Department of Environment
and Resource Management

Environmental Impact Statement (EIS) Report under the Environmental Protection Act 1994

Cannington Life Extension Project
Proposed by
BHP Billiton Minerals Pty Ltd

December 2011

Prepared by: The Statewide Environmental Assessments Unit, Department of Environment and Resource Management

December 2011

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1 Introduction

This report provides an evaluation of the environmental impact statement (EIS) process pursuant to Chapter 3 of the *Environmental Protection Act 1994* (EP Act) for the Cannington Life Extension Project (CLEP) proposed by BHP Billiton Minerals Pty Ltd (BHP Billiton Cannington; BHPBC). An application to prepare a voluntary EIS was granted by the former Environment Protection Agency (now the Department of Environment and Resource Management, DERM) and draft terms of reference (TOR) were advertised in June 2008. Following a period of public consultation, the TOR were finalised in October 2008.

DERM, as the administering authority for the EP Act, coordinated the EIS process. This assessment report has been prepared pursuant to Sections 58 and 59 of the EP Act. Section 58 of the EP Act lists the criteria that DERM must consider when preparing an EIS assessment report, while section 59 of the Act states what must be contained in the EIS.

The Act requires that this EIS assessment report must:

(a) address the adequacy of the EIS in addressing the final TOR

(b) address the adequacy of the draft environmental management plan (EM plan)

(c) make recommendations about the suitability of the project

(d) recommend any conditions on which any approval required for the project may be given.

In providing the required content this assessment report will summarise key issues associated with the potentially adverse and beneficial environmental, economic and social impacts of the project. It will discuss the management, monitoring, planning and other measures proposed to minimise any adverse environmental impacts of the project. It will also discuss those issues of particular concern that were either not resolved or require specific conditions for the project to proceed.

Chapter 2 of this EIS assessment report describes the project to provide context for the findings of the report. Chapter 3 outlines the EIS process that has been followed for the project and the approvals that will be necessary for its commencement. Chapter 4 addresses the adequacy of the EIS, discusses the main issues with regard to the environmental management of the project, and outlines the environmental protection commitments made in the EIS. Chapter 5 of this EIS assessment report assesses the adequacy of the EM plan for the project in incorporating the environmental protection commitments and meeting the content requirements of section 203 of the EP Act. Chapter 6 makes recommendations for conditions to be included in the draft environmental authority (EA). Chapter 7 makes recommendations for any approvals required by the project.

The giving of this EIS assessment report to the proponent completes the EIS process for the project under the EP Act.

2 Project details

The existing Cannington Mine has been operating since 1997, and comprises two underground mining zones (north and south) and associated processes. Cannington Life Extension Project Mine (hereafter referred to as CLEP or the project) is currently one of the largest single-pit silver and lead mines in the world.

The proposed mine extension life project would involve the construction of an open cut pit above the northern zone of the current underground mine. The CLEP would also extend the life of mining on the existing mining lease (ML) 90059, until 2024. The mine is situated on Trepell Special Lease, approximately 140 km south southeast of Cloncurry. The CLEP MLs are held in the name of BHP Billiton Minerals Pty Ltd. Two MLs covering a total area of 8,461 hectares (ha) are granted for the mineral extraction and processing operations of the mine. The mine site is located on ML 90059 and its borefield (for water supply) is located on ML 90060. A third lease, ML 90077 was granted to provide for the construction of the Yurbi railhead loading facility near Cloncurry.

Mining operations would involve transitioning from underground mining in the north zone of the existing operations to an open cut mine while continuing underground mining of the south zone.

The CLEP would involve the use of conventional open cut mining methods consisting of drill and blast, load and haul using diesel powered earthmoving equipment to extract the ore. The current method of transporting the concentrate in covered tri- and quad- trailer road-trains to the Yurbi railhead loading facility located on ML 90077 via Toolebuc-McKinlay Road and Landsborough Highway would continue. The average number of vehicle movements is expected to increase slightly initially, but would decrease in the following years.

The concentrate would be loaded into covered rail carriages to be transported to the Sun Metals Zinc Refinery (Townsville) or the Port of Townsville where it would be loaded onto bulk carrier ships utilising the existing unloading, storage and ship-loading facilities.

The project would not require new mining leases. All mining activities would be carried out within the existing mining lease (ML90059).

The mine life extension would utilise the existing infrastructure and processing plants however, some additional works and specific infrastructure for the open cut operation would be required including:

- construction of waste rock dump and an open cut pit
- construction of additional surface infrastructure and facilities to service the open cut pit
- relocation of existing infrastructure affected by the open cut operation
- additional grinding capacity and expansion of the flotation circuit for ore processing
- additional gas turbine generators at the power station
- expansion of the run of mine (ROM) stockpile
- expansion of the current tailings storage facility (TSF)
- diversion of Trepell Creek to the east
- re-alignment of a section of Toolebuc-McKinlay Road.

The existing mining infrastructure area would be extended to the west. New infrastructure would be constructed or relocated progressively. As construction is not expected to occur until after open cut mining has begun, detailed design layouts are still under development. General construction details were outlined in the EIS while detailed information would be provided in the project's plan of operations closer to the date of construction.

The EIS outlined the workforce levels to be 584 employees and 310 fulltime contractors. Workforce numbers would increase above existing numbers by approximately 140 personnel during construction of the project and 60 personnel for operations. The mix between employees and contractors in the workforce is to be determined but nominally the increased total workforce consists of approximately 500 employees and approximately 450 fulltime equivalent contractors.

As per current operations, the mine would run 24 hours a day, 7 days a week.

The workforce would be housed in the existing accommodation village which would be expanded by an additional 16 beds. Transportation of most of the construction workers would be through a fly-in fly-out (FIFO) regime, as per existing transportation systems. The construction workforce is not expected to result in a significant change to charter flight movements.

2.1 Ore processing

The project would utilise the existing processing plant but would require upscaling of the grinding machine and an expansion of the floatation unit. Ore processing rate would increase to 4 million tonnes per annum (Mtpa) to produce between 415,000 tpa and 585,000 tpa of concentrate.

A detailed cut-off grade study was undertaken early in the development of the project, looking at different production rates from the underground operation at different cut-off grade strategies to maximise net present value. The preferred underground mining strategy was then evaluated with an open pit operating in conjunction. Mine production schedules were then developed utilising calculated cut-off grades based on assumed economic parameters. The pre-feasibility study indicated that mine schedules accommodated variable cut-off grades through time.

The proponent estimated a total ore reserve based on current observed and modelled data of 24.32 million tonnes, comprising an average of approximately 8% lead, 4% zinc and 324 grams per tonne of silver. Changes to the basis of ore classification and cut-off grade for open cut mining, once additional technical assessments are done, is expected to result in an increase in reserves suitable for open cut mining beyond that currently declared. The recovery rates are expected to generally be above 85% for silver and lead and 70% for zinc throughout the operation. Based on the generated optimal pit shells, an additional 6% of material which is currently wasted can be classed as low grade ore. A sub-economic material stockpile would be designed into the current footprint of waste dump area for potential processing in the future.

The concentrate would be hauled by road train to Yurbi railhead loading facility, and from there to the Port of Townsville, via rail for use in the Sun Metals zinc refinery, or for export through the Townsville Port Facility.

2.2 Water supply

Water is supplied from the existing Great Artesian Basin (GAB) borefield located about 20 km east of the project site. BHPBC currently extracts up to 5.2Ml/day from the bore field but this rate of extraction would need to increase to 6.4Ml/day to support the mine life extension project. This is greater than the current groundwater allocation and BHPBC would need to apply for an increase in its allocation. The current groundwater extraction licence expires in 2022. Consequently, an extension would also be needed to ensure supply throughout the life of the project. No changes are expected for water demand for potable water and fire water from current rates of usage.

2.3 Power supply

The mine has its own gas fired power station that supplies power to the underground mine, process plant, mine site infrastructure and accommodation village. Power is currently provided on-site by gas and diesel fired generators supplying approximately 30 MW. Projected power demands indicate that an additional 4 MW of power is required and would be provided by the installation of additional gas fired generators.

The existing mine-owned 11 kV electricity network would need to be extended by installation of a new transformer for the mine infrastructure area. The preferred option connects the extension to the existing workshops substation which has a compatible load and comparable operational requirements. The 11 kV network would be extended to the new mine infrastructure area including installation of an 11 kV transformer.

The Cannington Mine operates under the Commonwealth's Energy Efficiency Opportunities programme and legislation. In accordance with the programme, BHPBC routinely assess and report on cost effective energy savings opportunities. In conjunction with this, Cannington Mine generates power from natural gas and as a result collects Gas Electricity Certificates (GEC) under the Queensland Government's 13% GEC programme. This is anticipated to remain in place for the life of the project. Furthermore, the accommodation village utilises solar hot water services to help reduce energy consumption.

2.4 Construction

Pre-stripping and development of initial infrastructure would take place in the 12 months before commencement of open-cut mining. Relocation of infrastructure would be carried out progressively as the pit footprint encroaches on the existing infrastructure.

2.5 Operations

The EIS stated that the project would extend the life of Cannington Mine by 4 years to 2023. At the current rate, underground mining in the northern zone would be expected to finish in 2014. Underground mining in the southern zone would continue simultaneously with open-cut mining, which is expected to commence in 2013. Underground mining in the southern zone is expected to close in 2019. The final open cut is expected to have a surface area of 55 ha and a depth of 230 metres.

During the review of the project EIS the expected life of the mine was altered by BHPBC. The SEIS stated that the operational life of the project would be expected to extend a further year to 2024 rather than 2023 that was indicated in the EIS. Mining would conclude in 2023 and processing completed in 2024, due to a refining of the mining schedule. These changes have no substantive effect on the project described in the EIS or assessments of project impacts apart from the transport impact assessment, which has been revised to recognise this.

The ore would be extracted and mined using conventional open cut mining methods, including diesel powered earthmoving equipment, drill and blast/load and haul methods. Open cut mining is proposed to occur continuously, 24 hours per day, seven days per week for 52 weeks per year.

The existing mine infrastructure area would be extended to the west (Figure 2-1). New infrastructure within the extension would be constructed or relocated progressively. The construction of infrastructure in the extension is not expected to occur until after open cut mining commences.

Concrete foundations would be required during the construction of the expanded mine infrastructure area. Structural steel would be likely fabricated off-site and then assembled on-site to provide access to and support for buildings, mechanical and electrical equipment, piping, valves, instrumentation and cabling. Large open buildings would generally be assembled on-site from prefabricated steel components. Smaller enclosed buildings would be pre-constructed demountables transported to site by road. Large bulk fuel storages would be assembled and smaller bulk fuel, oil and lubricant facilities would be brought to site as pre-constructed steel tanks. Design and construction of flammable and combustible material storages, piping and dispensing facilities would conform to AS1940-2004: The Storage and Handling of Flammable and Combustible Liquids. Chemical storage facilities would be brought to site as pre-constructed units conforming to State and Commonwealth regulation and Australian Standards applicable to the substances.

Most mechanical equipment would be supplied with electric motors already assembled. Electrical and instrumentation works would predominantly involve installing circuit breakers and other electrical equipment into sub stations and buildings, and the field erection of electrical distribution boards and other electrical equipment.

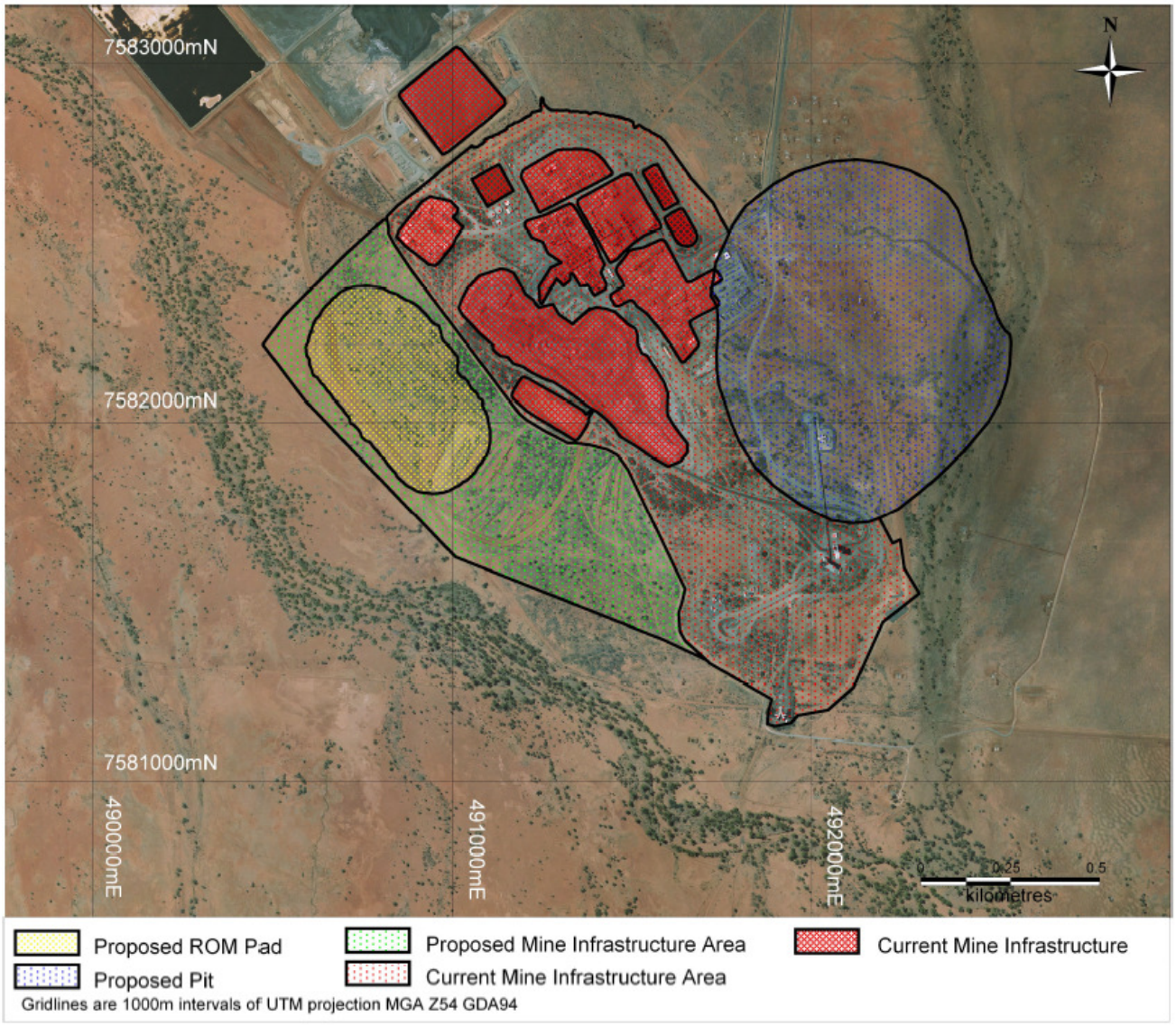

Figure 2-1 Proposed mine infrastructure area (Figure taken from EIS, May 2011)

2.6 Tailings Storage Facility

The Tailings Storage facility (TSF) will be extended by construction of new cells adjacent to the existing tailings facility. Construction will be similar to the existing TSF, in an altered paddock style, extending to the northwest and northeast of the existing TSF. Some localised redirection of stormwater runoff would also be required.

