land suitability classification, i.e. suitability for grazing. The major potential impacts on land suitability will be the construction of surface infrastructure and mining. The Queensland Department of Minerals and Energy (1995) Environmental Policy for Mining in Queensland (Policy) states that post mining landforms should aim to return lands of similar suitability and range of land use options which existed prior to mining, or, to an agreed alternative use(s).

20.9.1 Environmental Values

20.9.1.1 Land

Elevation at the existing Isaac Plains Coal Mine site ranges between 200 m AHD and 300 m AHD and the site drains towards the Isaac River. Smoky Creek flows through the centre of the mining lease and Billy's Gully traverses near the southern boundary of ML70342. Within the Expansion Area, the local topography generally grades from the west to the east towards the Isaac River, with the topography characterised by a small ridge/plateau in the centre, running almost north-south. Topography in the Expansion Area can also be described primarily as gently undulating.

Other than works associated with the existing Isaac Plains Coal Mine, the current land use in the IIPP site is grazing, with no indication of cultivation for grain crops having been undertaken. The area was originally vegetated with mixed Brigalow and Poplar Box communities and associated grasslands but has almost been completely cleared to increase grazing capacity and for farm infrastructure including fencing, dams and water troughs.

20.9.1.2 Soils

Soil mapping units within the IIPP have been developed on the basis of similarity in morphology, laboratory data, original vegetation, soil origin and topographic position. Literature reviews were conducted and supported by field surveys.

Soils assessment in the existing Isaac Plains Coal Mine area identified a total of nine soil types including one variant, the black/brown linear gilgai complex (B1v) which occurs with B1. Smoky Creek which forms a clear soil boundary between better quality scrub soils to the north (B1 and B2) and the harder, coarser structured soils to the south (B4, B5 and B6). A small residual hill of apparently lateritic basalt occurs to the north-west.

The principal soil types are non-cracking sandy clay Brigalow on gently undulating plains, together with sandy duplex Poplar Box woodlands (E1). Hard sandy duplex alluvia with mixed Poplar Box woodland (A1 and A2) occur in association with two creek lines in the area.

The principal soil types over the Expansion Area are non-cracking sandy clay Brigalow gently undulating plains (B2) together with sandy duplex Poplar Box woodlands (E1). Deep sandy and duplex alluvia with mixed Poplar Box woodland (A1) occur in association with major alluvial lines in the area.

The soils and land suitability assessment conducted identified a total of seven major soil types, including one variant. A soil variant may possess attributes which are somewhat different from the mainstream soil attributes but either cannot be mapped out at this scale or does not constitute any significant deviation from the agricultural suitability or basic soil morphology. The variant in this survey consists of the shallower upper slopes of Ironbark occurring within the Poplar Box E1.

The assessment of soils units potentially impacted by the Expansion Area was completed before the finalisation of the alignment of the access/haul road linking the Expansion Area to the existing Isaac Plains Coal Mine. It is anticipated that soils in the area of the final alignment would be similar to those within the northern part of the study area.

20.9.2 Potential Impacts

20.9.2.1 Land

Potential impacts on land are as follows:

- contamination of land from storage and handling of fuel chemicals;
- contamination resulting from acid rock drainage;
- contamination from overburden;
- erosion – wind and water;
- change in topography, attributed to the overburden spoil dumps and final voids;
- change in vegetative communities;
- reduction in the productivity of the land for post-mining land use; and
- loss of topsoil through poor topsoil management practices.

During mining the potential for soil erosion on disturbed areas may also be increased due to:

- loss of the protective vegetative cover;
- loss of existing soil conservation works (contour banks, diversion banks, waterways);
- loss of soil structure;
- re-configuration of soil profiles upon rehabilitation; and
- differential settlement of rehabilitated areas.

Exposure of unweathered material to oxidation processes near the post-mining landform surface can result in the release of oxidation products (e.g. salts and potentially acid) which are prone to transport by surface run-off or infiltration.

Materials expand by approximately 30% when mined (i.e. spoil in a dump has a volume approximately 1.3 times that of its *in situ* or unmined volume). As a result, spoil cannot be contained within the mined excavation leading inevitably to landforms different to those already present. The post-mining material will also have a higher initial porosity than the original *in situ* spoil. Some residual settlement is expected with time, but this will have little effect on the final landform. Historical evidence from open cut coal mines in the Bowen Basin indicates that instability does not largely exist on spoil dumps however some residual settlement may occur over time.

Return of a vegetation growth media to the surface of a landform that is different from that which was present near the surface prior to mining, can alter the capability of original vegetation communities to re-establish.

Spoil returned to the surface will have a poorer nutrient status, lower organic matter content and poorer structure compared to the soil hosting original vegetation communities. Poorly structured and potentially dispersible materials may be prone to erosion, particularly on slopes.

In addition, open cut mining operations have impacts on the topography of the area, attributed to the overburden spoil dumps and final voids. The spoil dumps, after controlled placement, will appear as a gently undulating plateau of unconsolidated soil and rock, on what was previously predominantly undulating lowland plains and gently sloping crest areas. Spoil dumps will be a maximum of 40 m above natural ground level as a consequence of the swell factor of 30 %.

The mine plan is such that the void on the Isaac River floodplain adjacent to the Isaac River will be backfilled at the end of mining up to the 202 m AHD contour, which is equivalent to the 1 % AEP plus 1 m.

In terms of soil conservation and agricultural land suitability, potential impacts from mining activities are considered manageable and the proposed post-mining land use of low level grazing is considered readily achievable.

20.9.3 Environmental Protection and Control Strategies - Land

Environmental Protection Objectives And Control Strategies - Land	
Environmental Value	Existing soils and land capability.
Environmental Protection Objective	Prevent excessive clearing. Return disturbed land to pre-mining land suitability, where practicable, or alternative suitability subject to the agreement of the underlying landholder. Ensure post-mining landforms are stable so that the agreed post-mining land use is not compromised. Implementation of ARD monitoring program.
Performance Indicators/ Criteria	The rehabilitation objective shall be to achieve stable landforms. The rehabilitation objective shall be to achieve: <ul style="list-style-type: none"> • self sustaining native ecosystem; • a stable landform that meets the criteria outlined below; and • landforms are stable with no visible active rill or gully erosion. Sufficient quantity and quality of topsoil salvaged for rehabilitation. No impacts from ARD.

Environmental Protection Objectives And Control Strategies - Land							
	Monitor rehabilitation and carry out maintenance where required. Install graded banks on re-contoured spoil to minimise erosion. Progressive rehabilitation will commence when areas become available within the operational land. All areas significantly disturbed by mining activities are rehabilitated to a stable landform with a self-sustaining vegetation cover in accordance with the following two tables:						
	Disturbance type						
	Residual Voids	Waste rock dump(s)	Sediment/ Supply Dams	Infrastructure	ROM area	Road(s) and tracks	
	Projected surface area (ha)	63123	241.3	183	40.1	15.6	32.14
	Pre-mine land use	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing
	Post-mine land use	Water storage	Native Ecosystem	Water storage	Grazing	Grazing	Grazing or to remain as farm access upon agreement with landholder
	Post-mine land capability classification	V	V	V	IIV	II - IV	III or V
	Projective cover range (%)	N/A	70%	N/A	70%	70/%	N/A
	Based on conceptual design details.						
	Disturbance Type		Maximum Slope Range %		Projected IIPP Surface Area (ha)		
External wall		15% (8.5°)		326			
Low wall		73% (36°)		192			
Residual voids will comply with the following:							
Void identification		Void wall –competent rock slope (%)		Void low wall – incompetent rock slope (%)		Void maximum surface area (ha)	
N1		275% (70°)		73% (36°)		12.3	
N2		275% (70°)		73% (36°)		6.9	
S1		275% (70°)		73% (36°)		1.1	
S2		275% (70°)		73% (36°)		11.9	
S3		275% (70°)		73% (36°)		4.8	
Expansion Area Mine Pit		275% (70°)		73% (36°)		2686	
Control Strategies & Commitments	<p>Outer dump slopes will be designed at no greater than 16 % (also known as 1V:6H or 10°) until site specific trials indicate alternative design options. The outer pit dump slopes will have maximum slope lengths between graded banks conforming to current best practice. External slopes will drain to sedimentation dams.</p> <p>The surface of waste dumps will be shaped to mimic the original gently undulating landform to promote a self sustaining native ecosystem. Surface run-off will be directed towards appropriately lined drains.</p> <p>The low wall of the final void will remain as dumped (angle of repose) and will be benched as required. The low wall drains internally to the final void.</p> <p>Highwall slopes in geotechnically stable ground which have not been mined will remain at their final batter angles (typically 70° based on geotechnical investigations to date) and will be made safe to ensure the safety of humans and animals.</p> <p>The coal seam in final voids will be sealed using pre-strip, if available.</p> <p>Design and install a perimeter stormwater diversion drain to divert clean water from disturbance areas.</p>						

Environmental Protection Objectives And Control Strategies - Land

To minimise the risk of the Isaac River overflowing into the final void and drawdown of the alluviums, the mine plan has been redesigned to remove the void that previously ran adjacent to the Isaac River. At the end of mining, the final void on the Isaac River floodplain will be backfilled up to the 202 m AHD contour, which is equivalent to the 1% AEP plus 1 m level of the PMF.

The perimeter of final voids will be fenced and appropriately signed to restrict access.

Surface runoff from all rehabilitated areas will pass through sediment control structures to reduce the amount of final sediment loads reporting watercourses near the IIPP, i.e. Smoky Creek, and the watercourses known locally as Billy's Gully and Conrock Gully to current EA discharge levels.