Design of the TSF incorporates the need to hold the critical three month wet season rainfall, with an annual exceedence probability (AEP) of 1%, estimated at 790mm. The TSF will be extended in two stages; the first is a horizontal expansion to the current TSF crest level, while the second involves raising the TSF banks up to six metres. Total additional fill volumes of clay and rock for the additional embankments required will be 2.379 Mm^3.

2.7 Trepell Creek Diversion

As the open cut will be located across the current Trepell Creek alignment the creek will need to be relocated. BHPBC proposes to permanently move the creek to the east of its current location and eastward of the waste rock dump. The diversion will be approximately 4.6 km long and would be designed to form a stable channel that, in

some places, would be up to 8 metres below current ground level. The diversion incorporates a levee adjoining the northern side of the waste rock dump (WRD), designed to collect water from tributaries entering the upstream reach of Trepell Creek to prevent flooding of the WRD, the mine pit, and post mining, the final void.

2.8 Waste Rock Dump

The expansion project will include construction of a single, integrated waste rock dump containing 125.6 M tonnes of potentially acid forming (PAF) and non-acid forming (NAF) waste rock from the mine. It would be located to the east of the proposed open cut and constructed in two lifts of about 30 metres each, with a footprint of approximately 168 ha. Seepage collection and runoff interception drains would be incorporated into the design, with any seepage reporting ultimately to the mine void.

3 The EIS Process

3.1 Timeline of the EIS process

The EIS process was initiated by BHPBC on 9 May 2008, by submission of application to DERM for approval to prepare a voluntary EIS under section 70 of the EP Act. DERM approved the application to undertake a Voluntary EIS on 15 May 2008.

BHPBC submitted the draft TOR for the EIS on 27 May 2008 and DERM issued a notice of publication of the draft TOR to BHPBC on 18 June 2008. DERM placed a public notice (the TOR notice) announcing the comment period for the draft TOR on its website, and in the Courier Mail on 21 June 2008, and in the Mount Isa North West Star on 23 June 2008. The comment period for the draft TOR was from Monday, 23 June 2008, till close of business on Friday, 1 August 2008. As required, BHPBC issued copies of the TOR notice to affected and interested persons.

DERM received comments on the draft TOR from 13 stakeholders within the comment period. These comments, together with those provided by DERM, were forwarded to BHPBC on 13 August 2008. DERM considered all comments received on the draft TOR and BHPBC response prior to issuing the final TOR on 13 October 2008.

BHPBC submitted the draft EIS on 15 March 2010 to DERM for review. DERM reviewed the document to determine whether the draft EIS adequately addressed the requirements of the final TOR in an acceptable form. On 14 April 2010, DERM agreed for a request by BHPBC to extend the decision period on the draft EIS to 14 June 2010 to allow for changes to be made to the submitted EIS. On 25 May 2010, BHPBC submitted the amended draft EIS to DERM. On 11 June 2010, DERM decided to allow the EIS to proceed to notification under s49(5) of the EP Act. The public notification and submission period was set at the minimum 30 business days, from Monday 12 July 2010 until close of business on Friday, 20 August 2010.

DERM placed a public notice (EIS notice) announcing the submission period for the draft EIS on its website on Friday, 9 July 2010, and placed public notices in The Courier Mail on 10 July 2010 and the Mount Isa North West Star on 12 July 2010. BHPBC provided copies of the public notice to affected and interested persons.

DERM received nine submissions on the draft EIS within the submission period. Eight of these submissions were from the state government departments and the remaining one from the McKinlay Shire Council. These submissions, together with a submission from DERM were forwarded to BHPBC on 3 September 2010.

In order to enable thorough consideration of the issues raised in the draft EIS by various respondents, on 20 September 2010 BHPBC requested an extension to the period provided for preparing a response to respondent submissions. DERM agreed to extend the period to 17 January 2011. BHPBC submitted its response to the submissions and a supplementary EIS (SEIS) on 17 January 2011. The SEIS included amendments to the environmental management plan (EM plan). On 20 January 2011, copies of the BHPBC response to the submissions and SEIS were sent to those stakeholders who had made a submission on the draft EIS for review.

As the response provided to submissions by BHPBC was not considered adequate, on 15 February 2011 DERM issued a notice under section 555 of the EP Act extending the period in which the decision under s56A of the EP Act would be made and requested further information to assist in making that decision. The notice extended the decision date until 15 March 2011, and this decision date was further extended to 29 April 2011. The reason for the extensions was to allow BHPBC time to provide additional information to clarify the issues raised in the information request and to make appropriate amendments to the submitted EIS. BHPBC submitted its response to DERM's request for information on 12 April 2011 - Cannington Life Extension Project (CLEP) Response to DERM Notice of Extension Matters to be Addressed, March 2011. A revised Environmental Management Plan (EM Plan) was submitted by BHPBC on 31 March 2011. As DERM considered that the information provided was inadequate, a decision was made on 29 April 2011 to issue another notice under s555 of the EP Act requesting further information and clarification regarding the design, location and management of waste rock dump and levee system. The notice extended the decision period date until 24 June 2011. BHPBC submitted its response to DERM on 9 June 2011- Cannington Life Extension Project (CLEP) Response to DERM Notice of Extension - Assessment of Adequacy of Response to Submissions and Submitted EIS, June 2011 .

DERM issued another notice under s555 of the EP Act to allow time for BHPBC to amend the EIS and for DERM to consider the amended EIS before making a decision under s56A of the EP Act. The notice extended the decision period date to 22 July 2011. Three meetings were held between DERM officers and the representatives from BHPBC on 12 May, 2 June and 12 July 2011 to resolve the issues involving the location of the waste rock dump. A result of the meetings was a submission by BHPBC entitled Executive Summary on Cannington Waste Rock Dump Location which provided additional information on the waste rock dump and a risk analysis on 22 July 2011. As there was no resolution of the issues, DERM issued another s555 notice under the EP Act on 22 July 2011 extending the decision making period until 12 August 2011, subsequently issuing two more s555 notices extending the decision making period until 28 October 2011. On 19 October 2011, BHPBC provided an Independent Peer Review Report on the WRD for consideration by DERM. On 28 October 2011 BHPBC submitted a notice under s66(3) of the EPAct amending the EIS by way of an the Independent Peer Review of the waste rock dump design and location - Cannington Life Extension Project (CLEP) Notice of Amendment of Environmental Impact Statement (EIS) Report, 28 October 2011 .

On 28 October 2011 DERM made a decision under s56A of the Act that the submitted EIS (which includes the submitted EIS, the SEIS, amended EM Plan and additional information) was adequate to proceed to the preparation of the assessment report. A notice of that decision was given to BHPBC on 28 October 2011.

DERM, in the preparation of this EIS assessment report, as well as the EIS documents and subsequent information, considered submissions and comments from members of the advisory body (see section 3.3.2 for advisory body constituents) and other interested parties, made at all stages of the EIS process.

This EIS assessment report will be available on DERM's website (www.derm.qld.gov.au).

3.2 Approvals

BHPBC currently holds three MLs (ML 90059, 90060 and 90077) for the Cannington Mine. An Environmental Authority amendment application would be made over ML 90059 to allow for the development of the mine life expansion project. Pending the granting of an amended EA and other approvals, construction would begin within 12 to 18 months of the amendment being approved by the administering authority. The advancement of the open pit would determine the construction schedule including the removal, relocation or expansion of existing infrastructure.

Development would include the extension of the existing mine infrastructure area, construction of associated infrastructure (such as workshops and offices), the extension of the TSF, construction of the WRD, the beginning of pit excavations, the diversion of a portion of Trepell Creek and the re-alignment of a section of Toolebuc-McKinlay Road.

BHPBC has nominated that the EA would need to cover the following activities that are directly associated with, or facilitate or support, the mining activities and which would otherwise require approval under the EP Act as environmentally relevant activities (ERAs). The following ERAs proposed to be conducted on the project, which would otherwise be ERAs as per Schedule 2 of the Environmental Protection Regulation 2008, if the project was not a mining project:

- ERA 7.3(d) - Explosive Manufacturing: Manufacturing 200 t per year or more of explosives
- ERA 8.1 - Chemical Storage: Storing a total of 50 t or more of chemicals of dangerous goods Class 1 or Class 2
- ERA 8(3b) - Chemical storage: Storing more than 500 cubic metres (m^3) of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3
- ERA 14.1 - Electricity Generation: Power station (gas) with a rated capacity of 10MW electricity or more
- ERA 15 - Fuel Burning: Using fuel burning equipment capable of burning 500 kg or more of fuel an hour
- ERE 16.2(d) - Extractive Activities: Extracting Rock or Other Materials greater than 1 Mt per year
- ERE 16.3(c) - Extractive Activities: Screening Rock or Other Materials greater than 1 Mt per year
- ERA 21 - Motor Vehicle Workshop: Operation of a Motor Vehicle Workshop
- ERA 31.2(b) - Mineral Processing: Mineral processing > 100,000 t per year

- ERA 33 - Crushing, milling, grinding or screening: Crushing, milling, grinding or screening > 5,000 t per year
- ERA 43 - Concrete Batching: Concrete batching 200 t per year or more
- ERA 50.1(a) - Bulk Material handling: Stockpiling 50,000 t or more of minerals or loading or unloading 100 t/day or more of minerals within 5 km of HAT or 1 km of watercourse
- ERA 56.1 - Regulated Waste Storage: Receiving and storage more than 5 t of tyres or parts of tyres
- ERA 56.2 - Regulated Waste Storage: Receiving and storing regulated waste (other than tyres)
- ERA 60.1(a) - Waste Disposal: Waste disposal facility (any combination of regulated waste, general waste and limited regulated waste – and <5 t untreated clinical wastes if in a scheduled area): < 50,000 t/yr
- ERA 61.2(a) - Waste incineration: Incinerating general waste less than 5,000 t per year
- ERA 61.3(b) - Waste incineration: Incinerating regulated waste
- ERA 62 - Waste Transfer Station Operation: Waste transfer station receiving > 30 m3 or > 30 t of waste on any day
- ERA 63.2(b) - Sewage Treatment: Sewage treatment for > 100 but <1,500 equivalent persons.

Table 3.1 Approvals required for the Cannington Extension Project

Approval	Legislation (Administering Authority)
Environmental authority (mining activities) amendment	*Environmental Protection Act 1994* (Department of Environment and Resource Management)
Water Licence for the diversion of flow within Trepell Creek	*Water Act 2000* (Department of Environment and Resource Management)
Development permit for operational works for the taking of or interfering with the flow of water (Creek Diversion)	*Water Act 2000* (Department of Environment and Resource Management) and the *Sustainable Planning Act 2009*
Water licence to take groundwater (mining operations - not GAB water)	*Water Act 2000* (Department of Environment and Resource Management). Water Resource (Georgina and Diamantina) Plan 2004 - upper Georgina declared sub artesian area.
Great Artesian Basin Water Extraction Licence extension (bore field for water supply)	*Water Act 2000* (Department of Environment and Resource Management) Water Resource (Great Artesian Basin) Plan 2006
Cultural Heritage Management Plan	*Aboriginal Cultural Heritage Act 2003* (Department of Environment and Resource Management)

3.3 Consultation program

3.3.1 Public consultation

In addition to the statutory requirements for advertising the TOR and EIS notices and the mailing of the notices to interested and affected parties, the proponent undertook community consultation with members of the public and other stakeholders during the public submission period of the draft EIS. The proponent also circulated information about the project to the community.

3.3.2 Advisory Body

DERM invited the following organisations to assist in the assessment of the TOR and EIS by participating as members of the advisory body for the project:

- Former Department of Main Roads
- Former Department of Mines And Energy
- Former Department of Communities
- Former Department of Natural Resources And Water

- Former Queensland Transport
- Port of Townsville
- Former Environmental Protection Agency
- Former Department of Infrastructure And Planning
- Former Department of Housing
- Former Department of Tourism, Regional Development And Industry
- Former Environmental, Health And Community Law McKinlay Shire Council
- Former Department of Mines And Energy
- Former Queensland Health
- Department of Communities (DoC)
- Department of Community Safety (DCS)
- Department of Employment, Economic Development & Innovation (DEEDI)
- Department of Infrastructure and Planning (DIP)
- Department of Transport and Main Roads (DTMR)
- McKinlay Shire Council
- Queensland Health (QH)
- Queensland Conservation Council (QCC)
- Queensland Police Service (QPS)
- Queensland Rail Limited (QRL)
- Queensland Treasury (QT)
- Southern Gulf Catchments Group (SGCG).

An advisory body briefing for the project was held in Brisbane on 2 August 2010. In addition, a field trip to inspect the project site was held on 10 August 2010.

On 26 March 2009 and in February 2011 the structure and names of a number of those departments changed (e.g. see Public Service Departmental Arrangements Notice (No.2) 2009).

Table 3.2 summarises the machinery of government changes that occurred to Queensland Government departments referred to in this report.

Table 3.2 Changes to Queensland Government departments

Previous department/s	New department (as of 26 March 2009)
Department of Primary Industries and Fisheries Department of Mines and Energy Department of Tourism, Regional Development and Industry Department of Employment and Industrial Relations Department of Infrastructure and Planning	Department of Employment, Economic Development and Innovation (DEEDI)
Environmental Protection Agency Department of Natural Resources and Water	Department of Environment and Resource Management (DERM)
Department of Local Government, Sport and Recreation	Department of Local Government and Planning (DLGP)
Department of Main Roads Queensland Transport	Department of Transport and Main Roads (DTMR)

Department of Communities Department of Housing Disability Services Queensland, Department of Child Safety	Department of Communities (DoC)
Department of Emergency Services	Department of Community Safety (DCS)

3.3.3 Public notification

In accordance with the statutory requirements, public notification of the of the draft TOR and EIS and public comment periods was made through notices in The Courier-Mail, the Mt Isa North West News and on DERM's website.

The draft TOR and EIS were placed on public display at the following locations during their respective public comment and submission periods:

- EPA/DERM Websites: <www.epa.qld.gov.au> and <www.derm.qld.gov.au>
- Naturally Queensland Information Centre, 160 Ann Street, Brisbane (draft TOR only)
- DERM Mount Isa Business Centre, Corner Camooweal and Mary Streets, Mount Isa
- DERM Referral Centre, 400 George Street, Brisbane (EIS only)
- Cloncurry Municipal Library, Corner Scarr and King Streets, Cloncurry (EIS only)
- BHPBC website <www.bhpbilliton.com>.

3.4 Matters considered in the EIS assessment report

Section 58 of the EP Act requires that an EIS assessment report consider the following matters:

- the final TOR for the EIS
- the submitted EIS
- the submitted supplementary EIS (SEIS)
- additional information submitted
- the amended EM Plan
- all properly made submissions and any other submissions accepted by the chief executive
- the standard criteria
- another matter prescribed under a regulation.

These matters are addressed in the following subsections.

3.4.1 The final TOR

The final TOR document issued on 13 October 2008 was considered when preparing this EIS assessment report. While the TOR were written to include all the major issues associated with the project that were required to be addressed in the EIS, they were not exhaustive, nor were they to be interpreted as excluding all other matters from consideration.

Where matters outside of those listed in the final TOR were addressed in the EIS, those matters have also been considered when preparing this EIS assessment report.

3.4.2 The submitted EIS

The submitted EIS was considered when preparing this report. The submitted EIS comprises:

- The EIS that was made available for public submissions on 12 July 2010 until close of business on 20 August 2010. Referred to as the EIS in this report.

- The response to submissions and the amendments to the EIS - referred to as the SEIS - received by DERM on 17 January 2011. The SEIS included amendments to the EM plan.
- Cannington Life Extension Project (CLEP) Response to DERM Notice of Extension Matters to be Addressed, March 2011[1]
- Revised Environmental Management Plan received 31 March 2011
- Cannington Life Extension Project (CLEP) Response to DERM Notice of Extension - Assessment of Adequacy of Response to Submissions and Submitted EIS, June 2011[1]
- Executive Summary on Cannington Waste Rock Dump Location submitted 22 July 2011[1]
- Cannington Life Extension Project (CLEP) Notice of Amendment of Environmental Impact Statement (EIS) Report, 28 October 2011[1]

DERM accepted 9 submissions on the EIS including submissions from:

- Department of Employment, Economic Development and Innovation
- Department of Transport and Main Roads
- Department of Infrastructure and Planning (Social Impact Assessment)
- Department of Communities
- Department of Community Safety
- Queensland Health
- Queensland Police Service
- McKinlay Shire Council
- Queensland Treasury.

The department also made its own submission on the EIS.

All Government agencies that made submissions were given the opportunity to review and provide comments on the supplementary EIS. This included comments on the conditions that should apply to the project and on the adequacy or otherwise of the supplementary EIS in addressing concerns raised in submissions. These comments and recommendations were considered in this report.

3.4.3 The standard criteria

Section 58 of the EP Act requires that, among other matters, the standard criteria listed in Schedule 3 of the EP Act must be considered when preparing the EIS assessment report. The standard criteria are:

- the principles of ecologically sustainable development as set out in the National Strategy for Ecologically Sustainable Development
- any applicable environmental protection policy
- any applicable Commonwealth, State or local government plans, standards, agreements or requirements
- any applicable environmental impact study, assessment or report
- the character, resilience and values of the receiving environment
- all submissions made by the applicant and submitters
- the best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows -
    i. an environmental authority
    ii. a transitional environmental program
    iii. an environmental protection order
    iv. a disposal permit

[1] Collectively referred to as 'additional information' in this report.

v. a development approval

- the financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) as they would relate to the type of activity or industry carried out, or proposed to be carried out, under the instrument
- the public interest
- any applicable site management plan
- any relevant integrated environmental management system or proposed integrated environmental management system
- any other matter prescribed under a regulation.

The department has considered the standard criteria when assessing the project.

3.4.4 Prescribed matters

Section 58 of the EP Act requires that the following prescribed matters, under the Environmental Protection Regulation 2008, are considered when making an environmental management decision for this project:

- Section 51, matters to be considered for environmental management decisions
- Section 52, conditions to be considered for environmental management decisions
- Section 53, matters to be considered for decisions imposing monitoring conditions
- Section 55, release of water or waste to land
- Section 56, release of water, other than stormwater, to surface water
- Section 57, release of stormwater
- Section 60, activity involving storing or moving bulk material
- Section 62, activity involving acid-producing rock
- Section 64, activity involving indirect release of contaminants to groundwater.

3.4.5 Notifiable activities

BHPBC would be required to provide notification to the Contaminated Lands Register for all notifiable activities and the identified notifiable activities should be clearly identified and listed in the EM plan. Any notifiable activity, as defined under Schedule 3 of the EP Act would be a relevant mining activity if it is directly associated with, or supports or facilitates, the mining or processing of minerals on the CLEP tenures.

3.5 Environment Protection and Biodiversity Conservation Act 1999

BHPBC formed the view that the project would be unlikely to impact on matters of National Environmental Significance (as described in the *Environment Protection and Biodiversity Conservation Act 1999*) and did not refer this project to the former Department of Environment, Water, Heritage and the Arts (DEWHA), nor the current Department of Sustainability, Environment, Water, Population and Communities (SEWPaC).

Consequently, the EIS process for the Cannington Life Extension project was not accredited under the Bilateral Agreement between the Commonwealth and the State of Queensland, and there is no requirement for this EIS assessment report to specifically address matters of national environmental significance.

4 Adequacy of the EIS in addressing the TOR

Table 4.1 lists the main aspects of the project addressed in the EIS and highlights the significant issues associated with those aspects. The table notes whether the submitted EIS adequately addressed the matters described in the TOR. The subsections of this chapter enlarge on some of those significant issues, discusses the findings of the EIS in regard to them and outlines the environmental protection commitments made by the proponent.

Table 4.1 Summary of the adequacy of the EIS in addressing the TOR

Matters included in the TOR	Significant issues	Were issues adequately addressed in the EIS?
Introduction	▪ Overview of the project, its objectives and scope	Adequate
	▪ Outline of the necessary approvals and their assessment processes.	Adequate
Project need and alternatives	▪ Project justification and any alternatives.	Adequate
Project description	▪ Location of the project in the regional and local contexts	Adequate
	▪ Description of the construction phase of the project	Adequate
	▪ Description of the operational phase of the project including operations, product handling, and mine infrastructure	Adequate
Transport	▪ Road	Adequate
	▪ Transportation of personnel by air	Adequate
	▪ Rail	Adequate
Climate	▪ Climatic conditions at the site	Adequate
Land	▪ Geology of the proposed mine including the tailings storage facility and mine infrastructure	Adequate
	▪ Land disturbance, including creek diversion	Adequate
	▪ Land use	Adequate
	▪ Soils and land suitability	Adequate
	▪ Resource utilisation	Adequate
	▪ Land contamination	Adequate
	▪ Landscape character and visual amenity.	Adequate
Waste	▪ Excavated waste	Adequate
	▪ Tailing storage facility	Adequate (further information on foundations and a detailed design are still required)
	▪ Waste rock dump	Adequate (further information on foundations and a revised detailed design are still required)
	▪ Regulated waste	Adequate
	▪ Liquid wastes	Adequate
Water resources	▪ Surface watercourses and overland flow	Adequate
	▪ Groundwater	Adequate
Air quality	▪ Dust	Adequate
	▪ Greenhouse gases	Adequate
	▪ Other air emissions.	Adequate

Noise and vibration	▪ Noise at sensitive receptors ▪ Noise impacts on wildlife ▪ Vibration due to blasting.	Adequate Adequate Adequate
Nature Conservation	▪ Terrestrial plants and Regional Ecosystems (REs) ▪ Terrestrial animals ▪ Aquatic ecology ▪ Mitigation strategies for nature conservation	Adequate Adequate Adequate Adequate
Other infrastructure	▪ Groundwater supply borefield ▪ Stormwater infrastructure ▪ Accommodation and other infrastructure ▪ Storage facilities.	Adequate Adequate Adequate Adequate
Cultural heritage	▪ Indigenous cultural heritage ▪ Non-Indigenous cultural heritage.	Adequate Adequate
Social	▪ Impacts on local community ▪ Impacts due to fly-in, fly-out workforce.	Adequate Adequate
Health and safety	▪ Air, noise and water emissions.	Adequate
Economy	▪ Effects on the local economy ▪ Effects on the state economy.	Adequate Adequate
Hazard and risk	▪ Unplanned discharges to air, water or land ▪ Transportation, storage and use of hazardous substances ▪ Emergency response.	Adequate Adequate Adequate
Decommissioning and rehabilitation	▪ Rehabilitation of areas affected by mining activities ▪ Decommissioning the project, in terms of the removal of plant, equipment, structures and buildings ▪ Final void ▪ Waste rock dump ▪ Stream diversion and levees ▪ Tailing storage facility ▪ Stockpiles ▪ Monitoring of reference and rehabilitation sites.	Adequate Adequate Adequate Adequate (design details and ongoing management arrangements - including for cover, slopes and drainage - are still required) Adequate (design details still required) Adequate (final design details and capping arrangements still required) Adequate Adequate

4.1 Introduction

The EIS provided an introduction to the project, its objectives and scope.

4.2 Regulatory approvals

The existing processing plant, Run of Mine (ROM) pad and associated infrastructure are covered by existing mining approvals. The EIS outlined that the extension of the mine and the change in mine operation to open cut would require additional approvals.

DERM commented that the EIS did not provide an adequate summary of the purpose of legislation and regulatory approvals required for the project, hence, the SEIS was amended to incorporate relevant legislation, subordinate legislation and regulatory approvals. The legislation and approvals applicable to this project are listed in Table 3.1 and discussed further in section 7 of this report.

4.3 Project need and alternatives

The EIS described the need for the project and outlined the social, economic and environmental benefits and costs. The positive and negative impacts, appropriate mitigation and management measures and environmental protection commitments of the project were addressed in later sections of the EIS.

Cannington Mine is one of the world's largest single pit silver and lead mines and has been operating since 1997. In recent years BHPBC has been assessing options to extend the mine life, as economically available underground resources diminish. The mine life extension project will allow the mine to continue to support economic stability in the local region, and to provide economic benefits and opportunities for employment and export trade to Queensland and Australia. The estimated establishment cost of the project is in excess of $100 million.

The CLEP would allow the mine to continue to produce silver rich lead and zinc concentrates suitable for domestic markets and for export to overseas markets. In accordance with Queensland legislation the proponent would continue to pay mineral royalties to the Queensland Government for the right to mine the State's resources. These royalties would be paid on an *ad valorem* basis and would be calculated as a percentage of the value of the mineral, as determined by the relevant Minister. Project royalties of over $500 million are expected to be paid over the life of the project.

Mining is a major contributor to the sustainability of the Australian economy and BHPBC contributes significantly as one of the world's largest tonnage single pit silver and lead mines. If the project did not proceed, a significant portion of available mineral resource would remain unutilised and the life of Cannington Mine would not be extended beyond 2019. Locally, Queensland and national economies would forego the economic benefits that would derive from the extension project.

The land underlying the project is currently used for underground metalliferous mining and processing, mining exploration and low-intensity cattle grazing. Historical agricultural land-uses in the area include breeding, grazing and fattening of both cattle and sheep, although sheep are no longer farmed in the area.

The EIS concluded that the land around the project site would be unlikely to sustain other agricultural activities due to potential natural resource limitations. Such limitations include low rainfall, poor plant available water capacity, low nutrient levels, shallow soils and high levels of salinity. It is unlikely that rain-fed broadacre cropping would be sustained on the site without significant artificial input. The land contains no specific values that are not well-represented in the wider area.

A number of alternative mine life extension concepts were assessed as part of the EIS process. Multiple project concept scenarios were reviewed for their mine planning configurations, processing capacities and concentrate production rates, as well as disturbance footprints, associated infrastructure and potential effects on existing operations. Mining concept scenarios assessed ranged from the optimisation of the underground mine only, to the development of an open cut operation replacing both north and south zone underground zones. The scenarios that were considered also included configurations representing transitions between these two scenarios.

4.4 Project description

The EIS described the location, scope and phases of the project. A brief outline of the project is found in section 2 of this report. Major aspects of the project including ore processing, tailings management, waste rock, stormwater drainage and storage, transport, water supply, power and waste management are described in the EIS and are outlined in more detail below.

4.5 Climate

The EIS described the local climate and how the climate could affect the potential for environmental impacts and the management of operations at the site. The principal aspect would be the effect of seasonal rainfall on water management on site and the need to cope with potential flooding extremes and surface-water management to prevent the release of unauthorised contaminants from the site. Furthermore, the potential effects that drought conditions may have upon the project were considered by the proponent as the utilisation of an established and reliable source of water would be crucial for the stability of project operations.

Bushfire mitigation measures such as establishing fire breaks and buildings fitted with fire fighting equipment were proposed to minimise bushfire risk during the peak fire season during winter and into spring. Best-practice bushfire mitigation and management measures that are currently employed at Cannington Mine would be adopted for the project and incorporated into the new infrastructure.

4.6 Land

This section of the EIS described the existing environment values of the land area that would be affected by the project. It also defined and described the objectives and practical measures for protecting or enhancing land-based environmental values, described how nominated quantitative standards and indicators would be achieved, and how the achievement of the objectives would be monitored, audited and managed.

The following subsections address land qualities and characteristics in more detail.

4.6.1 Land use

The project site would be located in an area characterised by mineral exploration, mining and pastoral activities, with several mines operating within the district.

The mine area is separated into two major mining zones - a southern zone (SZ) and a northern zone (NZ). Development of the SZ started in 1993 to 1995, with an exploration decline to the underground resource and level access. The first stope production commenced in late 1997. The NZ is separated from the SZ by the Trepell fault. Development of this zone commenced in 2003 to 2004. First stope production was in 2004, with a retreat mining sequence from south to north away from the Trepell fault. Mining of the NZ and SZ has created an extensive network of underground tunnels, shafts and levels.

4.6.2 Soils and land suitability

The EIS reported that field and laboratory assessments were undertaken for the project site and four main soil types were identified. These have been mapped as four distinct soil management units (SMU): Soil Type 1 (Landsborough), Soil Type 2 (Kunldala), Soil Type 3 (Oorindi) and Soil Type 4 (Hamilton). The first three SMUs identified on the lower plains of the site (Landsborough, Oorindi, and Hamilton) exhibited increasing sodicity with depth and are thus chemically predisposed to soil erosion. Therefore, disturbance of these soil units to depths greater than those outlined in the EIS should be avoided. In the areas of higher relief, the Kunldala SMU exhibited significant sections of rock that were interdispersed with a non-sodic Vertosol. The chemistry of this soil suggests that it would be not prone to erosion.

Agricultural land class of each SMU were based on the descriptions provided in Planning Guideline - The Identification of Good Quality Agricultural Land (DIP, 1993). No SMU on the site were found to be of good quality agricultural land, due to limiting factors such as poor plant available water capacity, low nutrient levels, shallow soils, high levels of salinity and rocky outcrops (equivalent to Agricultural Land Class D). An assessment of the physical, chemical and nutrient characteristics of the soil was then undertaken to rank the land according to a five-class land use system, which includes grazing, rain-fed cropping and conservation.