The final landform drainage system will be subject to detailed design as part of future detailed mine closure planning. Amendments to the conceptual design will be made as necessary at that time to address detailed design issues.

The overburden emplacement will drain externally with runoff being controlled by contour ripping and contour drains. The contour drains will be standard, open cut rehabilitation contour drains constructed by cut and fill, using a grader or small bulldozer. Drain cross sections will be sized to convey runoff from the 20 year average recurrence interval (ARI) rainfall event. The drains will have a 1% grade and will have typical spacings of approximately 100 m to limit the effective contributing catchment areas.

Drainage at the toe of the overburden dump, around the perimeter of the final landform, will be collected in a table drain. These drains will convey runoff from the overburden emplacement to the surrounding natural drainage system via a series levee culverts fitted with flood gates. The flood gates will ensure the integrity of the PMF levee is maintained during any extreme flood events. Standard sediment and erosion will be installed the establishment phase of final landform drainage structures. Once drainage infrastructure has established grass cover, erosion sediment controls will be decommissioned.

On behalf of IPCM, a Registered Professional Engineer of Queensland (RPEQ), will complete an assessment report on the geotechnical issues and erosivity of the proposed final landforms, including final voids, by 30 June 2010 to demonstrate long-term landform stability. Reference will be made to the Queensland Mining Guidelines (or subsequent reprints) in making this assessment.

All infrastructure constructed by or for the IIPP during the mining activities including water storage structures, will be removed from the site prior to mining lease surrender, except where agreed in writing by the post mining land owner/holder.

Dry reject disposal will be used to maximise the potential for water recovery as well as fine coal reject management system all encapsulated in the site water management system to minimise the potential for groundwater and surface water contamination.

The existing facilities for the prevention of land contamination and management of wastes with the potential to cause such contamination will be extended into the Expansion Area from the existing Isaac Plains Coal Mine.

Testing will be carried out to evaluate the acid forming characteristics of the coal rejects and to evaluate appropriate management strategies.

All chemicals and fuels will be appropriately stored in accordance with *AS10940 - The Storage and Handling of Flammable and Combustible Liquids*.

Explosives will be stored in accordance with the requirements of *AS2187 - Explosives Storage and Transport*.

The initial PoO for the IIPP, and subsequent updates, will provide evidence of testing or proposed testing of the spoil to be mined during the term of that plan to identify those materials having a high propensity for acid mine drainage and describe the management practices for the placement of such material to minimise the potential generation of acid mine drainage. Water quality monitoring will also be carried out as outlined in **Section 20.6.4**.

Dispersive and non-dispersive spoil will be identified to ensure the appropriate selective placement in the post mining landform. The relevant identification and selective placement procedures and, evidence of operations in accordance with those procedures, will be made available to the administering authority upon request.

Revegetation

IPCM will complete an investigation into the rehabilitation of areas of disturbance and submit a report to the administering authority proposing acceptance criteria to meet the outcomes listed above by 30 June 2010.

Disturbed land will be progressively rehabilitated as it becomes available. The rate and areas for rehabilitation will be detailed in the Plan of Operations.

IPCM is committed to the four general rehabilitation goals, i.e. that the rehabilitated landform be:

- safe to humans and wildlife;
- non-polluting;
- stable; and
- able to sustain an agreed post-mining land use.

The IPCM rehabilitation operating philosophy is based on the following concepts:

- design earthworks and revegetate to a predetermined post-mine land use;

Environmental Protection Objectives And Control Strategies - Land

- minimise unnecessary land disturbance;
- minimise erosion and its potential off-lease effects;
- protect downstream water quality from contaminated runoff;
- recognise and protect downstream beneficial uses (surface and groundwater); and
- on relinquishment of title, ensure the agreed post-mine land use has been reached.

All areas significantly disturbed by mining activities are rehabilitated to a stable landform with a self-sustaining vegetation cover.

Where reasonable and practicable, areas of the site where grazing is nominated as the post mine land use must include native grass species endemic to the area.

IPCM will continue to research the most appropriate species mix of native trees, shrubs and grasses for revegetation and determine rehabilitation success criteria using on-site research program and relevant data from other mines. The program will include investigations into vegetation productivity, diversity, and soil fertility.

The selection and establishment of plants will be complementary to nearby remnant vegetation.

Monitor rehabilitation and carry out maintenance where required to achieve rehabilitation success criteria.

Topsoil

A-horizon topsoil to be salvaged for rehabilitation. Topsoil stockpiles to be mapped and volume recorded. Revegetate topsoil stockpiles.

Respread topsoil on re-contoured spoil. Contour rip spoil to > 0.5 m.

Vegetation clearing and topsoil management will include the following:

- prior to disturbance, all soil to the depth of the A horizon will be stripped;
- where topsoil is being stripped within an economic (scraper haulage) distance of a prepared rehabilitation area, topsoil will be directly placed on the rehabilitation area without stockpiling. Where this will not be feasible, topsoil stockpiles will be constructed;
- the height of topsoil stockpiles will be minimised where possible given operational constraints;
- topsoil stockpiles will be left to self-revegetate. If after one or more wet seasons an unacceptable grass cover has established on the topsoil dump, the surface will be ripped and sown with pasture grasses; and
- topsoil replacement on reshaped spoil areas will occur at similar depths existing prior to mining (maximum 250 mm A horizon depth).

Erosion Control

Excavations (borrow pits and quarries) required during mine infrastructure construction will require erosion control measures to be in place. The measures will comply with the Queensland Division of the Institution of Engineers "Soil Erosion and Sediment Control - Engineering Guidelines for Queensland 1996".

Areas to be excavated and levelled will be kept to a minimum for the required construction purpose.

Unnecessary disturbance of soil or vegetation will not occur beyond the construction area.

The time of exposure of disturbed areas will be minimised by ensuring that excavation and leveling occurs immediately prior to construction.

Diversion drains will be used to divert water away from disturbed areas.

Sedimentation traps will be erected to minimise sediment run-off from disturbed areas into waterways and surrounding areas.

Service roads will have sufficient surface drainage to prevent run-off eroding the road or adjacent areas.

Install graded banks on re-contoured spoil to minimise erosion.

Levees will remain on-site to protect undisturbed areas from impacted areas.

Final voids, including pits and ramps not backfilled, will be made safe and persons and stock excluded.

During the mining operations, the stability of pit and overburden dump slopes will be reviewed and designs amended as necessary.

Exploration

Should exploration activities be undertaken in the IIPP area in areas not authorised to be mined, they will be rehabilitated in accordance with provisions detailed in the *Code of Environmental Compliance for Exploration and Mineral Development Projects*.

20.9.4 Proposed EA Conditions

Proposed EA Conditions	
Spoil Placement	
F1-1	Provide for the identification of dispersive and non-dispersive spoil to ensure the appropriate selective placement in the post-mining landform. The relevant identification and selective placement procedures and, evidence of operations in accordance with those procedures, will be made available to the administering authority upon request.
Acid Mine Drainage	
F1-2	For each plan of operations provide evidence of testing or proposed testing of the spoil to be mined during the term of that plan to identify those materials having a high propensity for acid mine drainage and describe the management practices for the placement of such material to minimise the potential generation of acid mine drainage.
Rehabilitation landform Criteria	
F1F2-1	All areas significantly disturbed by mining activities must be rehabilitated to a stable landform with a self-sustaining vegetation cover in accordance with Schedule F - Table 1 and Table 2.
F1F2-2	Progressive rehabilitation must commence when areas become available within the operational land.
F1F2-3	Complete an investigation into rehabilitation of proposed areas of disturbance and submit a report to the administering authority proposing acceptance criteria to meet the outcomes in Schedule F - Table 1 by 30 June 2010. Development of acceptance criteria is to consider the re-establishment of representative regional ecosystems (reference sites or another suitable alternative approved by the administering authority) and functioning habitat of areas equal to or greater than areas to be cleared and specific revegetation performance descriptors (e.g. rehabilitated areas are to display characteristics of the existing (pre-mining) regional ecosystems).
F1F2-4	Areas which are to be rehabilitated to native ecosystem must achieve a self sustaining native ecosystem with species composition and distribution similar to an analogue site or another suitable alternative approved by the administering authority.
F1F2-5	Areas to be rehabilitated must be rehabilitated to the landform design criteria defined in Schedule F - Table 2 and the landforms must be stable.
F1F2-6	Where reasonable and practicable, areas of the site where grazing is nominated as the post-mine land use must include native grass species endemic to the area.
Residual Void	
F2F3-1	Residual voids must comply with the following outcomes; a) residual voids must not cause any serious environmental harm to land, surface waters or any recognised groundwater aquifer, other than the environmental harm constituted by the existence of the residual void itself and subject to any other condition within this environmental authority; and b) residual voids must comply with Schedule F – Table 3.
Infrastructure	
F3F4-1	All infrastructure constructed by or for the environmental authority holder during the mining activities including water storage structures, must be removed from the site prior to mining lease surrender, except where agreed in writing by the post mining land owner/holder. NOTE: This is not applicable where the landowner/holder is also the environmental authority holder.
General	
F4F5-1	The EM Plan and Plan of Operations must be consistent with the geotechnical and erosivity assessment (outlined in condition F4-2) within three months of the completion of the assessment (outlined in condition F4-2).
F4F5-2	Complete an assessment report, to be undertaken by a Registered Professional Engineer of Queensland (RPEQ), of geotechnical issues and erosivity of the proposed final landforms, including final voids, by 30 June 2010 to demonstrate long-term landform stability. Reference is to be made to the Queensland Mining Guidelines (or subsequent reprints) in making this assessment.
Exploration	
F5F6-1	Disturbance due to exploration activities in areas not authorised to be mined must be rehabilitated in accordance with provisions detailed in the <i>Code of Environmental Compliance for Exploration and Mineral Development Projects</i> .