The project site currently supports low intensity cattle grazing and has been used historically to graze sheep. The EIS outlined that the project site would be of limited use for broad acre cropping or conservation. The land suitability assessment for beef cattle grazing indicated that the eastern half of the area would be of Land Suitability Class 5 (unsuitable land with extreme limitations). The suitability class for the main soil unit to the east was classified as lower primarily due to soil salinity, although the proponent acknowledged that grazing of this land appears to be possible, with limitations. Class 3 land (suitable land with moderate limitations) dominated the western portion. On closure and decommissioning of the project, BHPBC proposed to return much of the disturbed land to a land suitability consistent with the pre-existing land suitability. The most significant departure from pre-existing land suitability would be the final void which would be proposed to remain as a permanent void with a water body. Other areas such as the walls of the Tailings Storage Facility (TSF) and Waste Rock Dump (WRD) would be downgraded to a lesser suitability.

Approximately 62% of land disturbed by the project site would be returned to its pre-mining land use and suitability on closure and decommissioning. Approximately 38% of disturbed land would be downgraded from Land Suitability Class 3 to Class 5 in the areas of the open pit, the TSF and the WRD.

The final void would contain a pit lake from water inflows and would be fenced, as it would not be expected to have beneficial use for grazing or as a water source. Most of the stormwater dams, sediments ponds and roads on site would be returned to their pre-mining land use and suitability unless the landholder wishes to retain these structures through a written agreement with BHPBC.

4.6.3 Sensitive Environmental Areas

No category A or B environmentally sensitive areas and no endangered or of concern Regional Ecosystems (REs) were identified on the project site. No rare species were found on the site although researchers are believed to have recorded the call of the Little Pied Bat (*Chalinolobus picatus*) a species listed as rare under the Nature Conservation (Wildlife) Regulation 2006.

4.6.4 Landscape character and visual amenity

Regionally, the project would be located on the outskirts of the Mount Isa Inlier. The area typically supports gently undulating plains with many low ridges, with limestone outcrops, and alluvial flood plains of main watercourses with numerous anastomosing channels. The topography of the project area mainly consists of flat plains within an area of gently undulating land that would be dissected by numerous ephemeral creek lines with average elevation of 250 m Australian Height Datum (AHD). A low ridgeline runs across the project site from north to south, through the eastern side of the ML. Additionally, to the west, the Selwyn Range runs north to south approximately 10 km from the western boundary of the project site. The Cannington deposit lies upstream of the confluence of the Hamilton River and Trepell Creek. Both of these watercourses are ephemeral and often anastomosing, with multiple channels in a floodplain. The Hamilton River flows south for some 200 km before it joins the Georgina River and after a further 500 km it flows into Lake Eyre. Trepell Creek flows north to south for some 7 km through the middle of the project site, before converging with the Hamilton River. Three other ephemeral creeks traverse the project Site, Emu Creek in the north which flows into Trepell Creek, Lily Creek in the west, and Downs Creek in the southeast.

The site has undergone moderate changes since European settlement. Pastoral development began in the late part of the 1800's and the site has continued to be utilised as grazing land. Intense and light grazing, along with periods of drought, have lead to the project site being impacted. Almost two thirds of the project site is covered by Mitchell Grasslands, with the remainder comprising of patchy Gidgee Woodland and riparian zones. For the majority of the year, the site's landscape character is representative of northwest rural Queensland – mostly dry. The area can quickly become lush, green and healthy following periods of heavy precipitation which occur during the wet season. There are no formal or recognised viewing points or landmarks associated with the project site. The most significant points from which to appreciate scenic amenity in the area are likely to be road crossing points on the Hamilton River, where views along the watercourse are bordered by riparian vegetation.

The north western area of the project site contains the existing Cannington Mine's mining area infrastructure and associated facilities, providing a contrasting backdrop to the surrounding landscape. The EIS identified the presence of the existing Cannington Mine as an important landscape feature of the project site. While not significantly prominent from a distance, the mine, and particularly Cannington Mine headframe, have become a distinct characteristic of the local site.

4.6.5 Land disturbance and creek diversion

The project has the potential to disturb, in total, approximately 380 ha comprising 346 ha of Mitchell Grassland, 25 ha of Coolabah Riparian Woodland and 9 ha of Gidgee Open Woodland, all of which are listed as least concern under the *Vegetation Management Act 1999* (Table 4.2). The Mitchell Grassland community would be affected by the WRD, expanded TSF, the diversion of Trepell Creek and the open cut pit.

The initial construction of the project would consist largely of clearing, topsoil stripping and stockpiling, road construction, site levelling and an extension to the existing process plant flotation circuit. Bulk earthworks would be undertaken to prepare internal roads and pads for construction. Following the removal of topsoil, in situ material would be expected to be suitable for structural fill. Some works, such as pre-stripping and stockpiling of topsoil, may continue during the development of the open cut and associated infrastructure.

The EIS stated that the proposed open cut pit would encroach upon Trepell Creek, and that the creek would need to be diverted. Three creek diversion concepts were described and assessed in the EIS.

Option T1 would divert Trepell Creek from a point northeast of the accommodation village across to the Hamilton River, staying northwest of the mine infrastructure and the TSF. This option was eventually rejected by the proponent because of the length of the diversion, technical difficulties due to elevation differences, resulting cost, surface disturbance implications and deprivation of flow from the greater downstream length of Trepell Creek. The other two options (T2 and T3) investigated flow diversions closer to the open pit.

The second option (T2) would divert a 1.2 km length of Trepell Creek around the perimeter of the open cut. It would shift the watercourse up to 270 m eastwards along a diversion length of approximately 1.54 km. This diversion would lie between the open pit and the WRD. This would be the shorter option and therefore would be less costly in construction and maintenance and also represents a smaller surface area subject to erosion and requiring stabilisation.

The third option (T3) would divert a 2.7 km length of Trepell Creek around the eastern edge of WRD. It would shift the watercourse up to 1.3 km eastwards along a diversion length of 4.7 km. This diversion would lie east of both the open pit and the WRD.

Although the third option (T3) would involve a longer channel than option T2, option, BHPBC considered that T3 would be preferred because routing the diversion east of the WRD greatly reduces the risk of potential WRD run-off, including potential acid rock drainage (ARD), entering the watercourse with potential subsequent downstream contamination.

The EIS also stated that the preferred T3 diversion would also reduce the risk of inundation of the pit. This in turn would reduce the likelihood of potential safety and infrastructure consequences during the mine operation. It would also decrease the risk of environmental impacts after closure that might arise from any seepage or run-off from the WRD entering watercourses, or a possible release of pit water. The EIS also considered that these risks are further attenuated if the WRD were to be constructed across Trepell Creek channel, south of the diversion off-take.

DERM reviewed the proposed design of the diversion of Trepell Creek and accepted the concept information provided by the proponent. It is understood that additional design issues can be resolved during the detailed design stage for this part of the project.

In the SEIS, consultants provided a report regarding the regional geomorphology to examine confined watercourses within that region. A commitment was made to incorporate the findings from this study into the detailed design.

As part of the review of the location of the WRD and flood immunity of the final void, DERM requested flood modelling of the diversion and levee system proposed to protect the WRD and void be re-modelled for a 1:1000 ARI flood event (1 % risk of levee overtopping in 11 year projected mine life extension). The modelling indicated that relatively high velocities may occur in sections of the diversion during this type of event. It is likely that the diversion may sustain some scouring, aggredation and other damage during such an event, even to the extent that meandering processes are triggered,. This matter would be looked at in the detailed design but as the diversion results in an increase in stream length compared to the natural channel, it is likely that the formation of meanders would not be a significant issue.

Following a review of the diversion design to optimise the alignment and allow more natural contours and reduce angles to manage energy, BHPBC redesigned the diversion channel in the area of the offtake from Trepell Creek. The new alignment reduces the angle off offtake from 90^0 to about 140^0 and incorporates a secondary channel to drain water from behind the levee bank. While DERM has not identified any concerns with the proposed changes or has identified anything in the proposed design that will result in the diversion being unstable in the long term, the Department will review the proposed changes when the detailed design is submitted for approval.

4.6.6 Resource utilisation

The mineral resources classification for the project site indicated that around 77 Mt of ore was present, with more than 60% of this mass categorised as ‘measured resources’ and only 20% as ‘inferred’. This classification is based on an efficient underground mining methodology for the potential economic extraction of the ore body. These resources represented the overall ore body content, assuming that exploitation by an efficient underground mining methodology could be possible. The EIS stated that changing to a more economic exploitation strategy, involving open pit mining, would increase the minable reserves.

The EIS stated that approximately 150 Mt of rock would be extracted from the open cut pit, which would include approximately 23 Mt of ore. The average stripping ratio would be about 5.5 t of waste rock per tonne of ore.

DEEDI commented that the EIS should acknowledge the concept of resource stewardship in the company's exploration of the mineral resource. The location, tonnage and quality of all mineral resources and reserves within the project site should be reported and described in detail with accompanying maps. The EIS should analyse and detail the effectiveness of the mining proposal in achieving the optimum utilisation of the mineral resources within the project site and consider development impacts on other resources. DEEDI also stated that it should be demonstrated that there would be no unnecessary sterilisation of resources. In response, the proponent provided the requested information as well as a flowchart outlining BHPBC's resource stewardship process in the SEIS.

4.6.7 Land contamination

As part of the soil and land suitability assessment, selected soil samples were analysed for concentrations of heavy metals, including lead, silver, copper, zinc, iron, boron and manganese. Environmental investigation levels (EILs) for soil contamination were used for this assessment. The land contamination assessment found that the Landsborough, the Oorindi and the Hamilton soil management units (SMU) exhibited low metal concentrations and did not exceed any of the EIL values while the Kunldala SMU exhibited elevated concentrations of several metals, with one (cadmium) exceeding the EIL of 4.5 mg/kg. The EIS concluded that these represent naturally occurring levels for these metals within this SMU.

No contaminated land has been identified at the project site over the life of Cannington Mine. In addition, no contaminated land was indentified during the resource drilling programme that was conducted over the proposed pit area. However, the EIS identified that the project would have the potential to contaminate land if any of the following incidents were to occur on site:

- spillage of fluid or stormwater run-off from ore, tailings, waste rock, process area or concentrate from the mining and processing area
- overflows from the TSF or other volumes of stored contaminated water
- spills or overflows from the sewage treatments plants
- windblown rubbish from the waste disposal site
- windblown dust from the processing area
- spillage of chemicals or fuel
- acid and metalliferous drainage from waste-rock materials that are brought to the surface.

Control measures were identified as part of the EIS and are further discussed in section 4.9.

4.7 Transport and infrastructure requirements

The EIS described the arrangements for the transportation, importation or exportation of plant, equipment, materials, products, wastes and personnel during both the construction and operational phases of the project.

The EIS concluded that compared to existing conditions, no significant change in transportation requirements would occur for rail, ship or air as a result of the construction or operation of the project. Concentrate would be loaded into covered rail carriages for transport via rail to Townsville. Yurbi railhead loading facility is located on existing Mining Lease 90077 and would be not expected to require any alterations to the existing infrastructure or operations. Trains deliver the concentrate to the Sun Metals Zinc Refinery or the Port of Townsville, ready for loading onto bulk carrier ships. BHPBC has existing, purpose-built unloading, storage and ship-loading facilities at The Port of Townsville and these would not require expansion.

DTMR commented that the executive summary of the EIS did not contain a section summarising transport, one of the key issues of the project. While a short paragraph in the infrastructure section claimed that the project would have no significant impact on road demand, no statement about any potential impacts on road safety or pavements had been made. The proponent responded in the SEIS that the EIS and Appendix I have been amended to include more specific detail in relation to historic and proposed haulage data, as well as an overview of project-related

transport operations had been inserted into the executive summary. A commitment has also been added to undertake a road impact assessment if the project schedule changes in the future and would be likely lead to an increase in traffic and/or road transport of concentrate.

The following subsections address transport requirements in more detail.

4.7.1 Road

Existing major road infrastructure surrounding the project site includes the Landsborough Highway 80 km to the northeast of the project, which connects Cloncurry with Charleville, and Toolebuc-McKinlay Road. Toolebuc-McKinlay Road is sealed to the north of the project site.

The main impacts of the project would be on the re-routing of the Toolebuc-McKinlay Road, revised site access roads, and on site haul roads for waste rock and ore. The EIS stated that vehicle separation and minimising road intersections would be key design criteria for planning new site access roads. The haul road from the open cut to the WRD would be designed to maximise durability, cost efficiency, safety and with minimal impact on the environment.

The EIS reported that the Toolebuc-McKinlay Road would be re-routed to by-pass the WRD and Trepell Creek diversion. The re-alignment would be undertaken at the time the Trepell Creek diversion would be constructed. The re-alignment would not cross any defined watercourses. Detailed designs have not yet been developed in the EIS and these would be outlined in the proponent's plan of operation before the road re-alignment would commence. The current design concept has the road diverted to the eastwards by approximately 1 km for a length of approximately 4 km. BHPBC has committed to work closely with the McKinlay Shire Council, who has jurisdiction over the road, during the development of diversion designs and during construction of the road diversion.

In its comments on the EIS, DTMR requested a brief outline of the *Mineral Resources Act 1989* objectives of dealing with impacts of road use as well as provisions of transport-related legislation (e.g. *Transport Infrastructure Act 1994* and *Transport Operations (Road Use Management) Act 1995*), as those objectives apply to ensuring adequacy of road safety of accesses to/from state-controlled roads and heavy vehicle use (for example, the bulk haulage of minerals). DTMR advised that the notifiable road-use provisions of the *Mineral Resources Act 1989* require a mining tenement holder to advise road authorities of product/haulage information if they haul more than 50 kilotonne per annum or if existing haulage varies. The proponent should advise DTMR what mineral type and actual tonnages have been hauled on State controlled roads over the last 5 years, to demonstrate mineral haulage has not substantially changed since the 'notifiable road-use' provisions in the *Mineral Resources Act 1989* commenced. The EIS indicated vehicle movements would be reduced during the operational phase. However, this assertion was contradicted by the increase of mineral production/haulage during years 2015/2018 as indicated in the appendix. DTMR also raised concerns that the EIS failed to clearly state accurate mass hauled and a road safety and pavement impact assessment which would document potential impacts and proposed mitigation measures. The EIS further failed to provide adequate information about existing arrangements with road authorities to assess and mitigate road impacts.

As a result of these comments the EIS was amended to outline the requirement for proponent to report notifiable road uses to the DTMR. The SEIS also included historical haulage data to clarify the type of concentrate being hauled, more specific and accurate detail in relation to the proposed haulage data, details on historic and proposed hauled concentrate data as well more specific detail regarding existing road maintenance agreements. The proponent noted that concentrate would not be hauled by road from Yurbi to Townsville and any references to this transportation route was removed from the SEIS.

DTMR further requested that the proponent undertake a pavement impact assessment and mitigate any identified pavement impacts. BHPBC acknowledged the department's request but stated that the project would not alter significantly the existing conditions. As such, significant adverse impacts on traffic volumes and haulage corridors would not be expected. Hence, a road safety risk assessment specific to the project would have limited relevance. However, to meet BHPBC continuous improvement and risk management approach, BHPBC has committed to liaise with DTMR and Queensland Police to assess and identify the best ways of minimising road safety risks associated with existing and future road transport operations.

DTMR reviewed the proponent's response and commented that, while the majority of issues were addressed, some required further clarification. DTMR considered that the increased traffic at the Toolebuc-McKinlay Road/Landsborough Highway intersection and the load out access intersection with the State-controlled road warranted an assessment in terms of any increased road safety risk and potential pavement impacts. DTMR outlined that once the assessment has been undertaken, the proponent should consult with DTMR's regional office to determine if impact mitigation is required.

McKinlay Shire Council was concerned with aspects of the transportation of concentrate along the Landsborough Highway particularly the potential risks to identified areas of high environmental value to the council. Council also suggested an alternative transport route in the McKinlay-Gilliat Road and the possibility of loading concentrate at a suitable point along the railway corridor within the McKinlay Shire. The Council also stated that that the proponent should consider giving employees the option of moving their families into housing in McKinlay or Julia Creek. BHPBC responded that the project was using industry best practice for environmental protection with enclosed trucks and rail wagons for concentrate transport. Operational practices and equipment are subject to ongoing evaluation and improvement as part of the continuous improvement obligations. BHPBC would continue to engage with DTMR to ensure concentrate continues to be transported in an environmentally sound and safe manner. While BHPBC recognised the council's suggestion of relocating the railway corridor, the economic cost to relocate the rail-loading facility would not be viable. In terms of accommodation choices of employees, BHPBC stated that the company does not restrict or promote where employees live. However, BHPBC would continue to engage with McKinlay and other local shires and communities in an endeavour to maximise local opportunities. Hence, no changes were made to the SEIS as a result of these comments.

McKinlay Shire Council further commented on surface water and stream sediments and the potential for contamination, especially as a consequence of severe flood. The council required further clarification regarding contamination mitigation strategies in the event of severe flooding (greater than a Q20 event). The proponent responded that in order to adequately address the council's comment, modelling of flood hydrology would be undertaken. The assessment would be submitted to DERM and the council separately to the SEIS and would provide information on flood hydrology before, during and after the project ceases.

McKinlay Shire Council took the opportunity to comment on the proponent response and stated it acknowledges the BHPBC's engagement with the council and is satisfied with the responses. However, in addition to these responses, it was noted that a re-alignment of Toolebuc-McKinlay Road would be considered. The council requested that the surface of the re-aligned section would be suitable for the traffic that would use it.

4.7.2 Staff transportation

Transportation of most of the construction workers would be through a fly-in fly-out (FIFO) regime, as per existing transportation systems. The construction workforce is not expected to result in significance changes to charter flight movements. Approximately 98% of the workforce would be transported to and from site in a similar manner to the existing FIFO roster systems. Workers would be transported by bus from the existing Trepell Airport to the accommodation village.

Limited employee transportation by light vehicle would originate from Mount Isa and/or Cloncurry.

4.7.3 Rail

The majority of concentrate would be hauled to Yurbi railhead loading facility where it would be transported to the Port of Townsville via rail. The Yurbi Rail Siding located about 15 km east of Cloncurry and is associated with the Mount Isa System – a rail line network which extends from Townsville through to Mt Isa. Yurbi is currently owned and operated by BHPBC and is situated on ML 90077.

For existing operations, ore concentrates are hauled by quad-trailer road-trains approximately 170 km from the Cannington Mine, via Toolebuc-McKinlay Road and then the Landsborough Highway, to Yurbi. Some concentrate would be road hauled direct to Mt Isa, and if rail transport were to be unavailable for an extended period, concentrate may be road hauled to Townsville. A 12.5 kt totally-enclosed storage shed, located at Yurbi, holds the concentrate until it is ready to be loaded onto rail wagons specifically built for BHPBC.

Projected transport figures in the EIS and SEIS have shown that the quantities of concentrate requiring haulage will be less than those in 2003, hence the project will be able to operate within existing transport capacity levels.

4.7.4 Port and Shipping

Ore concentrate hauled via rail, would be delivered to the Sun Metals Zinc Refinery in Townsville, or BHPBC's port facility at the Port of Townsville. BHPBC has constructed its own concentrate storage and ship-loading facilities at the Port of Townsville.

DTMR recommended in its review of the EIS that the proponent and their consultants should liaise with Maritime Safety Queensland and particular with Regional Harbour Master (Townsville) to ensure close co-operation on the project development, including future changes to the scope of the project as they relate to safety of navigation and prevention of ship sourced pollution. BHPBC responded that the company is committed to ongoing communication with Regional Harbour Master (Townsville) as project development occurs and where changes to the project are required.

4.7.5 Air

The existing Cannington Mine supports its own private airport (Trepell Airport) situated approximately 2 km west of the existing accommodation village. All FIFO operations take place from Trepell airport.

The capacity of these services would adequately meet the FIFO needs of the current and proposed mining operations.

4.8 Other infrastructure

The EIS provided descriptions, with concept and layout plans, of requirements for constructing, upgrading or relocating all infrastructure in the vicinity of the project area. These are described in more detail below.

4.8.1 Pipelines

The existing Cannington Mine receives natural gas from the Ballera compression facility in central Australia via the Carpentaria Gas Pipeline. The pipeline runs underground, approaching the project site from the south west. A cleared track provides access along the pipeline corridor. The pipeline has sufficient capacity to supply the additional generating capacity required by the project.

4.8.2 Groundwater supply borefield

The existing groundwater supply borefield is located approximately 20 km to the east of CLEP and has operated since September 1997. The borefield intersects sediments of the GAB. The Cannington borefield licence allows a nominal maximum groundwater extraction in any one water year of 2,210 ML (equivalent to an average rate of 70 Litres/second) until June 2022.

A buried pipeline conveys groundwater from the borefield to the Cannington Mine. The borefield comprises nine commissioned bores, of which eight are currently in operation. BHPBC owns and operates the borefield pipeline which contains regular valve pits and outlet points.

The project would continue to obtain its water supply from the borefield. The proponent’s existing GAB extraction license permits the installation and operation of up to 18 bores. The project would see an increase in GAB extraction rates from 5.2 ML/d to a peak of 6.4 ML/d. This peak would persist from 2014 to 2022 and would exceed the existing GAB water allocation by 130 MLpa. BHPBC would apply for an increase to the GAB water extraction limit, for use within the project. An extension of two or more years would also be required to BHPBC’s GAB extraction license timeframe.

DERM advised that any increase in the allocation under the Water Resource (Great Artesian Basin) Plan 2006 would need to come from the State Reserve. BHPBC applied for and has been declared a project of regional significance and has subsequently made application for increased allocation needed for the project. This application is currently being assessed by DERM.

4.8.3 Stormwater infrastructure

The existing and proposed Cannington Mine site water management system aims to maintain separation between the undisturbed catchments and potentially contaminated catchments. Water would be managed by utilising the natural fall of the land surface, in combination with either interception trenches and/or bunding. This method directs water from disturbed areas into dedicated dams for associated catchments. The purpose of this system would be to capture and attenuate run-off derived from rainfall events on the mine site.

Existing catchment dams would have their storage capacity expanded, where required, as part of ongoing Cannington Mine operations. The EIS identified that the capacities of those dams that may potentially receive contaminated run-off would be determined to contain the critical wet season (three month) rainfall with AEP of 5%. This is based on the design requirements of the Technical Guideline Site Water Management (DME, 1995) criteria and equates to 477 mm rainfall.

For the existing management system, potentially contaminated water from the process plant would be contained and pumped to the process water dam. This catchment area contains the power station, fuel and diesel storages, concentrate slurry thickeners, drying filters, storage shed, vehicle workshops, wash-down facilities, the effluent (sewage) dam, the laboratory and administrative offices. The process water dam has an overall capacity of 10,130 m^3 that equates to holding a 10% AEP 6 hour run-off event. In the event of larger storms, a spillway has been installed to accommodate overtopping into a flood bund. The process water dam operates as balance of storage for process and decants waters throughout the year. It is located next to the effluent dam with a connecting spillway.

A surface water management plan (SWMP) has been prepared for the project and is discussed in more detail in section 4.10 of this report.

4.8.4 Borrow Pits

Borrow pits are expected to be established on the project site to source clay, gravel, sand, coarse rock and aggregate, all of which would be required during construction. Suitable clay material would also be stockpiled for use during closure.

Sources of these construction materials would be finalised prior to construction commencing. Structural and low permeability material required for construction of the TSF embankments are expected to be sourced from within the footprints of the TSF extension and the open cut excavation.

Some borrow pit materials may require crushing and screening prior to use. If this were to be the case, a crushing and screening plant would be established at some borrow pit locations. Temporary stockpiles of the various materials would also be located adjacent to crushing and screening plants. Borrow pits are likely to remain open during the construction phase and potentially well into the operational phase. Should a borrow pit be exhausted of suitable materials, the site would then be rehabilitated.

4.8.5 Sewage

The EIS indicated that the existing sewage treatment capacity at the mine would be adequate for the proposed project numbers. However, BHPBC have indicated that the sewage treatment capability at Cannington Mine would need to be upgraded to improve reliability and effluent quality, regardless of the decision to extend the mine life. Options for this upgrade are under evaluation at this time.

4.8.6 Telecommunications

A new fibre optic network would be installed to connect all the new buildings and infrastructure for the expanded mine layout. Mobile phone communication would continue to be supplied via the existing Telstra NEXT G network. The existing telecommunications infrastructure would be otherwise sufficient to support the development and operation of the project. The project would not impact on any existing telecommunications infrastructure outside of the project site.

4.8.7 Accommodation and other infrastructure

The EIS outlined that the workforce would be housed in the existing accommodation village which would be expanded by an additional 16 beds. The existing accommodation village is located approximately 4 km north of the mine infrastructure area and comprises accommodation units (824 personnel beds), sporting and recreational services, kitchen, laundries and mess. At one stage there were additional accommodation units in the village, but these were removed when workforce numbers were rationalised. Four additional 4-person units would be constructed at the village. Design and construction of the units would reflect existing units at the village and would bring the total number of beds available at the accommodation village to 840.

Due to the nature of shift rotation and rosters, the modified accommodation village is expected to adequately meet the projected long-term operational workforce increase from 894 to 954 personnel. The short-term increase in workforce numbers to 1,034, during the construction phase, is also expected to be accommodated by these arrangements because equivalent numbers are currently accommodated during maintenance shut-downs. Additional transportable accommodation units would be installed if necessary.

4.8.8 Storage facilities

The Cannington Mine has an existing diesel fuel storage facility. The EIS identified that an additional diesel storage facility would be installed for the support of the open cut fleet. Tanker trucks would unload diesel for storage in the diesel fuel storage facility. Light and heavy vehicles would refuel via high and low capacity bowsers at the facility. A diesel storage capacity of approximately 750,000 L would be required for the project. This additional capacity would be provided by multiple bulk horizontal bullet style tanks possibly in a 3 x 250,000 L tanks arrangement. The storage areas would continue to be bunded and would be incorporated into stormwater drainage systems to provide oil/water separation.

Bulk storage would continue to be provided for oil and waste oil in a bunded area. All fuel and hydrocarbon storage would be bunded and would meet the requirements Australian Standard 1940-2004 – The Storage and Handling of Flammable and Combustible Liquids.

The explosives needed for the mining process would be stored within existing explosives magazine storages which would be expanded to hold an additional 500 t of explosives/emulsions needed for the project. Explosives and detonators would continue to be stored separately to minimise any potential for accidental ignition of explosives. The construction of new storage units would conform to relevant regulations regarding the storage of explosives. Access to the magazine would be restricted to authorised personnel only.

Currently, oils and lubes (engine, gearbox, transmission and hydraulic) used for site vehicles are stored in 1,000 L pods that are located in a bunded area adjacent to the existing diesel fuel farm. Waste oils generated by workshop activities are stored in a 20,000 L collection tank. Additional storage capacity of around 9,000 L of various oils and lubricants would be required.

This report considers that the additional storage facilities and their potential risks have been adequately described in the EIS documents. Proposed storage design and management are adequate for the increased volumes of possible contaminants to be stored on site. Where appropriate, existing conditions in the EA would be amended.

4.9 Waste

The EIS identified that waste avoidance and minimisation, waste reuse / recycling, waste treatment and waste disposal would be applied to management of waste.

The major waste streams identified in the EIS are excavated waste, waste material from processing the ore and general waste associated with the construction and operation of the mine. The following subsections address waste management in more detail.

4.9.1 General Waste

The existing Cannington Mine has a waste management plan (WMP) in place to handle all the waste on site. The recycling plant recovers aluminium cans, batteries, empty drums, scrap metals, copper cable, cardboard and waste oil.

During construction, the CLEP would operate under the existing WMP which incorporates practices to prevent or reduce the generation of waste, such as requiring suppliers to minimise packaging. Existing site energy efficiency targets would remain and would be revised for the project as the operations comes online. Development of the project would be strategically planned in order to limit the movement, and the redeploy, of construction vehicles and equipment. Where the recycling of materials would be possible, waste would either be recycled on site or via external waste recycling operators, as per existing operations. Operational waste would be expected to increase from existing levels of 4.7% (2,705 m^3), not including waste rock and tailings waste.

4.9.2 Excavated Waste

The main form of excavated waste to be created would be waste rock from the open cut pit. Is is projected that 127 million tonnes of waste rock would be extracted during the 11 year life of the open cut operation.

The EIS reported that characterisation of the waste rock involved the collection and analysis of 907 waste rock samples from drill cores, ore stockpiles and freshly blasted rock in underground workings. The number of samples and the testing regime applied was reported in the EIS for each of the six lithologies identified. Both the number of samples and the testing regime met the requirements of the Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland (DME, 1995), as required by the TOR.

Subsequent analysis of the results of the testing of these samples indicated that the waste rock materials are generally characterised by low levels of sulfide mineralisation and low Maximum Potential Acidity (MPA) values. Materials with the highest MPA values were the quartzite which hosts the ore body. The acid neutralising capacity is typically low or negligible. Hence a significant proportion of the material is classified as uncertain (UC) or potentially acid forming (PAF). For each lithology the mass of material classified as UC, PAF or non acid forming (NAF) was estimated and reported in the EIS.

NAF material may be used for the construction of mine roads, the TSF extension, development of the new ROM stockpile and for the development of the combined NAF/PAF waste rock dump (WRD).

In comments on the EIS, DERM raised queries regarding the potential for Neutral Mine Drainage (NMD) for the proposed waste rock dump storage facility. The information presented in the EIS showed a strong potential for the development of neutral and saline drainage from certain lithologies under certain laboratory conditions.

In response, the SEIS provided tables (tables 10 and 11) that show indicative solute concentrations for a range of potential contaminants, including metals, in percolate from the waste rock dump assuming a low infiltration rate of 2% of mean annual precipitation (MAP). However, DERM suggested that this did not adequately address the matter and requested further clarification. The response from BHPBC, in March 2011, argued that not all the salt found to be released based on paste electrical conductivity values, would be available for release in the field. It further argued that the kinetic testing showed that the salinity would be rapidly flushed from the material (within two or three flushes) and that there would be little or no on going production of salinity. The report also suggested that the source of salinity in the material used for the laboratory tests may have been contaminated with local water used in drilling, and that not all of the salinity found in the pores would be available for release. The conclusion made was that the potential for salinity release is expected to be significantly less than indicated by the laboratory testing.