Schedule F - Table 1 (Final land use and rehabilitation approval schedule)

	Disturbance type					
	Residual Voids	Waste rock dump(s)	Sediment/ Supply Dams	Infrastructure	ROM area	Road(s) and tracks
Projected surface area (ha)	63	241.3	183	40.1	15.6	32.14
Pre-mine land use	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing
Post-mine land use	Water storage	Native Ecosystem	Water storage	Grazing	Grazing	Grazing or to remain as farm access upon agreement with landholder
Post-mine land capability classification	V	V	V	IIV	II - IV	III or V
Projective cover range (%)	N/A	70%	N/A	70%	70/%	N/A

*based on conceptual design details

Schedule F - Table 2 (Landform design)

Disturbance Type	Maximum Slope Range %	Projected IIPP Surface Area (ha)
External wall	15% (8.5°)	326
Low wall	73% (36°)	192

Schedule F - Table 3 (Residual void design)

Void identification	Void wall –competent rock slope (%)	Void low wall –incompetent rock slope (%)	Void maximum surface area (ha)
N1	275% (70°)	73% (36°)	12.3
N2	275% (70°)	73% (36°)	6.9
S1	275% (70°)	73% (36°)	1.1
S2	275% (70°)	73% (36°)	11.9
S3	275% (70°)	73% (36°)	4.8
Expansion Area Mine Pit	275% (70°)	73% (36°)	26

20.10 NATURE CONSERVATION

20.10.1 Environmental Values – Terrestrial Ecology

20.10.1.1 Vegetation Communities/Flora

The majority of the areas within the IIPP to be disturbed are highly modified, i.e. cleared grazing land, providing limited habitat opportunities for native woodland fauna. These cleared areas provide habitat for some native grassland species but do not, or are unlikely to, exhibit the characteristics required for them to qualify as native grassland communities given the dominance of the introduced pasture species, Buffel Grass (*Cenchrus ciliaris*), and the low diversity of other grasses and herbs. Throughout all woodland areas, ground habitat values are diminished by the virtual monoculture of Buffel Grass and the consequent lack of floristic and structural diversity.

Remnant vegetation is restricted largely to relatively robust tracts of riparian and frontage woodland along the Isaac River and Cherwell Creek, a narrow band of riparian vegetation along Conrock Gully, and a riparian corridor along Smoky Creek which is 'of concern' (under the *Vegetation Management Act 1999* (VMA)). The limited riparian vegetation which exists along Billy's Gully is 'not of concern' (under the VMA). Remnant vegetation within the areas is in poor-moderate ecological condition with the impacts of grazing evident, i.e. reduced groundcover and shrub diversity, replacement of the native groundcover flora with Buffel Grass in most areas, and replacement of native groundcover along Isaac River with Guinea Grass.

No endangered Regional Ecosystems (REs) (including Brigalow) were found to occur in the existing Isaac Plains Coal Mine. However, two small "of concern" REs were identified along Smoky Creek.

Based on field verification, Brigalow communities are present within Expansion Area and access/haul road alignment.

20.10.1.2 Fauna

Two rare or threatened fauna species, the Squatter Pigeon (Vulnerable) and Little Pied Bat (Rare) were observed or detected within the IIPP site during fauna field assessments.

The Squatter Pigeon was observed in riparian woodland adjacent to the Isaac River and is also likely to utilise riparian and non-riparian grassy woodland habitats throughout the Expansion Area. It was also observed foraging along Billy's Gully and is expected to utilise the small alluvial pockets along Smoky Creek.

The Little Pied Bat was detected along Conrock Gully, Smoky Creek and Billy's Gully during Anabat surveys conducted as part of the riparian fauna surveys in these areas. Given the vegetation present, it is likely to also be present in the general vicinity of the Isaac River.

Based on the ecological assessments conducted and given the limited extent and poor condition of remnant habitats, the IIPP site and surrounding area is not likely to represent especially significant feeding or breeding habitat for any of the migratory or other EPBC listed species regarded as likely or possible inhabitants.

20.10.1.3 Weeds/Animal Pests

Environmental weeds including introduced pasture species are abundant in the remnant vegetation areas and have displaced natural ground cover species within the IIPP area. Buffel Grass (*Cenchrus spp.*) is particularly widespread being the main pasture species established in the area. Throughout the entire IIPP, ground habitat values have been diminished by the virtual monoculture of Buffel Grass and the consequent lack of floristic and structural diversity as previously discussed.

Three declared plant species under the *Land Protection (Pest and Stock Route Management) Act 2002* (LPA) were detected in the IIPP area, including Parthenium (*Parthenium hysterophorus*) which is widespread throughout the IIPP area. A list of all pest plants occurring in the IIPP area is provided in **Table 20-7**.

Table 20-7 Declared Pest Plant Species Occurring in the IIPP Area

Scientific Name	Common Name	Pest Status under LPA	Belyando Shire Council Status	Nebo Shire Council Status
<i>P. hysterophorus</i>	Parthenium weed	C2	Control Target	Medium Priority
<i>Harrisia</i> sp.	Harrisia Cactus	C2	Control Target	Medium Priority
<i>Opuntia</i> sp.	Prickly Pear	C2	Not listed	Medium Priority
<i>Acacia nilotica</i>	Prickly Acacia	C2	Eradication Target	High Priority
<i>Xanthium pungens</i>	Noogoora burr	N/A	C2	Medium Priority

Noogoora Burr (*Xanthium pungens*) and Prickly Acacia (*Acacia nilotica*) also occur sporadically along the waterways of the IIPP. Although the Noogoora Burr is not a declared species under the LPA as a pest species, it is listed under the Nebo and Belyando local government control requirements.

The Belyando Shire Pest Management Plan 2005-2009 (which was prepared under the requirements of the LPA) classifies weed species as either eradication target species or control target species. The Nebo Shire Pest Management Plan 2005-2009, also developed in line with the LPA, classifies weed species as particular priority species with specific levels of control for each listed species. In both Shires, eradication of target species must be destroyed wherever they occur and control targets will be removed from strategic areas in a phased control program. **Table 20-7** lists those species identified in the IIPP area, pest status under the LPA and local council status. The Belyando and Nebo Shire Councils, in consultation with landholders, develops property pest management plans for their specific areas/properties.

Five introduced fauna species are found in the IIPP Area:

- Feral Cat (*Felis catus*), listed as a Class 2 pest under the LPA;
- Feral Pig (*Sus scrofa*); listed as a Class 2 pest under the LPA;
- European Rabbit (domestic and wild breeds) (*Oryctolagus cuniculus*), listed as a Class 2 pest under the LPA;
- Cane Toad (*Bufo marinus*), not a declared pest in Queensland; and
- Brown Hare (*Lepus capensis*), not a declared pest in Queensland.

Although not observed during the most recent field surveys conducted in the Expansion Area, observations of both Wild Dog/Dingo (*Canus familiaris*), listed as a Class 2 pest under the LPA, and the House Mouse (*Mus musculus*), not a declared species in Queensland, have been made in the IIPP area. All of the above listed species are commonly encountered throughout the Central Highlands area. Both the Nebo and Belyando Pest Management Plans address Class 2 pests. The Plans provide a legal and administrative framework for the enforcement and removal of declared animals from private property. As for weed control, Councils, in consultation with landholders, develop property pest management plans for their specific areas/properties.

20.10.2 Potential Impacts – Terrestrial Ecology

Potential impacts of the IIPP on flora and fauna are associated with:

- disturbance of remnant vegetation and/or habitats for the construction of mine infrastructure and as a result of mining activities;
- clearing of endangered Brigalow REs 11.3.1 and 11.4.9;
- removal of riparian corridor vegetation as part of watercourse diversion to access the coal reserves beneath Smoky Creek and Conrock Gully;
- construction of a levee in the Expansion Area;
- translocation of weeds;
- infestation of animal pests;
- noise;
- lighting;
- vehicle collisions with fauna;
- cable crossings of watercourses;
- aquatic continuity in watercourses;
- hydrology and water quality changes in watercourses; and
- impacts on rare, threatened or migratory species, populations and communities.

No direct impacts on fauna at the IIPP site are anticipated.

Given the minimal proposed disturbance to remnant habitats, the poor condition of habitats within the proposed extent of disturbance for the IIPP, and the area of disturbance compared to available habitats in the study region, it is not anticipated that the IIPP will lead to significant impacts on rare, threatened or migratory species, communities or populations listed under the NCA or EPBC Act.



20.10.3 Environmental Values – Aquatic Ecology

The waterways within the IIPP area are typical of small temporary streams in central Queensland. Temporary streams are those driven by a climate characterised by a lengthy dry period followed by a shorter wet period. Streams dry up and surface waters disappear during the dry periods only to reappear with associated biological communities following the onset of the next substantial rains. Ephemeral waters are a subset of temporary waters that contain water only after irregular rainfall or flow events. The defining features of these temporary waterways are the aridity of the environment, alternating with high energy flow in storm events. The aridity also makes them prone to degradation.

The waterways within the IIPP area generally flow for only a few hours after rain. They are often survived by small surface pools which may remain for up to a few weeks at a time. The aquatic ecology in these systems are driven by the short periods of time that they contain water.

The gullies and water bodies examined in this study area are identified as ephemeral waterways. These waterways typically flow for short periods following rainfall events.

The aquatic habitats within the waterways are in reasonable condition, although some had been subject to disturbance from land use practices, particularly damage to bank structure and stability where unrestricted cattle had access to the surviving pool environments. The presence of cattle in the water bodies can result in disturbance to the aquatic environment through physical alteration of the channel.