Further, BHPBC did not consider that there was a need for the selective handling of the waste rock, in order to mitigate salinity release and neutral leachate generation, as all runoff from waste rock material would either be used in the process plant or for dust suppression and would not be released off site. The proponent also contended that the design of the waste rock dump would ensure that any leachate would report to, and be contained in, the final void. However, selective handling of the waste rock is required to prevent metal leaching from the dump. Selective handling and placement of NAF and PAF material was endorsed by BHPBC, DERM and the findings of the Independent Peer Review. The design, construction and management of the waste rock dump (WRD) are dealt with in Section 4.9.2 of this report.

Other excavated waste would be in the form of civil cut materials which would be removed from stormwater dams and pond areas during construction. As this material would be NAF it may be used for construction works such as roads or bunding, or otherwise placed in the WRD.

4.9.3 Tailings Storage Facility (TSF)

An estimated 86 million cubic metres of tailings material will be generated during the life of the Project, which will report directly to an impoundment style TSF on the existing ML. The TSF would need to be expanded to accommodate additional tailings generated over the extended mine life. A number of options for dealing with this material were considered as part of the EIS process, including cells adjacent to the existing tailings facility or by building a new impoundment, which would be spatially and hydraulically separate from the current TSF.

The option 'adjacent TSF' cells was selected at the end as this option would be expected to result in a smaller surface area and minimise the site disturbance footprint. Available areas in which to construct a second impoundment would probably necessitate greater distance of travel for trucks hauling construction material and over which to pump the tailings slurry. A second impoundment would also likely require relocation of selected infrastructure, for example the airstrip or accommodation village.

The EIS estimated the footprint of the TSF extension by considering the performance of the existing TSF and applying the current loading rate, of approximately 23,000 t/ha per annum. The proposed TSF expansion would be located adjacent to the existing TSF in a north-easterly direction. The expansion is required to maintain sufficient drying area and storage capacity. The site is constrained to the east by roads and to the west by an airfield.

The extended TSF would operate in conjunction with the existing facility. In order to maintain the required drying area while providing the necessary volumetric storage capacity, the TSF would be operated and expanded in three stages. Each new 'lift' would be constructed well in advance of any tailings deposition.

Geochemical properties of the tailings to be deposited in the TSF and paste tailings (tailings which are combined with cement to make a paste used to backfill underground areas) were characterised in the EIS. Overall, there would be potential for the tailings material to become acidic; however, this condition would be expected to persist for only a short period of time (i.e. a few years) due to low overall sulfide content of the material. Leach tests showed that arsenic, antimony, selenium silver and zinc could be leached from the tailings.

Tailings pore water quality was also considered in the EIS as pore water in the TSF would gradually draw down after tailings deposition ceased at mine closure. The quality of this pore water would then be influenced by the oxidation of sulfide minerals and the rate at which this occurs. The studies identified that the process of accumulating solutes would be predicted to endure for approximately 100 years at the end of which concentrations would be at their highest. After 170 years, the concentrations would be expected to decrease to near background groundwater quality levels. The sulfide oxidation would decrease due to sulfide mineral depletion. Hence, the EIS concluded that no ongoing material management would be required. The pore water would percolate form the base of the tailings at low rates. This is expected to flow as subsurface flow to the open pit, not appearing as surface flow.

The EIS identified that structural and low permeability material required for construction of the TSF embankments could be sourced from within the footprints of the TSF extension and open cut excavation.

In the EIS, BHPBC committed to the construction of a low permeability clay core in the earth-fill embankments to aid in minimising the potential for seepage from the TFS. Commitments were also given for monitoring systems to be installed and operated to monitor the TSF for embankment integrity and seepage losses. As the operation of the expanded TSF facility would be similar to the existing TSF, the EIS anticipated that the monitoring system would be similar to that currently in use at the mine. This system would also be used enable detection of any seepage losses from the landfill facility. The system currently in place comprises a program of routine inspections, annual inspections and the use of instrumentation (such as standpipe piezometers within the embankments, and shallow and deep standpipe piezometers).

In comments on the EIS and SEIS, DERM advised that insufficient detail had been provided on the extent and form of the cretaceous mudstones underlying the current TSF and proposed WRD and their likely performance as an impermeable barrier when subjected to stress loading with tailings, waste rock and water in the TSF. DERM considered that additional investigation work is necessary to better characterise the cretaceous mudstone underlying the site of the TSF expansion, so that this information can be taken into account in the detailed engineering design of the TSF. BHPBC investigated the hydraulic performance of local formations by conducting 17 in situ permeability tests of the mudstone, and this was reported in the SEIS. These preliminary results suggest that the material has relatively low permeability.

BHPBC has committed to undertaking additional investigations of the material underlying the TSF through engineering and geotechnical testing to inform the detailed design of the TSF. The proponent acknowledged that ground conditions can vary dependent on the time of year that construction takes place, and the methodology outlined in the EIS may be subject to modification on site during construction, in order to match on-ground conditions.

DERM also expressed concerns with the water management arrangements proposed for the TSF. According to the EIS, the TSF would be designed to withstand the critical three month wet season rainfall, with an annual exceedance probability (AEP) of 1% (estimated at 790 millimetres), no evaporation of rainfall water and 100% catchment runoff. DERM commented that the EIS proposed that augmentation stages of the TSF will be used to store mine-affected water contributed from the TSF, WRD, and ROM and (by implication) the open cut pit. Further the EIS stated that: "while tailings are being deposited, minerals within the TSF will remain submerged and isolated from oxidising conditions". However, DERM does not accept that a TSF can always be operated under saturated conditions (in the nature of a 'wet cover'), as is suggested by the proponent. TSF operations routinely draw oxygen as well as water through the matrix. DERM suggested that the water management strategy for the project should seek to minimise prolonged water contact with the tailings material by providing a dedicated water storage facility near the TSF. In response, the SEIS stated that the water management strategy would include a requirement to remove as much water as possible from the TSF as soon as possible, as is done for the existing operations.

DERM reviewed the information provided in the SEIS and on 29 March 2011 issued a notice of extension with matters to be addressed. DERM remained concerned regarding the provision of sufficient capacity on site to contain seasonal rainfall collected on the TSF. The information given to DERM in the SEIS was based on current assumptions regarding evaporation that this would result in water being present for several months (and even years) at a time. DERM does not consider this approach to be consistent with acceptable mine water management practices. DERM also noted that it was not apparent how the design storage allowance (DSA) estimates referred to as complying with the Technical Guidelines for the Environmental Management of Mines in Queensland, DME (1995) have been translated into commitments for on site design storage volumes for the TSF.

The proponent reiterated that it did not intend using the TSF for water storage and this was factored into the mine water balance. Tailings decant water and rainfall that accumulated in the TSF would be drawn off to the return water dam and used in the process plant. BHPBC stated that a key aspect of its TSF management strategy is to maintain the decant water levels as low as possible, so as to minimise the area of tailings covered by the decant pool. The proponent suggested that this approach would increase the rate of solar drying of tailings, improving dam safety and provide additional storage buffer for large or prolonged rainfall events. In its response to DERM's concerning about water management in the TSF, the proponent's response to DERM (in March 2011) modelled the water balance in the TSF using the management parameters outlined to show that the TSF would store rainfall for less than six months in the absolute worst case weather scenario. However, this approach could result in the tailings being underwater for up to 9 months (6 months plus the wet season) which may not provide sufficient time for the tailings to dry out and consolidate. Consideration should be given to enlarging the capacity of the return water dam so that more of the water on the tailings can be removed.

While this review report found that the design, construction and management of the TSF had been adequately assessed, final details of the TSF, particularly the construction method to ensure integrity of the embankments and base of the TSF, should be provided to DERM, either in the revised EM Plan or as a separate report prior to commencement of TSF construction.

4.9.4 Waste Rock Dump (WRD)

A waste rock dump (WRD) would be required for the permanent disposal of waste rock from the open cut mine. The EIS proposed a single integrated PAF/NAF WRD would be constructed to the east of the proposed open cut. Initially part of the WRD was to be placed across the original channel of Trepell Creek (downstream of the diversion) but was relocated during the assessment process so that all the WRD will now to be located to the east of Trepell Creek. The height of the WRD would now be approximately 90 m (EIS design was 60 m). The EIS identified a total of 125.7 Mt of waste rock to be placed in the WRD over the course of the project, including 52.1 Mt of NAF and 73.6 Mt of UC and PAF waste material.

Location

In comments on the EIS and SEIS, DERM considered that building waste rock dumps in creek lines had been shown historically to be of high environmental risk. Comments were made regarding the location of the WRD particularly in regard to flood immunity and risk of water contacting and enhancing seepage through the WRD. It was considered that by placing the WRD in and across the diverted channel of Trepell Creek that post mining protection of the WRD would be dependent on engineered levees, the design and construction of the WRD and the integrity of the Trepell Creek diversion channel. DERM requested investigation into alternative locations for the WRD than that proposed in the EIS. BHPBC responded by providing a report (April 2011) which presented a number of options for the location of the WRD and an analysis of the relative performance of these options across a number of parameters.

BHPBC argued that the location proposed in the EIS was still its preferred option as:

- it was a minimal distance from the mine pit,
- it would generate minimal seepage,
- any leachate generated would be readily collected and managed using drains, and
- any seepage would report to the void post mining.

It was also argued that the combination of a levee and the diversion of Trepell Creek would provide sufficient flood protection for the WRD and would not result in water being ponded against the levee (other than during creek flood events). Also that the risks of levee failure resulting in over-topping of the void would be reduced due to the WRD being placed in and across the diverted Trepell Creek. All other aspects of the design; noise, dust, traffic management and runoff control could be managed. The location would avoid existing mine infrastructure yet be close enough to keep haul distances sustainable and to divert WRD run-off and leachate to the final void if required.

Of the other five locations and configuration options proposed and analysed, DERM considered that the option that located the WRD on the western side of Trepell Creek, opposite the enlarged TSF, as its preferred option. This option would also have involved the disposal of the PAF material in the extension to the TSF. Reasons stated for preferring this option included:

- Locating the PAF material in a WRD within the TSF would utilise an area of existing accepted risk.
- All poor quality waste would be located in the one location.
- PAF material would be removed from the floodplain.
- The length of diversion of Trepell Creek would be shorter and more likely to achieve normal watercourse flood flow behaviour, thereby reducing the potential for erosion and other long term risks associated with the upstream afflux and geotechnical stability of the levee/WRD combination.
- Storing NAF separately and providing appropriate containment would decrease the long-term liability for the State.
- Some NAF could be used as cover if it was shown to have significant neutralising capacity.

In response, BHPBC provided a detailed comparative analysis of the two preferred locations for the WRD (June, 2011) - the EIS case (east of Trepell Creek) and the location preferred by DERM (west of Trepell Creek). This document restated the reasons why the location described in the EIS was preferred by BHPBC, while identifying significant concerns with DERM's preferred location. These concerns included:

- The need for long interception channels to route seepage to the final void.
- Greater difficulty in segregating runoff from seepage from the WRD - the WRD would extend over natural tributaries of Trepell Creek creating a barrier to drainage which would need to be managed.
- Increased catchment (650 ha) compared to the EIS location (530 ha) reporting to the void post mine closure.
- Protection of the pit from flood flows in Trepell Creek would rely solely on the levee.
- Increased potential for nuisance dust and noise at the accommodation camp.
- Relocation of some infrastructure and storage on the mine site.

In July 2011, further advice was submitted from BHPBC, confirming the company's preferred location for the WRD. This advice included a risk assessment, Failure Mode Effect Analysis and a Decision Making Matrix for both the preferred and alternative locations. Factors considered in the analysis included:

- Management of the WRD seepage
- Management of surface water runoff
- Catchment size contributing to containment release
- Levee associated with the creek diversion
- Noise and vibration
- Dust
- Greenhouse gas emissions
- Traffic management

Based on the all of the available information, BHPBC argued that the WRD location put forward in EIS was consistently found to exhibit the lowest risk and would be more sustainable over the long-term.

DERM considered that insufficient information had been provided, particularly concerning the alternative location of the WRD to complete the assessment of the location of the WRD. BHPBC, in agreement with DERM, commissioned an independent review of the information in the EIS, comments by DERM and the reports (including the comparative analyses) on the matter.

A report was prepared by BHPBC and submitted to DERM. The review report was conducted by a suitably qualified and experienced mining and mineral processing engineer. The report concluded that in the context of metal mines that have been successfully operated and closed, the proposed EIS case for the location of the WRD can be successfully designed, constructed and operated. In making this conclusion, the report considered that the waste rock would be moderately reactive; the seasonal surface flows are manageable with sound engineering, and with quality assurance on construction and operation. The report found that between the two proposed options (EIS case and the alternative case), minimising the footprint of disturbance and containing the mine development within a single catchment or drainage area would improve environmental outcomes. Locating the WRD adjacent to the TSF would constrain the options for the required tailings expansion associated with the project and places the WRD closer to the mine village (thus creating more noise, dust and traffic management issues).

Overall, the reviewer recommended the EIS case over the alternative case. The report recommended that the location of the proposed WRD be moved to ensure that no part of the dump would be placed over the diverted bed of the Trepell Creek. Also, the angle of entry of the diversion to the existing creek channel would be changed to reduce potential for ponding. The new concept design and configuration for the WRD and upstream tie-in for Trepell Creek are shown in Figure 4.1 Proposed open pit layout (CLEP Notice of Amendment EIS, October 2011).

BHPBC subsequently submitted an amendment to the EIS based on the findings of the reviewer's report. The revised waste rock dump will now be located away from the original creek channel and the infilling of the creek channel would be limited to retention dams and haulage roads. The revised WRD would have a smaller footprint (150 ha compared to 160 ha) and be increased in height to 90m (previously 60m), which would be achieved in a series of three 30m lifts.

BHPBC committed to implementing these recommendations in the detailed design, construction and management of the WRD. This review finds that the changes to the location of the WRD and the commitment to undertake further comprehensive design work for the WRD and related structures, adequately addresses matters concerning the location of the WRD.

Revised design and related details would need to be described in detail an amended EM plan.

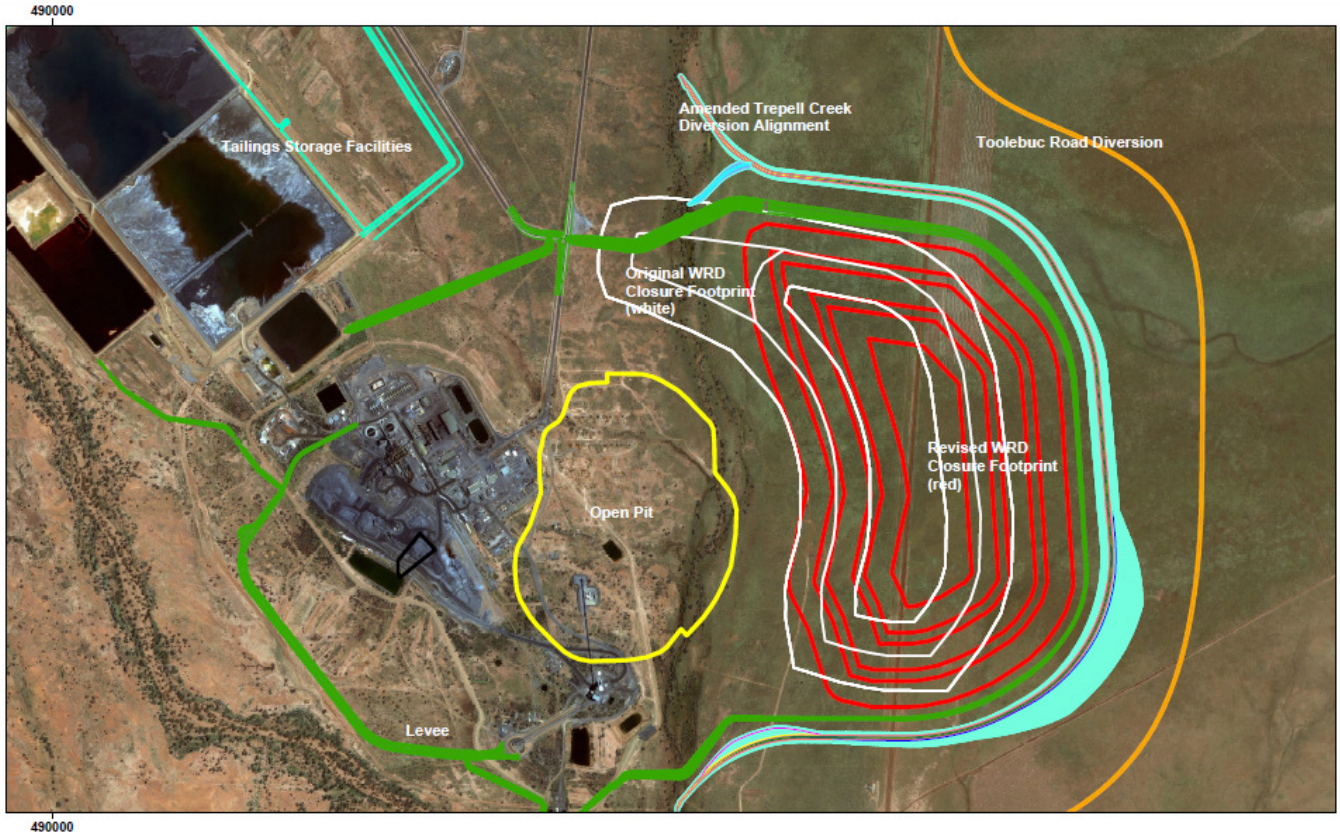

Figure 4-1 Proposed open pit layout (CLEP Notice of Amendment EIS, October 2011)

WRD (and TSF) foundation

As the proposed location of the WRD is also underlain by cretaceous mudstone, most of the concerns raised by DERM concerning the integrity and permeability of this material in relation to the TSF (as described in Section 4.9.3) also apply to the WRD.

However, the concerns regarding the foundations of the WRD are related to risks associated with subsurface flow under the levee bank in the WRD from sediments associated with Trepell Creek; the proposal to provide engineered preferential flow paths under the WRD to direct any seepage to drains (during operations) and ultimately the void at closure; and that the potential for significant infiltration into the WRD (and hence the generation of contaminated seepage) if a 'store and release cover' is used post mining without an underlying low permeability layer.

Concerning the risks associated with the risk of seepage from the levee and diversion of Trepell Creek, BHPBC stated that the design of the levee and diversion would be designed and constructed to afford flood immunity to the WRD under moderate and extreme events up to Q1000 operationally and to PMF at closure. While the afflux upstream of the WRD is predicted to be about 3.0 m during a 1000 year ARI flood event and about 3.5 m for the PMF event, the residence time at these levels is predicted to be less than 50 hours. The levee would be designed to be 6 m high with a base width of 40 m. It should be noted that these predictions are based on the design and layout of the levee and diversion as described in the EIS. The Notice of Amendment to the EIS submitted in October 2011 recommends realignment to reduce the off take of the diversion of Trepell Creek to allow more natural contours and reduce angles to manage energy. It is unclear if this re-alignment will have any impact on afflux or water velocities in the diversion.

The proponent also advised that where significant discontinuities in the mudstone are encountered, the material will be compacted or replaced with suitable materials. The target permeability of the compacted layer is 1 x 10^{-6} to 1 x 10^{-7} cm/s. However, the permeability of a compacted clay liner is required to be about 1 x 10^{-7} cm/s hence this should be the minimum specification achieved. Above this a drainage layer will be reduce the hydraulic load on the clay compacted area and therefor prevent seepage.

In the Notice of Amendment, BHPBC committed to undertaking further investigations of the clayey soils and mudstones by either drilling or seismic surveys to optimise the final WRD pad design. The company also commited to modify the material under the WRD to achieve positive drainage of any seepage to the mine pit, should those investigations indicate significant discontinuities.

As recommended by BHPBC, it should be a condition of the project that the WRD pad/foundation investigation is carried out before final design and construction of the WRD.

DERM requested additional investigation to be undertaken post-SEIS to demonstrate a continuous and significant depth of cretaceous mudstone beneath the WRD and TSF. The feasibility and sustainability of WRD and TSF in relation to seepage into and through the underlying cretaceous mudstone should also be demonstrated. The information should demonstrate how the characteristics of the mudstone will have been taken into account in detailed engineering design of these structures. The bore information presented, which is sparse for the key areas of concern raised by DERM, suggested that the conclusions expressed by WMC regarding the existence and hydraulic performance of underground structures were not based on an extensive data set. The proponent responded that the current available geological and operational information at the Cannington Mine site enabled the hydrogeological characterisation and prediction of hydraulic performance of local formations below the TSF and WRD facilities, for development of concept level designs and control measures with a reasonable level of confidence. This is reviewed in Issue 6 of the main document. However, further ground investigations would be required during more advanced stages of project development to validate current interpretations and enable development of engineering designs of these structures. BHPBC commits to undertake additional investigations prior to detail design of the facilities.

Side slopes

DERMs comments on the EIS raised concerns regarding the proposed overall slope of the WRD of about 1V: 3H as it is not considered optimal for this final landform. Evidence would be needed to show that the final landform would be stable and erosion rates would be acceptable for the proposed design. The proponent responded that a concave profile has been developed for the conceptual landform design which supersedes the original 1:3 slopes and provides improved erosion mitigation. The EIS indicated that further investigation, research and trials would contribute towards optimising a stable landform design. Final slope design would also need to take into account the varying characteristics of the waste rock over the life the mine and the need to selectively place this material to minimise acid and neutral mine drainage as well as erosion.

Management of waste rock

DERM outlined further that waste rocks with the potential to release elevated levels of salts should be managed to reduce environmental risk of impact. The proponent replied that no change is necessary as the EIS already outlined that all waste rock would be placed within the footprint of the proposed WRD and that any waste rock used for construction or other purposes around the site would be tested for salt release and acid drainage. All run-off and toe seepage would be contained within the near vicinity of the WRD in purpose built ponds, and water release would occur only if the water quality meets discharge limits or the water would be utilised as process water, evaporated or managed in an acceptable manner. After closure the waste rock would be covered and surface run-off would not be impacted by salt releases. Percolate from the waste dump, which may be impacted by ongoing salt releases, would be routed to the open pit either as toe seepage or as shallow flows in purpose built drains. Therefore, the proponent concluded that an environmental risk due to salt release from the waste rock after closure is considered to be minimal.

Another issue identified by DERM was the detection of fluorapatite in a composite sample, which raises the possibility of fluorine mineralisation and the need for monitoring of this phenomenon. The proponent responded that the presence of fluoride in groundwater in the Cannington region was recognised in early groundwater monitoring and that groundwater fluoride concentrations in Proterozoic rocks in the vicinity of the proposed open pit were present in the range 1 mg/L to 5 mg/L. These results were consistent with anecdotal advice that fluoride is naturally and commonly elevated in groundwater aquifers throughout the Cannington Mine region and in many parts of the GAB. Hence, the presence of naturally elevated fluoride in the groundwater is recognised. Fluoride is monitored at the Cannington Mine as part of routine water monitoring programmes and this would continue for the duration of the extension project.

DERM requested that testing should be undertaken to model the "likely case" and "worst case" scenarios in relation to metal mobility due to seepage into and drainage from the WRD. As a response to this comment, the SEIS presented lower and upper case water quality run-off and metal mobility from the WRD. DERM required further testing in order to model "likely case" water quality flowing through the NAF into the field environment. In the SEIS, BHPBC provided estimates of the solute concentrations in the percolate from the WRD upper and lower lifts. These concentrations represent the steady state release rates once percolation rates have stabilised. It is estimated that these concentrations would continue for up to 280 years, although this would need to be re-assessed as the Notification of Change notice of October 2011 indicated that there would be three lifts of the WRD.

While characterisation of non-acid forming (NAF) and PAF material has been adequately described in the EIS documentation details of how this material will be managed to minimise possible acid and neutral drainage and run-off, was not fully addressed.

Review of the EIS details the initial geochemical work done in relation to waste rock. While the level of testing done is deemed appropriate for this stage of the assessment process, the Department has some concerns with the application of these results for the WRD design. Specifically, the information presented in the EIS shows a strong potential for the development of neutral and saline drainage from certain lithologies under certain laboratory conditions.

BHPBC's Response to DERM Notice of Extension and Matters to be addressed (of March 2011) advised that the potential for salinity release is indicated by the paste EC values obtained for all samples. The kinetic test results further indicated that salinity is flushed from the material rapidly (within two or three flushes) and there is little or no ongoing production of salinity. The reported concluded that the source of the salinity was finite and may originate from local water sources used for the drilling used to collect the samples, or it may be sourced from saline pore water in the finely crushed material used for testing. It concluded that in any case, not all of the salt release indicated by the paste EC values would be available for release and the potential for salinity release would less than indicated by the laboratory testing.

DERM also queried how PAF waste would be handled during mine operation and how the WRD would be designed to manage the risks associated with acid, neutral or saline drainage generation. In the additional information provided by BHPBC in March and June 2011, details were provided of a dumping strategy whereby PAF material would be encircled by NAF material. This approach was also tested against the waste production schedule to ensure that sufficient NAF material would be available for completion of the dump in this way. It should be noted that this design was specific to the proposed two tiers lifting of the WRD. The Notice of Amendment outlined a proposed three tier lifting of the WRD. This strategy for encapsulating the PAF material in the WRD will obviously also need to be tested against this three tier design of the WRD.

Rehabilitation

DERM comments on EIS and SEIS regarding rehabilitation of the WRD are discussed below in section 4.19.3 of this report.

Flood protection

As the BHPBC preferred location of the WRD is within the flood zone of Trepell Creek, DERM required the hydrology to demonstrate that the WRD had an acceptable level of flood immunity. The EIS outlined the performance of the proposed levees and diversion of Trepell Creek in providing flood protection to the pit and void post mining.

DERM reviewed the proposed creek diversion in the EIS and the SEIS and outlined several unresolved issues regarding measures to provide flood immunity, mitigation of flood impacts at all stages of the project, including rehabilitation. DERM commented that the analysis of potential flood impacts in the EIS or SEIS was insufficient. The current proposed immunity during operations is AEP (annual exceedence probability) is 1 in 500 for the pit. An AEP of 1 in 500 represents a 2% probability of failure over the minimum 10 years projected for active operations, and approximately 4% over 20 years. A realistic assessment might reveal a longer period of operational risk for structures, before long term (foreseeable future) probable maximum flood (PMF) immunity is provided. DERM advised that the potential impacts of flood events rarer than AEP 1 in 1,000 should be determined and documented. Operational flood immunity or protection for proposed pits, underground operations, TSF and WRD should be to an appropriate standard of less than AEP 1 in 1,000. As a response the these comments BHPBC

committed to providing 1,000 year ARI flood immunity to the pit during operations and PMF immunity post mining. This commitment is further outlined in section 4.10 of this report

In design of the WRD described in the EIS, part of the WRD was to be constructed across the original channel of Trepell Creek and it was stated that this would assist in enhancing the flood immunity of the pit (and void protection post mining). However, DERM was concerned that the integrity of the WRD could be compromised should the flood waters become directly in contact with the WRD. In its response, BHPBC explained out that there would be a levee to prevent flood flow contact with the WRD. This levee would also serve a function in the separation of mine affected run-off from non-mine affected Trepell Creek flow. It would be designed to withstand a Q1000 flood event during mine operation and to PMF at mine closure. It was stressed that the levee would be a standalone compacted low permeability embankment during mine operations and at closure.

The changed location WRD briefly described in the Notice of Amendment (namely, locating the WRD to the east of the Trepell Creek channel) will require the flood immunity of WRD (and the void) to be revisited and new details provided to DERM prior to finalisation of the amended EA for the project. This would need to include details of the levee system to be used during mine operation and post mining to protect the WRD and void from flood waters.

4.9.5 Regulated waste

The EIS outlined that waste management procedures from the existing Cannington Mine would remain for the duration of the project. Updates to these procedures would be undertaken as required. Onsite waste would continue to be separated through the use of coloured waste bins located throughout the site. The project would continue to utilise existing waste stockpiles and storage areas to minimise environmental disturbance. BHPBC's minimal waste creation approach would be maintained.

The landfill site would be prepared and managed in accordance with the existing Cannington Mine landfill management plan. This plan would be updated to reflect the extension. Seepage would continue to be monitored as part of the groundwater monitoring programme.

4.9.6 Liquid wastes

The EIS outlined that the main sources of liquid wastes created by the project include truck washdown water, dewatering water from pit, sewage, stormwater run-off from disturbed area and contaminated run-off, process and tailings water.

BHPBC currently operates separate light and heavy vehicle washdown bays. New washdown bays would be constructed for the surface fleet in the extended mine infrastructure area as the project develops. A sediment trap would remove solids from washdown water at the vehicle washdown bays. An oily water separator would remove oils and petroleum products from the washdown water with the clean water being collected in an evaporation pond. Waste oils from the oily water separator pad would be collected in a bulk waste oil storage tank and removed from site by a licensed waste transport contractor.

During the development of the open cut pit, Trepell Creek would be diverted to the east of the WRD, with the pit rim protected from surface water flooding by the configuration of the WRD and north and south levees. Therefore, surface water inflows to the pit operation are only expected to arise from direct precipitation within the footprint of the pit. Under average monthly conditions, the evaporation rate exceeds the precipitation rates by a ratio of approximately 2 to 4 times during the wet season (December – March). Therefore the EIS concluded that pit flowing over an extended period of time would not be expected. However, individual rainfall events of approximately 50 mm to 200 mm may typically be observed that may cause temporary pit flooding during a few days or possibly weeks, resulting in temporary interruptions to mining activities in the pit. Based on the frequency analysis for extreme precipitation events in the area, the volume of water inflows has been estimated for a single 72 hour event over the open pit life and area. A predicted total of 164 ML of pit inflow could be expected during a 72 hour 100 year ARI rainfall event during the later years of pit development. Continual monitoring would be undertaken during the development of the open cut to determine structure stability and potential water inflows.