Such waterholes, whilst not permanent, provided temporary refuge for remaining aquatic fauna such as fish. Although fish and macroinvertebrates were recorded from the study sites, none of these aquatic species recorded during this survey, were listed under the EPBC Act, NCA or *Fisheries Act 1994*.

No aquatic flora (macrophytes), turtles or platypus were observed during the study. The absence of macrophyte communities is not unexpected amongst water bodies with ephemeral flow and naturally turbid waters.

20.10.4 Potential Impacts – Aquatic Ecology

Potential impacts of the IIPP on aquatic ecology are associated with:

- erosion and sedimentation from land disturbing activities such as road and other mine infrastructure construction and mining operations;
- the diversion of Smoky Creek and Conrock Gully which will involve the removal of these water channels and their associated riparian zone; and
- potential for chemical and fuel spills.

20.10.5 Environmental Protection Objectives and Control Strategies – Nature Conservation

Environmental Protection Objectives And Control Strategies - Nature Conservation	
Environmental Value	Integrity of the natural ecosystems and conservation values for flora and fauna are to be protected.
Environmental Protection Objective	Confine clearing of habitat of rare and vulnerable species to that essential for the mine. Ensure there are no adverse impacts the local waterways.
Performance Indicators/Criteria	Extent of clearing. Water quality characteristics in local waterways. Extent of clearing does not exceed that set out in the project plan. Weed management in accordance with <i>Land Protection (Pest and Stock Route Management) Act 2002</i> and local Government requirements.
Control Strategies & Commitments	Restrict clearing of all vegetation areas to that essential for the project, i.e. no clearing of remnant vegetation beyond that needed to safely and efficiently operate the mine site. Vegetation cleared from the site will be managed in accordance with the following hierarchy: a) reuse, e.g. use of logs and tree stumps as shelter for fauna in rehabilitated areas; b) recycle, e.g. mulching of vegetation and use in rehabilitation on the site; and c) other alternative management options implemented in a way that causes the least amount of environmental harm.

Environmental Protection Objectives And Control Strategies - Nature Conservation

Preferential use of non-remnant areas and 'not of concern' remnant vegetation areas where possible prior to disturbing any areas of remnant vegetation.

The extent of disturbance to the riparian corridor will be considered in selecting the final location for the Isaac River low level crossing to minimise disturbance.

The low level crossing of the Isaac River will be oriented as near to perpendicular as practicable to the stream channel to minimise vegetation disturbance. Riparian vegetation will be left as close as possible either side of the crossing, with lateral branches of adjacent trees that may impinge on the crossing being routinely lopped to maintain clear passage rather than total removal of the trees.

Designing of the out-of-pit spoil dump to avoid or minimise the disturbance of the area of Brigalow and RE 11.3.2 adjacent to Cherwell Creek.

Fencing off an area of land (equivalent to the area of Brigalow to be disturbed) not required for mining to allow for the natural regeneration of Brigalow. Dependant on the location of this area consent may be required from the landowner prior to implementation of this strategy.

On an annual basis, areas of vegetation within the mine to be cleared, (including significant vegetation communities), will be identified and detailed with maps, in the PoO.

Areas of remnant vegetation (approximately 67.7 ha) that are proposed to be cleared and are classified as Of Concern or Endangered will potentially be offset to meet the objects of the VMA. Areas to be offset will be identified as part of the rehabilitation plan to be developed for the IIPP as a requirement of the PoO, and will be based on the DNRW documented as part of the IIPP will be offset in accordance with the requirements of the DNRW document *Policy for Vegetation Management Offsets*, 28 September 2007. IPCM is committed to providing an offset of 67.7 ha of remnant vegetation, with the required offset designed to:

- maintain ecological processes at a subregional level, including interrelationships of natural values, species distributions and movements;
- be geographically close to the areas proposed to be cleared as is reasonably achievable ensuring that localised environmental affects of clearing are mitigated and ecological equivalence achieved;
- recreate similar habitats to the surrounding area; and
- be a pre-clearing regional ecosystem that has the same or higher conservation value as the area proposed to be cleared and should ideally be on the same land zone as the regional ecosystem(s) being cleared.

The offset area will be an area that is large enough to be mapped as remnant vegetation in accordance with the current version of the EPA's "Methodology for Survey and mapping of Regional Ecosystems and Vegetation Communities in Queensland" and will be developed to become ecologically equivalent to the area being cleared.

As part of the application for the proposed offset covenant, IPCM will develop and submit a management plan which will specify how the offset will be managed to ensure the offset achieves or maintains remnant regional ecosystems status and ecological equivalence. As part of the management plan, IPCM will commit to ensuring the offset is legally secured for the life of the IIPP and for protection and management as required during operations and post-mining. Post-mining management decisions will include consultation with landholders.

IPCM will organise to meet formally with the DNRW Vegetation Management Officers in the relevant district to discuss offset requirements prior to making a formal covenant application. This will be conducted prior to an application being formally submitted. In addition, IPCM will ensure that it has offset covenant approval prior to works commencing for the IIPP.

IPCM are committed to managing the proposed buffer area located between the Isaac River and the proposed levee at the northern end of the Expansion Area in accordance with the following management measures:

- the buffer will be maintained as a vegetated area. Revegetation of this area will assist with connectivity and assist with sediment control and protect the water quality of the Isaac River. Prior to the revegetation of the levee, it is proposed to fence off the area and allow for natural regeneration. Should regeneration not be naturally forthcoming, using the results of soil/substrate assessment, direct seeding etc will be implemented in accordance with the substrate/soil types in the buffer area and consistent with the vegetation on the northern side of the river;
- establishment of vegetation on the levee wall. It is proposed to establish predominantly 'spreader type' grasses rather than bladed grass which will proved better stabilisation and dissipate the energy of rainfall which can lead to erosion. Specific species will be determined based on the substrate used in levee construction. No trees or shrubs will be planted on the levee. Although it will not intentionally be seeded, it is likely that in this region, buffel grass will compete with and dominate most native species. Local fauna species such as the squatter pigeon have adapted to foreign species such as buffel grass;
- both the buffer area and the levee will be fenced off from grazing impacts for the life of mine;
- the buffer area and levee will be included into the weed monitoring program for the ML areas

Environmental Protection Objectives And Control Strategies - Nature Conservation

within the Expansion Area; and

- no mine roads/access roads will be located within the buffer area.

Fauna

Do not instantly exclude native wildlife from water supplies on which they have become dependant.

Limit vehicle speed around the surface area of the mine site.

Low speed limit zones will be established and enforced for vehicle crossings of waterways in order to enhance the driver's abilities to detect crossing fauna and aid in avoiding collisions.

Lighting will be installed in such a way as to avoid direct illumination of riparian and woodland habitat areas, or where necessary, shading devices will be fitted to lights to restrict illumination of these areas.

Levees located between pits and waterways will provide some attenuation of noise generated by mining to riparian areas which may provide habitat to fauna.

The water management system for the IIPP has been designed to capture, contain and treat mine water ensuring that impacts on downstream beneficial water uses are minimised, including use by fauna.

Isaac River low level crossing will be constructed so as not to represent a passage barrier for fish and other aquatic fauna; there should be unrestricted flow through the crossing during both low and high flow events.

Provisions will be made for the safe movement of fauna in the vicinity of the low level crossing of the Isaac River. This includes the provision of 'dry culverts' or pipe/box culvert structures, and/or the erection of fencing along the margin of the riparian corridor in the vicinity of the crossing to direct fauna into the safe passage area and prevent fauna crossing the road. As part of the detailed design of the low level crossing, flood studies will be assessed to ensure that appropriate fauna passageways are provided.

The water management system for the IIPP has been designed to capture, contain and treat mine water ensuring that impacts on downstream beneficial water uses are minimised, including use by fauna.

In order to prevent bird injury and mortality, any aerial cables strung across the riparian corridors will be fitted with bird flight diverter devices at spacings which satisfy the manufacturer's application recommendations, as required.

Best practise erosion control measures will be incorporated into design and maintainance for both the construction and operation of the diversions to ensure minimal impact to downstream aquatic communities occurs from potential sedimentation resulting from surface water run-off.

Best practise erosion control measures and bunding of fuels, oils and other potential contaminants will be implemented and maintained during both the construction the operational phases, especially works near waterways and drainage lines to ensure minimal impacts to downstream aquatic communities.

Weeds

A weed management plan will be developed for the site by June 2010.

Weeds will be controlled in all areas of the site targeting species declared under legislation in accordance with the requirements of that legislation.

Weeds will be controlled in all areas of the site targeting species declared under legislation in accordance with the *Land Protection (Pest and Stock Route Management) Act 2002* and local Government requirements.

IPCM are committed to adhering to the weed management requirements of both the Belyando Shire Pest Management Plan 2005-2009 and the Nebo Shire Pest Management Plan 2005-2009.

Induction programs for site personnel on nature conservation and weed control issues.

All personnel shall report sightings of weeds, known declared plants (noxious weeds) or plants that appear out of place as an environmental incident. An environmental professional will determine whether or not the plant is a declared plant and take appropriate action, conforming to legislation where necessary. Populations of new weeds shall then be mapped and monitored to ensure they are not spreading.

All vehicles and equipment brought onto site will be thoroughly washed down prior to arriving at site to ensure all soil and plant matter has been removed.

Confirmation, in writing from the equipment provider, that all construction equipment to be used on site is washed-down and free of weed seed prior to mobilisation to the site. A movement protocol will also be developed for vehicles and plant to ensure declared weeds are not spread.

Where practicable, source external materials, e.g. sand, soil, from sites known to be free of declared and significant environmental weed infestations. NB: Parthenium is very widespread in the Moranbah district and therefore it will be very difficult to source such materials from that area.

Should a declared species be identified on the site, a management plan will immediately be developed for operations in the specific areas of infestation. This may include:

- surveying and identifying the weed species present;
- developing management procedures and practices in accordance with recommendations from

Environmental Protection Objectives And Control Strategies - Nature Conservation	
	<p>the DNRW, including reference to the Pestfact information sheet series;</p> <ul style="list-style-type: none"> controlling the weeds currently infesting the area by implementing the management procedures and practices; preventing the weeds from setting seed by implementing the management procedures and practices; reducing the spread of seeds and vegetative matter by implementing the management procedures and practices; and appropriate liaison with local councils. <p>Controls for areas of weed infestation may include:</p> <ul style="list-style-type: none"> mechanical means for which there are numerous options depending on the species and site geomorphology; hand grubbing or other labour intensive activities; chemicals of which there are numerous types that can be selected from to target species; and biological control measures can also be utilised such as summer rust (<i>Puccinia melampodii</i>) for Parthenium. <p>The use of chemicals for control will be minimised where appropriate in favour of mechanical or biological control methods.</p> <p>Any chemicals used close to waterways will have a high degree of biodegradability and low toxicity in this environment.</p> <p>IPCM is committed to adhering to the requirements of both the Belyando Shire Pest Management Plan 2005-2009 and the Nebo Shire Pest Management Plan 2005-2009 in order to further enhance the control and eradication of feral animals within the IIPP site and Nebo and Belyando shires as a whole.</p> <p>IPCM, in consultation with landholders and Councils, will develop a property pest management plan for the MLs.</p> <p>Feral animal control programs will be conducted as required.</p>

20.10.6 Proposed EA Conditions

Proposed EA Conditions	
G1-1	<p>Cleared vegetation from the site must be managed in accordance with the following hierarchy:</p> <ol style="list-style-type: none"> reuse, e.g. use of logs and tree stumps as shelter for fauna in rehabilitated areas; recycle, e.g. mulching of vegetation and use in rehabilitation on the site; and other alternative management options implemented in a way that causes the least amount of environmental harm.
G1-2	<p>A Weed Management Plan must be developed and implemented during the continuation of this environmental authority, and prior to the commencement of construction activities. The Weed Management Plan must describe how the weeds are to be managed in accordance with the <i>Land Protection (Pest and Stock Route Management) Act 2002</i> and/or local government requirements for weeds not declared under state legislation.</p>

20.11 COMMUNITY

Community consultation and feedback will occur as needed to inform the community about the project and to assist with community understanding of the opportunities and constraints presented by the operation of the IPCM. Community consultation and community feedback is an important part of any environmental management plan, not just because the community is part of the environment but also because they can add sensitivities and information invaluable to achieving environmental management.

All complaints associated with the IPCM will be directed to IPCM Compliance Superintendent.

20.11.1 Environmental Protection Objectives and Control Strategies – Community Consultation

Environmental Protection Objectives And Control Strategies - Community Consultation	
Environmental Value	Community interaction, open and friendly neighbourhoods with community kinship values, quietness and the high level of safety.
Environmental Protection Objective	<p>Maintain the current living standard in the vicinity of the project.</p> <p>Maintain or improve the current quality of the environment in the vicinity of the project.</p>
Performance Indicators/Criteria	<p>Number of complaints lodged by the public.</p> <p>All complaints received responded to within 48 hours.</p>



Environmental Protection Objectives And Control Strategies - Community Consultation	
	Number of incidents in one month.
Control Strategies	<p>The established complaints/incidents investigation and recording system at IPCM will be adhered to. A complaints/incidents register will also be maintained for complaints about activities associated with the IPCM. The following records are required to be kept in a Complaints/Incidents Register for the project in the event of an incident or complaint:</p> <ul style="list-style-type: none"> time, date and nature of the incident/complaint; type of communication (for complaints only, e.g. telephone, letter, in person, etc.); name, contact address and contact telephone number of complainant (Note: if the complainant does not wish to be identified then 'Not Identified' is to be recorded); response and investigation undertaken as a result of the incident/complaint; name of person responsible for investigating the incident/complaint; and corrective action taken as a result of the incident/complaint investigation and signature of responsible person.

20.11.2 Proposed EA Conditions

Proposed EA Conditions	
Complaint Response	
H1-1	All complaints received must be recorded including details of complainant, reasons for the complaint, investigations undertaken, conclusions formed and actions taken. This information must be made available for inspection by the administering authority on request.

20.12 VISUAL AMENITY

The environmental value to be maintained in this area is the preservation of the area's visual amenity.

The term landscape assessment describes the fabric, character and quality of the surrounding area, whereas the term visual assessment relates to the changes that arise in the composition of the available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity or aesthetic condition.

The characterisation of the IIPP area and its immediate surroundings has been based on an assessment of natural, cultural, social, aesthetic and perceptual factors as they exist today and are predicted following completion of proposed mining and post-mining rehabilitation activities.

20.12.1 Environmental Values

The IIPP area is bounded on all sides by grazing land, with grazing also continuing to be undertaken over part of the existing Isaac Plains Coal Mine site during mining. The region contains rich thermal and metallurgical coal resources, with a number of open cut mining ventures being located within a distance of 20 km, including the Peak Downs, Broadlea, Carborough Downs, Millennium, Poitrel and Moorvale mines.

The IIPP area comprises undulating rural land with isolated rocky knolls and is dissected by the Isaac River and its tributaries. The site has been extensively cleared for cattle grazing but also retains areas of remnant native vegetation, particularly riparian vegetation along creeks.

20.12.2 Potential Impacts

Due to the extent and nature of the development the visual elements that have the potential to impact on the visual amenity of the surrounding area include:

- open cut pits;
- additional ROM coal stockpiles, temporary stockpiling for coal destined for existing CHPP;
- CHPP;
- rail load out facility;
- mine infrastructure area;
- Peak Down's Highway underpass;

- out-of-pit spoil dumps (to an average height of 30 m – maximum 40 m) at the western margin of the proposed pit outlines;
- access/haul roads; and
- site restoration.

Lighting at night is likely to be noticeable from a limited number of viewpoints. The lighting associated with the IIPP infrastructure is likely to comprise:

- elevated flood lighting above the ROM coal stockpiles;
- flood lighting for active operational areas, e.g. dragline and excavator sites;
- elevated flood lighting in the vicinity of the active spoil dumps;
- along the truck access/haul road; and
- vehicle lights.

The post-mining rehabilitation objective is to rehabilitate the land to a stable undulating landform with self-sustaining native vegetation cover. Total residual disturbance is likely to comprise out-of-spoil dumps and final voids.

Potential impacts on visual amenity are as follows:

- change of visual quality of the surrounding environment and its compatibility/discord with the landscape and surrounding use;
- visual intrusion;
- visibility;
- visual exposure (lighting impact); and
- cumulative visual impact.

There are no formal guidelines for the assessment of visual amenity impacts in Australia with the exception of the assessment of lighting impacts.

Australian Standard *AS 4282 1997 "Control of the obtrusive effects of outdoor lighting"*, provides a common basis for assessment of the likely environmental effects of developments that involve the provision of outdoor lighting. AS 4282 addresses several aspects of potential obtrusiveness, namely the light falling on surrounding properties, the brightness of luminaries in the field of view of nearby residents, the glare to users of adjacent transport systems and the effects on astronomical observations. In order to control these potential effects, the following parameters require consideration:

- a) the existing lighting level in the area;
- b) the times that the proposed lighting will operate;
- c) the type of lighting technology available to light the activity; and
- d) the use of readily available and easily understood technical data on the lighting installations which can be verified at the design and assessment stages.

20.12.3 Environmental Protection Objectives and Control Strategies – Visual Amenity

Environmental Protection Objectives And Control Strategies - Visual Amenity	
Environmental Value	Existing visual amenity.
Environmental Protection Objective	To take all reasonable and practical measures to avoid or minimise impacts on visual amenity.
Performance Indicators/Criteria	Number of community complaints regarding impacts on visual amenity. Criteria specified in <i>AS 4282 1997 Control of the obtrusive effects of outdoor lighting</i> .
Control Strategies & Commitments	Use of high pressure sodium lights will be used where possible. Establish buffer vegetation between new surface infrastructure and sensitive receptors. Vegetation regrowth beside the access/haul road or a deliberately planted vegetative barrier will be established to reduce visual impacts.

Environmental Protection Objectives And Control Strategies - Visual Amenity	
	<p>Retain the existing vegetation on site where possible.</p> <p>Floodlights require a screen or louver attached (or close) to the light fitting to control light flux for all angles above 10 degrees below the horizontal effectively reflecting light onto the ground and improving lighting levels. The use of louvers may also allow for a lower energy rated globe to be used with ongoing energy and cost savings.</p> <p>IPCM will establish tall vegetation around dust generating areas within the IIPP to encourage dust fallout which will also provide a more aesthetic environment.</p> <p>Additional infrastructure required for the Expansion Area, where visible (e.g. ROM coal stockpile, access/haul road), will be of similar nature to that which is already present at the existing Isaac Plains Coal Mine.</p> <p>Open cut pit and the out-of-pit spoil dumps will be consistent with the existing undulating landform. The post-closure rehabilitated landform of the out-of-pit spoil dumps will be covered with self-sustaining native vegetation and therefore is unlikely to be obtrusive within the undulating landscape.</p> <p>Infrastructure will be removed at the completion of mining, unless agreed with the landowner.</p> <p>Complaints will be investigated expeditiously to determine the source of the nuisance light and where appropriate, an assessment will be conducted at the affected residence and residents informed of the outcome.</p> <p>Complaints will be recorded on a register at the IPCM site in accordance with the site EA requirements.</p> <p>Should the assessment determine that lighting is persistently causing nuisance, IPCM will seek to reach an agreement with the resident to provide ameliorative treatment of the dwelling to minimise the nuisance.</p>

20.13 CULTURAL HERITAGE

20.13.1 Environmental Values

The environmental values to be protected are the Aboriginal cultural heritage and the historic non-indigenous heritage.

Under the *Aboriginal Cultural Heritage Act 2003* (ACH Act), IPCM have a duty of care to take all reasonable and practicable measures to avoid or minimise impacts on aboriginal cultural heritage. Typically, a duty of care under the ACH Act can be demonstrated through undertaking a cultural heritage survey and developing a cultural heritage management plan (CHMP) or agreement in consultation with the Traditional Owners.

A cultural heritage study was undertaken over the area of the existing Isaac Plains Coal Mine during the preparation of the approved Environmental Management Overview Strategy (EMOS) for the site. Although not legally required, a cultural heritage management plan (CHMP) was developed and executed by IPCM and the Barada Barna Kabalbara and Yetimarla People (BBKY), however, is not formally registered in accordance with the ACH Act.

Following discussions with the relevant Traditional Owners for the Expansion Area, a cultural heritage study of the Expansion Area and areas of planned disturbance in ML70342 not previously assessed has been undertaken in November 2006, i.e. Smoky Creek and Billy's Gully. The current ML ML70342 has been completely surveyed by BBKY and areas due for disturbance by mining have had all artefacts salvaged and placed in designated "cultural heritage retention areas" located on the mine site.

The existing CHMP will be amended as required in accordance with the findings of this assessment. The CHMP will outline the measures to be taken to describe and protect indigenous and non-indigenous cultural heritage sites and places, and their values. Studies have been undertaken in accordance with the ACH Act.

The implementation of a CHMP will ensure that items of cultural heritage significance, should they be found to exist, will not be disturbed or removed without approval.

20.13.1.1 Indigenous Heritage

A search of the DNRW Cultural Heritage database revealed five Aboriginal cultural heritage places containing various artefacts. **Table 20-8** presents the artefact type and location.

Table 20-8 Cultural Heritage Aboriginal Cultural Heritage Sites

Attribute	Latitude	Longitude
Tree	-21.99545	148.08317
Artefact	-21.97353	148.11981
Artefact	-21.85317	148.15157
Silcrete Flake	-21.84943	148.19394
Silcrete Core	-21.85513	148.20298

20.13.1.2 Non-Indigenous Heritage

A search of the Department of the Environment, Water, Heritage and the Arts (DEWHA) Australian Heritage Register and a search of the EPA Queensland Heritage Register did not list any heritage areas of interest within either ML70342 or the Expansion Area.

20.13.2 Potential Impacts

The potential impacts from direct disturbance as a consequence of the IIPP are high as the Expansion Area, access/haul road and diversions will involve the disturbance of additional land.

20.13.3 Environmental Protection Objectives and Control Strategies – Cultural Heritage

Environmental Protection Objectives And Control Strategies - Cultural Heritage	
Environmental Value	Items of indigenous and non- indigenous heritage
Environmental Protection Objective	To take all reasonable and practicable measures to avoid or minimise the potential for impact on indigenous and non-indigenous heritage. Maintain appropriate communication protocols with Traditional Owners.
Performance Indicators/Criteria	Implementation of the CHMP in co-operation with Traditional Owner representatives. Protocols set out in CHMP and CHIMA for site surveys, site evaluation, salvage and safekeeping, restriction of access, and communication with Traditional Owners. Permit requirements under the ACH Act.
Control Strategies	BBKY have approved the removal of the affected artefacts from along Smoky Creek to be relocated to another cultural heritage retention area. Continued liaison will occur with the BBKY under the CHMP in relation to management of these items and those remaining within the IIPP. The implementation of a CHMP and CHIMA as outlined above will ensure that items of cultural heritage significance, should they be found to exist, will not be disturbed or removed without approval. Should any new items/areas of cultural heritage or indigenous value are identified and not removed from site, such items/areas will be clearly marked on site plans indicating surface features. A register of new items/areas of cultural, heritage or indigenous value shall be maintained and contain information about the artefact, the date discovered and its location. Supplement existing archaeological surveys where necessary. Identify any restricted areas to protect indigenous and non-indigenous heritage on site plans. Prevent unauthorised disturbance of sites by warning signage or fencing. Inductions to include indigenous and non-indigenous heritage protection.
Commitments	Cultural heritage matters will be managed in accordance with the site CHMP. The site CHMP will identify cultural heritage areas that have access restrictions. Workplace procedures that respond to the discovery of previously unrecorded cultural, heritage or indigenous sites located during mining operations will be developed and implemented during the continuation of this authority and prior to the commencement of construction and future exploration activities.

20.14 TRANSPORT**20.14.1 Environmental Values**

Use of public roads in the vicinity of the IIPP.

20.14.2 Potential Impacts and Mitigation Measures

Mine shift workers will be transported to the IIPP site by bus from their camp accommodation as will the majority of contractors during the construction phase. The use of the bus to transport shift workers is intended to reduce the risk of fatigued drivers on the road.

An estimated 200 light vehicles (composed of staff and visitor trips) will enter and exit (i.e. sum of in: out trips) the site on a daily basis during construction. In terms of heavy/other vehicles, an estimated 60 service/deliveries vehicles and minibuses will enter and exit the site daily.

The anticipated trip distribution for traffic accessing the site is as follows:

- 95 % of traffic will be travelling to and from the east (e.g. Coppabella and Mackay); and
- the remainder of 5 % will be travelling to and from the west (e.g. Moranbah).

It is anticipated that the traffic distribution percentages will be the same during construction and full operation.

In addition, assembly of the dragline at the existing Isaac Plains Coal Mine will require a peak workforce of 70 persons over approximately 12 months. It is estimated that 40 % of this workforce will travel to the site by buses from the Coppabella camp, supplied by IPCM with the remainder travelling in private light vehicles. An allowance for an additional 12 trade visitors per day has also been made.

20.14.2.1 *Proposed Access/Haul Road and Peak Downs Highway Underpass*

An access/haul road will be required between the Expansion Area and the existing Isaac Plains Coal Mine. The access/haul road will include an underpass beneath the Peak Downs Highway. The alignment runs north-west from the northern boundary of the Expansion Area to the Isaac River, along the Belyando/Nebo Shire Boundary (in a north-north-east direction), to the project area boundary, then heads north-west to meet the existing access road to the Isaac Plains Coal Mine (refer to **Figure 20-2** and **Figure 20-3**). The alignment for the access/haul road has been negotiated through consultation with the two affected landholders, and the holder of EPC602 (i.e. Anglo Coal and Exxaro).

This road will be similar in form to the recently-constructed haul road at Carborough Downs Mine, i.e. width and standard for 'big foot' sized road trains, length and the underpass, however, the envelope will be increased to accommodate the relocation of mobile earthmoving plant from the existing Isaac Plains Coal Mine to the Expansion Area on a regular basis.

The construction of the underpass is of a significant nature and is expected to take in the order of nine months to construct. From an operational and safety perspective, i.e. both workers and passing traffic, it would be impracticable to accommodate traffic along the existing Peak Downs Highway during the construction of the underpass.



20.14.3 Environmental Protection Objectives and Control Strategies – Transport

Environmental Protection Objectives And Control Strategies - Transport	
Environmental Value	Maintain trafficability of, and safety on, public roads.
Environmental Protection Objective	<p>To take all reasonable and practicable measures to avoid impacts on public roads by constructing an underpass of the Peak Downs Highway.</p> <p>Construct a suitable access/haul road to connect the existing Isaac Plains Coal Mine and the Expansion Area.</p> <p>Provide for reasonable maintenance of public roads.</p> <p>Provide a safe ingress/egress to the IIPP site.</p>
Performance Indicators/Criteria	<p>No heavy vehicles allowed to access the Peak Downs Highway for the transport of coal.</p> <p>No impacts on the Peak Downs Highway from the construction of the underpass.</p> <p>No public access on the access/haul road.</p>
Control Strategies/Commitments	<p>Public access will not be permitted on the access/haul road to the Expansion Area.</p> <p>Provide a side-track to deviate highway traffic past the underpass construction zone. This side-track will be provided to cater for two-way traffic movements and applied in accordance with the requirements of DMR's <i>Manual of Uniform Traffic Control Devices</i> (DMR, 2003).</p> <p>Some IIPP staff and contractors will be transported to and from the Coppabella Camp and to site by minibus.</p> <p>Provide appropriate lighting for the mine access road entry/exit.</p> <p>Ensure the painted medians and other line marking within the existing mine access road intersection is in suitable condition prior to the commencement of construction for the IIPP or dragline (whichever commences first). To augment the intersection's line marking, retro-reflective raised pavement markers (RRPM) will be provided. Linemarking and RRPMs will be provided in accordance with the requirements of DMR's <i>Manual of Uniform Traffic Control Devices</i> (DMR, 2003).</p> <p>For safety reasons the existing Isaac Plains Coal Mine access intersection includes a channelised right turn as per DMR's <i>Road Planning and Design Manual</i> (DMR, 2005)</p> <p>IPCM will contribute approximately \$4,850 towards the upkeep of the eastern section of the Peak Downs Highway during the 12 month construction period. (No ongoing annual contributions would be required).</p>

20.15 IMPLEMENTATION AND OPERATIONS

20.15.1 Continuous Improvement

Site environmental management practices will be refined in the light of company, industry and operational experience in order to improve performance throughout the project. IPCM has commenced the development of an Environmental Management System (EMS), based on the requirements of ISO14001, which will be maintained to ensure that continuous improvement occurs over the life of the IIPP.

20.15.2 Monitoring

Details of measurable indicators for environmental monitoring are provided in the respective strategies throughout the EM Plan.

The IPCM monitoring program will be extended to measure variables relevant to licence conditions, and to measure the environmental performance of any operational system or activity which may have an impact upon compliance with the EA conditions. The monitoring program will follow recognised codes, standards and guidelines, where appropriate, for selection of sample locations, sampling protocols, selection of parameters, sample analysis, and quality assurance. It will also contain records of any appropriate ancillary information which will assist in the interpretation of results.

Laboratory analysis will be undertaken by a NATA registered laboratory accredited for the analysis.

All monitoring and research data collected in accordance with the EA will be maintained and catalogued to allow ready access by IPCM staff and the EPA.

IPCM also intend to implement a shut down procedure in the event of significant and sustained adverse meteorological conditions. These will be established with the specific purpose of protecting noise and air quality amenity for residents within Moranbah and at noise sensitive receptors. The procedure will be implemented at the commencement of mining in the Expansion Area. These shutdown limits will be based on the limits described in the EIS and the appropriate meteorological conditions will be established following an analysis of the emissions and propagation characteristics of the operational mine. As part of this process, the EM Plan will also be amended to include any additional appropriate dust control and mitigation measures that may be appropriate to reduce emissions during extreme events at sensitive receptors, including Moranbah.

20.15.3 Training

All employees and contractors involved in construction, operation and rehabilitation activities at the IIPP will be appropriately qualified and experienced to undertake their relevant tasks. All employees are required to complete the IPCM induction training with site specific induction on the environmental responsibilities of the project, prior to commencement of work. The induction training focuses on training staff on the obligations of the Environmental Management Systems currently in place, this EM Plan, the environmental duty of care under the EP Act and the cultural heritage duty of care under the ACH Act.

Additional training will be given to those engaged in activities where specific environmental capabilities may be required to ensure compliance with the EA.

20.15.4 Environmental Auditing

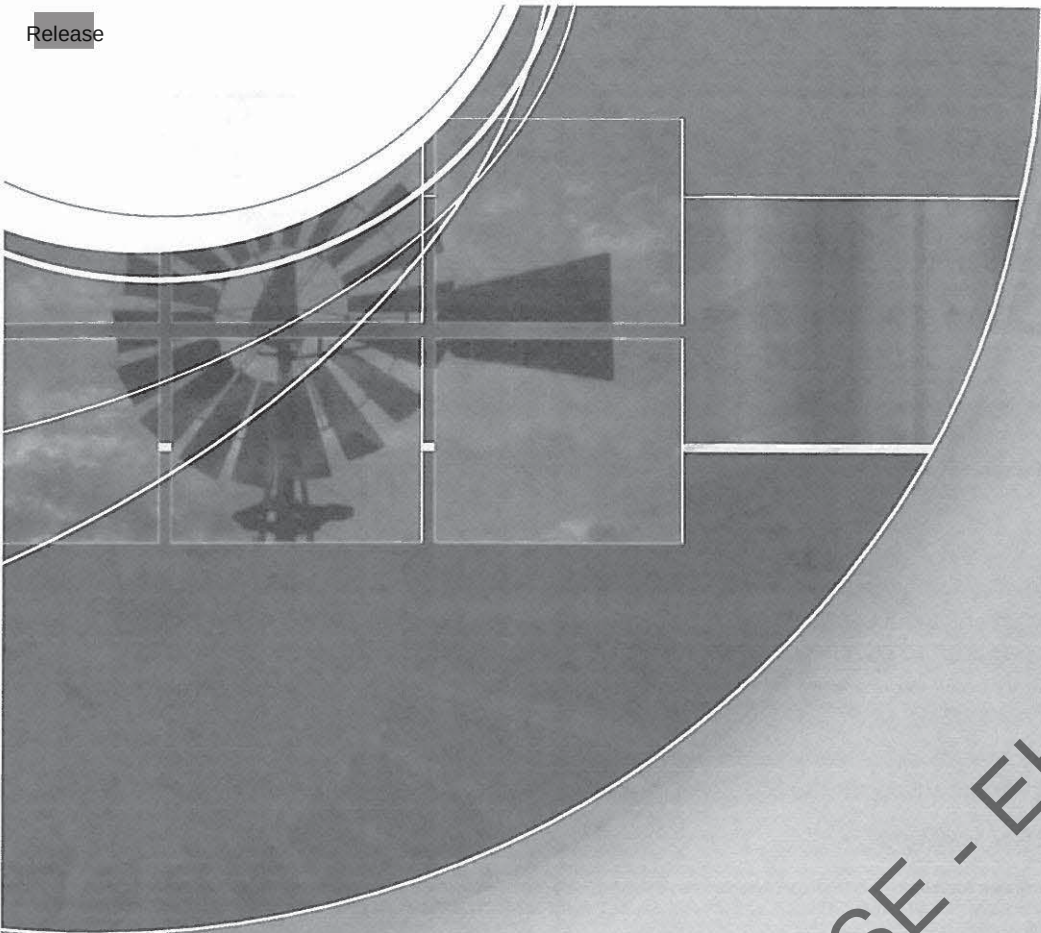
Regular internal and external environmental audits will be conducted of the IIPP in accordance with corporate environmental requirements. The audit reports will be used internally to improve environmental performance and monitor regulatory compliance.

20.15.5 Environmental Reporting

Reporting will be provided to the EPA in accordance with the requirements of the EA. As a minimum, an annual environmental report will be prepared and forwarded to the EPA as part of the Annual Return and also for the National Pollutant Inventory (NPI). To support the annual report, a schedule of statutory and corporate reporting requirements will be maintained and responsibilities assigned. All monitoring, research and planning data collected in accordance with the EA will be maintained and catalogued to allow ready preparation of statutory and corporate reports.

20.16 AMENDED EA

This section of the EM Plan contains the current EA.



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REFERENCES

21 REFERENCES

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GLOSSARY

INTEGRATED ISAAC PLAINS PROJECT
AMALGAMATED ENVIRONMENTAL IMPACT STATEMENT

GLOSSARY OF TERMS

TERM	DEFINITION
AADT	Annual Daily Traffic Volume
ACC	Area Consultative Committees
ACH Act	<i>Aboriginal Cultural Heritage Act 2003</i>
adb	air dried basis
Aerobic	Any process requiring oxygen
AGO	Australian Greenhouse Office
AHD	Australian Height Datum
Al	Aluminium
ALARA	As Low as Reasonably Achievable
Ambient	Surrounding environment/area
AMCI (IP)	AMCI (IP) Pty Ltd
AMU	Agricultural Management Unit
an hr	as in "an hour"
ANC	Acid Neutralising Characteristics
ANFO	Ammonium Nitrate Fuel Oil
Anglo Coal	Anglo Coal (Grosvenor) Pty Ltd
ANZECC	Australian and New Zealand Environment Conservation Council
Aquifer	A water bearing rock or sediment in a formation, group of formations, or part of a formation that is capable of yielding sufficient water to satisfy a particular demand.
Aquila	Aquila Resources Limited
ARD	Acid Rock Drainage
Arrow	Arrow Energy Pty Ltd
As	Arsenic
AS	Australian Standard
Ausplume Model	A gaussian plume dispersion model designed to predict ground level concentrations or dry deposition of pollutants emitted from one or more sources.
BBKY	Barada Barna, Kabalbara and Yetimarla People
BCC	Bowen Central Coal Pty Ltd
BCCJV	Bowen Central Coal Joint Venture
bcm	bank cubic meters
bcm/t	bank cubic metres/tonne
BDDM	Bowen Central Coal Management Pty Ltd
blast overpressure	high energy impulse noise which occurs from explosive detonations
BOD (5 day)	5-day Biological Oxygen Demand
BOF	Basic Oxygen Furnaces
BoM	Bureau of Meteorology
C	Carbon
°C	Celsius
CAMBA	China and Australia Migratory Birds Agreement
Catchment	The area of land which is drained by a river and its tributaries
CHMP	Cultural Heritage Management Plan
CHPP	Coal Handling and Preparation Plant

TERM	DEFINITION
CIB	Criminal Investigation Branch
cm	centimetre
CMSH Act	<i>Coal Mining Safety and Health Act 1999</i>
Co	Cobalt
CO₂	Carbon Dioxide
Confined Aquifer	A completely saturated aquifer of which the upper and lower boundaries are impervious layers.
CQSS2	Central Queensland Strategy for Sustainability – 2004 and Beyond
CSG	Coal Seam Gas
CSN	Crucible Swell Number
CV	Commercial Vehicles
dB	Decibel – the standard unit of measurement for noise. As the sound pressures experienced in noise can vary by millions of times, the most convenient method of measuring noise is with a logarithmic scale, which also approximates the response of human hearing. A change of ten decibels approximately equals a doubling or halving of apparent noise level.
dB(A)	Decibels with the sound pressure scale adjusted to conform with the frequency response of the human ear. A sound level meter that measures A-weighted decibels has an electrical circuit that allows the meter to have the same sensitivity to sound at different frequencies as the average human ear.
DBCT	Dalrymple Bay Coal Terminal
DD	Dust Deposition
DEH	Department of the Environment and Heritage
DEWHA	Department of the Environment and Water, Heritage and the Arts
DFE	Defined Flood Event
DLGP	Department of Local Communities and Planning
DMC	Dense Medium Cyclone
DME	Department of Mines and Energy
DMR	Department of Main Roads
DNRW	Department of Natural Resources and Water
DO	Dissolved Oxygen. The amount of oxygen dissolved in water
DPI	Queensland Department of Primary Industries
EA	Environmental Authority
EAF	Electric Arc Furnaces
EAR	Environment Assessment Report
EC	Electrical Conductivity
EEC	Endangered Ecological Communities
EEO	Energy Efficiency Opportunities
EIS	Environmental Impact Statement
EMISSION Plan	Environmental Management Plan
EMOS	Environmental Management Overview Strategy
EP	Equivalent Persons
EP Act	<i>Environmental Protection Act 1994</i>
EP Waste Regulation	<i>Environmental Protection (Waste Management) Regulation 2000</i>
EPA	Environmental Protection Agency
EPAV	Environmental Protection Authority Victoria

Glossary of Terms

TERM	DEFINITION
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i>
EPC	Exploration Permit for Coal
Ephemeral	A stream/river which only carries water during and after a rainfall event
EPP Air	<i>Environmental Protection (Air) Policy 1997</i>
EPP Noise	<i>Environmental Protection (Noise) Policy 1997</i>
EPP Waste	<i>Environmental Protection (Waste Management) Policy 2000</i>
EPP Water	<i>Environmental Protection (Water) Policy 1997</i>
EPPs	Environmental Protection Policies
EPR	<i>Environmental Protection Regulation 1998</i>
ERA	Environmentally Relevant Activities An environmentally relevant activity means; <ol style="list-style-type: none"> a mining activity; or another activity prescribed under section 19 as an environmentally relevant activity. Section 19 A regulation may prescribe an activity, other than a mining activity, as an environmentally relevant activity if the Governor in Council is satisfied; a contaminant will or may be released into the environment when the activity is carried out; and the release of the contaminant will or may cause environmental harm.
ERE	Endangered Regional Ecosystem
ERP	Emergency Response Plan
ESA	Equivalent Standard Axles
ESD	Ecological Sustainable Development - development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations (EPA definition).
ESP	Eastern Spur Pipeline
Exxaro	Exxaro Australia Pty Ltd
Fe	Iron
FEL	Front-end Loader
FOB	Freight on Board
FTE	Full-time Equivalent Employees
GHFL	Grazing Homestead Freeholding Lease
GHG	Greenhouse Gas
GJ/KL	Gigajoules per kilolitres
GP	General Practitioner
GPM	General Prediction Model
GQAL	Good Quality Agricultural Land
H₂	Hydrogen
Ha	Hectare
HPT	Hay Point Terminal
hrs	hours
Hz	Hertz
IDAS	Integrated Development Assessment System
IIPP	Integrated Isaac Plains Project
IP Coal	IP Coal Pty Ltd
IPA	<i>Integrated Planning Act 1997</i>

TERM	DEFINITION
IPCJV	Isaac Plains Coal Joint Venture
IPCM	Isaac Plains Coal Management Pty Ltd
IUCN	International Union for the Conservation of Nature and Natural Resources
JAMBA	Japan and Australia Migratory Birds Agreement
JORC Code	Australasian code for reporting on mineral resources and ore reserves
JSA	Job Safety Analysis
K	Potassium
KDA	Kumba Designated Area. The KDA is an area of EPC 548 that adjoins the western boundary of EPC 755 over which Kumba Australia Pty Ltd has granted exclusive rights to IPCM, for a period of 4 years, to prospect, explore and investigate the Rangal Coal Measures and to apply for additional mining tenements required to mine any resource identified within it.
Kg/t	kilograms per tonne
kHz	kilohertz
km	kilometre
Koala Plan	<i>Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006-2016</i>
kWh	Kilowatt hour
l	litre
LA10	Is the level exceeded for 10 % of the measurement period and approximates the average maximum noise level.
LA90	Is the noise level which is exceeded for 90 % of the measurement period and approximates the average minimum noise level. This is often referred to as the "background" noise level.
LAeq	Equivalent average sound level measured using A-weighting which is most sensitive to speech intelligibility frequencies of the human ear.
LAmx	The maximum noise level during a measurement period, with the appropriate time averaging and frequency weighting applied.
Leq	Equivalent sound level – a steady weighted sound level over any given time interval (not necessarily 24 hrs) that has the same acoustic energy as the fluctuating noise during that period (no consideration given to night weighting).
LGA	Local Government Areas
LHD	Leichhardt seam
LHL	Leichhardt lower split
Lox Line	Line of oxidation i.e. weathered near-surface coal
LPA	<i>Land Protection (Pest and Stock Route Management) Act 2002</i>
M	Million
m/s	metres per second
M ³	Cubic metres
Matrix+	Matrix+ Consulting Pty Limited
max	maximum
mBGL	Metres Below Ground Level
MDL	Mineral Development Lease
MIBC	Methylisobutylcarbinol

TERM	DEFINITION
Mining Activities	<p>1. A mining activity means an activity mentioned in Subsection 2 (below), that, under the Mineral Resources Act 1989, is authorised to take place on:</p> <ul style="list-style-type: none"> a) land to which a mining tenement relates; or b) land authorised under that Act for access to land mentioned in paragraph <p>2. For subsection (1) the activities are as follows:</p> <ul style="list-style-type: none"> (a) prospecting, exploring or mining under the Mineral Resources Act 1989 or another Act related to mining; (b) processing a mineral won or extracted by an activity under paragraph (a); (c) an activity that- <p>3. is directly associated with, or facilitates or supports, an activity mentioned in paragraph (a) or (b); and</p> <p>4. may cause environmental harm;</p> <ul style="list-style-type: none"> (a) rehabilitating or remediating environmental harm because of a mining activity under paragraphs (a) to (c); (b) action taken to prevent environmental harm because of an activity mentioned in paragraphs (a) to (d); (c) any other activity prescribed for this subsection under a regulation.
Mining Project	A mining project means all mining activities carried out, or proposed to be carried out, under one or more mining tenements, in any combination, as a single integrated operation.
ML or MLs	Mining Lease or Mining Leases
MLa or MLas	Mining Lease Application or Mining Lease Applications
mm	millimetre
MNES	Matter of National Environmental Significance
Mo	Molybdenum
MRA	<i>Mineral Resources Act 1989</i>
MSDS	Material Safety Data Sheets
Mt	million tonnes
Mtpa	Million tonnes per annum
MWh	Mega watt hours
M-WRCMP	Mackay-Whitsunday Regional Coastal Management Plan
N	Nitrogen
NAF	Non-acid Forming
NAG	Net Acid Generation
NC Regulation	<i>Nature Conservation Regulation 1994</i>
NCA	<i>Nature Conservation Act 1992</i>
NEPC	National Environmental Protection Council
NEPMs	National Environment Protection Measures
NES	National Environmental Significance as defined by <i>the Environment Protection & Biodiversity Conservation Act (C'wlth) 1999</i>
NHMRC	National Health Medical Research Council
NMA	Noise Mapping Australia Pty Ltd
NO_x	Nitrogen Oxide (NO and NO ₂)
NPI	National Pollutant Inventory
NT Act	<i>Native Title Act 1993</i>
NWQMS	National Water Quality Management Strategy

TERM	DEFINITION
Overburden	Soil and rock material originally overlying coal
PAF	Potential Acid Forming
PAWC	Plant available water capacity
PCC	Pulverised Coal Combustion
PCI	Pulverised Coal Injection
Permeability	A measure of the rate at which groundwater can flow through soil or rock, more technically referred to as 'hydraulic conductivity'
Petajoule	A unit of energy (10^{15} joules), roughly equivalent to 30 million kilowatt hours
pH	A measure of acidity or alkalinity
PL	Petroleum Lease
PLC	Planning Noise Level
PM10	A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre (μm).
PM2.5	Fine respirable particulates less than 2.5 μm in diameter
PMF	Probably Maximum Frequency
PNL	Planning Noise Level
PoO	Plan of Operations
PPE	Personal Protective Equipment
PPV	Peak Particle Velocity
QH	Queensland Herbarium
QR	Queensland Railways
RAP	Rural Agricultural Protection
RE	Regional Ecosystem
RIA	Road Impact Assessment
Riparian	Area pertaining to the banks of streams/rivers
ROM	Run-of-Mine
ROPS	Rollover Protective Structures
RRRM	Retro Reflective Raised Pavement Markers
S	Sulphur
S&HMS	Safety and Health Management System
Sb	Antimony
SCMP	State Coastal Management Plan
SCR	State Controlled Road Network
SD	Sustainable Development
Se	Selenium
SHCC	Semi-Hard Coking Coal
SO₂	Sulphur Dioxide
SO₄	Sulphate
SOPs	Site Operating Procedures
SPP	State Planning Policies
SRES	Special Report on Emissions Scenarios
SS	Suspended Solids
t	tonne

Glossary of Terms

TERM	DEFINITION
TAPM	A prognostic meteorological model which eliminates the need to have site specific meteorological observations and can predict airflow importance to local scale air pollution.
TDS	Total Dissolved Solids
TI	<i>Transport Infrastructure Act 1994</i>
TO	Traditional Owner
ToR	Terms of Reference
TSP	Total Suspended Particulate
TSS	Total Suspended Solids
US	United States
Vale	Vale Australia (IP) Pty Ltd
VER	Vermont seam
VKT	Vehicle Kilometre Travelled
VMA	<i>Vegetation Management Act 1999</i>
vpd	Vehicles per day
vte	Vehicle trip ends. A single or one-directional vehicle movement with either the origin or destination inside a traffic study site.
WR	<i>Water Regulation 2002</i>
WRP	Water Resource (Fitzroy Basin) Plan
yrs	years
YT	Yarrabee Tuff
µg	micrograms
µm	micrometres