Although groundwater stored in the pit walls would not represent an impediment to the mining and removal of the material, the presence of groundwater would be an important factor for the stability of the pit slopes, the design of the open cut pit and optimisation of the mining operation. High groundwater pore pressures could significantly

reduce safety and increase the risk of slope failure. The maximum total groundwater projected pit inflow would be expected to be less than 15 L/s. The flows would be most efficiently managed by allowing them to drain to sump at the base of the pit, for removal initially via evaporation and during later mine years by a pumping and reticulation system. The rate of groundwater inflow observed during the initial years of open cut mining would help to refine the operating conditions for the in-pit pumping system. Bores in the Trepell Fault are proposed to be located to the northwest and southeast of the proposed pit area and ideally outside of the pit perimeter to maximise the bores' life. Water from the dewatering operations of the pit would be recycled for use during ore processing and dust suppression on the site and haul roads when water quality allows.

Stormwater from rainfall occurring on areas disturbed by mining activities would be contained in existing and some new stormwater ponds. These ponds have been specifically designed to receive the quantities and qualities of stormwater produced over the life of the mine. To efficiently manage stormwater run-off on site, stormwater would be directed to open channels and directed away from the mining infrastructure area to the new and existing storage ponds. A spillway meeting relevant design criteria would be incorporated into the design of the storage pond. A potential for acid generation from the WRD, TSF and the ROM stockpile would exist. Potential run-off and seepage from these areas would be intercepted and the water returned to the TSF or through the process circuit. Process water would be contained in an existing process water dam. Process water would be made up of recycled water from the processing plant, water returned from the tailings circuit, dewatered water, storm water and a small amount of raw water. The process water pond would be not expected to require additional capacity for the operation of the project.

4.10 Water resources

This section of the EIS described the existing environment for water resources that would be affected by the proposal in the context of environmental values.

Water is currently supplied to the existing mine through eight sub-artesian bores in the GAB drawing approximately 1,900 Mlpa, a raw water dam with a storage capacity of 22.1 ML and potable water being produced by two reverse osmosis treatment plants at a combined rate of approximately 0.4 ML per day. The project would invoke an additional water demand for processing, dust suppression and increased numbers of personnel, and an extension to the licence duration. The increase in demand would exceed the current GAB licence allowance of 2,210 MLpa. An extension to the water extraction allowance and duration would be sought from DERM.

Based on the assumption of BHPBC receiving an increase in its water allocation, two options were considered to meet the project's increased water demand. One option considered was the installation of additional bores with bores operating below capacity, but having more reserve capacity. This option would allow for bore maintenance and potential bore failure without affecting the project. A second option would be to utilise existing bores at an increase operational rate. The second option would be preferred by BHPBC as no additional infrastructure or disturbance would be required and there would be adequate reserve capacity. Options for increased re-use and recycling of water are under investigation and implementation. Fluorine leach liquor currently sent to evaporation ponds may be suitable for recycling through the process plant. The EIS expected that with improved treatment, sewage effluent would also be suitable for reuse in the process circuit.

A bore field booster pump transfers the water from the collection tank to the mine site along a single buried pipeline. Water would be transported via an underground poly pipe network to the raw water storage dam at the Cannington Mine site. Raw water from the borefield would be close to potable quality and would be used as process water or fire water or directed to the reverse osmosis plant for treatment to potable standard. The main raw water storage dam would have a maximum storage capacity of 22,100 m^3. This dam would be retained in its current capacity for the project. The EIS outlined that the operation would take every opportunity to further conserve and recycle water on site using several strategies. These strategies would need to be outlined in the EM Plan and plan of operations for the project.

4.10.1 Surface water

As part of EIS, a scoping level water balance for the operation was developed to assess the management of run-off from surface catchments and potential water returns from each facility. The water balance model was based on a

water management strategy developed for the project as part of the hydrological studies and took into account of the key issues such as:

- Diversion of Trepell Creek to avoid potential flooding of the mine pit and void.
- Maintain a separation between undisturbed catchments and disturbed catchments.
- Divert surface run-off from undisturbed catchments either to Hamilton River or to Trepell Creek.
- Run-off from disturbed catchments would be diverted to retention dams from where water would be pumped back to the processing plant and / or evaporated.
- The existing mine infrastructure area catchment has five active retention dams constructed for the underground mine operation and would be based on a catchment area of 126 ha prior to the development of the open cut pit.
- Construction of a northern dam and WRD retention dam.
- Only direct precipitation contributes to water pooling in the open cut pit and no surface catchment would be diverted into the pit during the operating period.
- Based on the engineering designs, the expanded TSF would be assumed to have sufficient capacity to contain all but extreme precipitation events without overflow.

The EIS stated that existing surface water flow and stormwater management would be administered through the Cannington Mine Water Management System that incorporates a site-wide water balance and stormwater containment and control. It was stated that water management for the expansion project at mine aims to conform to its existing EA conditions and the EPP (Water) 2008.

The proponent developed a surface water management plan (SWMP) in order to control waters flowing towards, from and through the project site; to manage the generation and containment of potentially poor quality water; to identify potential sources of pollution; divert uncontaminated water (i.e. run-off from undisturbed surfaces) to the receiving environment; capture and contain potentially contaminated site water, and recycle stormwater from the stormwater retention dams. The design criteria for project site surface water retention have been based on QDME's 1995 Technical Guideline – Site Water Management.

The surface water section described in the EIS and summarised above received numerous comments from DERM. DERM commented that while the EIS described that water would continue to be sourced from the GAB and augmented by surface water intercepted for pollution prevention, the regulation of the take of overland flow is governed by the *Water Act 2000* and the Water Resource (Georgina and Diamantina) Plan 2004. DERM was also concerned about the use of average monthly evaporation for the estimation of volume of water in the pit. In response, the SEIS provided revised water balance modelling of operational water management using recognised proprietary models and evaporation assumptions..

In its review of the SEIS, DERM raised concerns that the SEIS did not comprehensively address the hydrology before, during and after the proposed project (particularly in relation to flooding - 1,000 year ARI and PMF) and that the results of the hydrology studies could be better presented using maps and graphics. The proponent prepared a flood study addressing hydrology before and after the proposed project and has submitted it to DERM as a component of the Response to DERM Notice of Extension and Matters to be addressed, March 2011. As the operational and post closure footprints would be essentially the same, the flood study considered two scenarios: existing conditions and post development. Mondeling of the existing conditions predicted that some surface areas around the mine currently have less than 1,000 year ARI flood immunity. Immunity of the critical facilities on site (access portals, ventilation shafts) was addressed in the Cannington Project Feasibility Study, predicting flood levels across the site for a range of ARIs. Recommendations from this study were implemented in full therefore flood risk and protection of the critical facilities on site was fully taken into account during planning and implementation. The proposed mine expansion would be provided with 1,000 year ARI flood immunity operationally and PMF flood immunity after closure. The levee crest levels would be set according to the hydrodynamic modelling results, with suitable freeboard provision.

The stability of the proposed diversion was assessed during functional design, and is described in the EIS. The proponent stated that the 1,000 year ARI and PMF flood events are not a design criterion typically applied for diversions as it is unrealistic to expect waterway stability in such extreme events, when change would be expected within a natural system. Nevertheless, it was acknowledged that resilience would be included in the diversion

design to ensure that any change occurring as a result of an extreme event will not be catastrophic. The flood study examined velocity rates through the diversion and across the site as a stability indicator, and discussed the likely stability performance.

4.10.2 Groundwater

Water for use on the mine would continue to be sourced from the GAB and augmented by surface water intercepted for pollution prevention. The current water license provides for a take of 2,210 ML per year but this would be slightly exceeded in 2014 and abstraction continues beyond the current license expiry date (30/06/2022) until 2026. From 2014 to 2022, the borefield would be abstracting water at its highest rate.

Net water consumption by the process plant would increase to approximately 4.0 ML/d to accommodate the increased processing rate. Other demand increases would derive from additional dust suppression and wash-down requirements. The daily water demand would increase to approximately 6.4 ML/d at the peak of the open cut operation which equates to approximately 2,340 ML per annum. As the projected water demand exceeds the existing extraction license limit by 130 MLpa and the extraction license timeframe, an amendment of the existing licence would be sought for the project.

Environmental values identified for the local groundwater system are those represented by the ecological integrity of the water and as a source of stock drinking water. The elevation and, thus, availability of this water source has the potential to be impacted by open cut mining which would cause some depressurisation of the groundwater.

The overall effect of open cut mining on local groundwater would be minor local depressurisation. This would be limited mainly to the Proterozoic rocks but possibly into the basal Cretaceous sands in the vicinity of the open cut pit. These geologic units have already been partly depressurised as a result of the underground mining activities. Development of the open cut mine would slightly increase the extent and degree of depressurisation in these units. This effect would be limited by the relatively shallow depth of the pit (approximately 225 m), current groundwater elevation and the limited nature of the hydrogeological connection between the Proterozoic rocks and the sands. Due to the low hydraulic conductivity of the Proterozoic rocks on a regional basis, and the presence of compartmentalising structures, the total inflows to the pit are estimated to be low (< 15 L/s). Consequently, the depressurisation would be restricted primarily to the pit area with very limited propagation into the basement underlying the GAB.

The nearest stock water supply bores known to be present in this area are situated 3 km south and 5 km northeast of the proposed open cut, including supply to Cannington Station. The remaining regional stock-water bores are located more than 10 km from the open cut. If any remediation would be required over the life of the open pit, it would take the form of either lowering the existing pump, or providing a replacement water supply bore. Although groundwater quality has not been affected by the existing underground mining operation, local groundwater around the open cut may have limited use for livestock drinking water based on comparisons with the ANZECC (2000) guidelines for water quality.

The potential for contamination of groundwater at the project site would derive from seepage or discharge from the existing and expanded TSF, run-off from ore processing, fuel storage and chemical handling areas, seepage and run-off from any potentially acid generating rocks stored in the WRD and any ARD impacted or elevated metal level water pooling at the base of the open pit, if the water level is above the local groundwater elevation.

The Cannington Mine water management system would be updated to included changes that would be implemented for the open cut mine and has been designed to minimise the risk of discharge of impacted waters. Once the open cut pit would be excavated, the confining mudstone layer would be removed in the pit area. Any discharges of impacted water which enter the pit could potentially seep into the underlying groundwater system. However, the EIS concluded that the vulnerability of these systems would remain low. A robust monitoring network has been installed surrounding the proposed open cut pit, and a monitoring programme has been prepared to adequately characterise the effects of the proposed project.

Environmental values identified for the groundwater of the GAB include those represented by the ecological integrity of the water and as a water source for nearby pastoral properties. The elevation and thus availability of this water source could potentially be impacted by depressurisation due to borefield extraction and open cut mining abstraction.

Groundwater samples are collected regularly from the production bores in the Cannington borefield. Results of hydrochemical analyses from monitoring over the ten year operating period were reviewed and the results were presented in the EIS. They showed that potential impacts of borefield operation were restricted to regional depressurisation of the Longsight Sandstone and the implications of any depressurisation on existing groundwater users in the region. Given no long-term changes to water quality have occurred during the operation of Cannington Mine, the EIS concluded that the proposed project would vary little and the quality of GAB water is not anticipated to be impacted by the extension. Furthermore, the EIS stated that the GAB water represents a potential resource to surface aquatics ecosystems, where it emerges at or near the surface. However, the zone of influence of the Cannington Mine bore field does not overly or is marginal to such systems. Therefore, the localised and temporary effects of groundwater abstraction by the project would not be expected to affect surface ecosystems.

Hydrogeological mitigation measures, implemented already for the existing Cannington Mine would continue to be implemented for CLEP. Furthermore, the EIS stated that the existing mine operates a groundwater and seepage monitoring network designed to monitor groundwater and seepage conditions and identify potential changes in groundwater quality and quantity. This network has been extended to help characterise baseline conditions prior to development of the proposed open pit and will be maintained during the project as part of onsite water management. The contaminant trigger levels were developed with reference to background groundwater conditions in accordance with the ANZECC (2000) Livestock Water Quality Guidelines and are outlined in the project's EM Plan. Additional seepage and groundwater monitoring was proposed for both the TSF and the WRD. However, the EIS outlined that further studies would be required in order to determine appropriate locations.

The groundwater section described in the EIS received several comments by DERM, requesting clarification on additional allocation of water from the Great Artesian Basin to meet project water demand and on the identification of the extent of the proposed open cut pit in relation to regional GAB aquifers in the area. As a result the proponent made changes to the SEIS and had initial consultation with DERM about future GAB water requirements. Further modelling of water demands and impacts on the GAB is being undertaken by the proponent to support an application for access to unallocated water from the State reserve to meet requirements for the CLEP.

4.10.3 Post closure water management

Disturbed sites will be rehabilitated and decontaminated in order to return them to a stable, non-polluting condition and where possible similar to pre-existing landforms. Permanent new landforms remaining after mining would be the Trepell Creek diversion, the TSF, the WRD and the open pit void. Closure strategies and rehabilitation for these are further described in section 4.19 of this report.

4.11 Air quality

The EIS characterised the atmospheric environmental values relevant to the project in the context of likely emissions and sensitive receiving locations. The nearest residential dwelling would be Cannington Homestead, located approximately 3 km to the south of the project site. Cannington Mine's accommodation village would be located approximately 4 km to the north of the project site. Glenholme Homestead to the north northeast and Squirrel Hills Homestead to the west northwest of the project site are also located in the vicinity, approximately 14 km and 18 km away from the project site respectively. Trepell Station Homestead is abandoned and no longer in use and has therefore not been considered as a sensitive receiver.

An air modelling and assessment was carried out in order to determine likely dust levels at sensitive receivers during the operation of the project. The focus of the study was on the potential effects of particulate matter (PM) emissions on the air shed and nearby residences as they are considered the major air quality issues and impacts that are commonly associated with open cut mining activities. Dust levels for the project were modelled for assessment against governmental guidelines. Modelled dust levels were recorded below the EPP (Air) 2008 guidelines at all sensitive receiver locations during peak mining periods. The EIS concluded that potential human health impacts from poor air quality were unlikely, due to the project's compliance with air quality guidelines. Regular air monitoring and dust suppression management would be implemented to minimise the risk of air contaminants from impacting human health. Air quality assessments as part of the EIS studies have indicated that all legislative Air Quality Goals would be met at the sensitive receivers, including PM_{10}, TSP and dust deposition concentration. The project would be managed so that the 24-hour PM_{10} concentrations do not increase above 50 $\mu g/m^3$, which would be equivalent to limiting the increase in 24-hour average $PM_{2.5}$ concentrations to 6 $\mu g/m^3$. The associated increase

in daily mortality risk for an individual would then be 1 in 9.75 million. The increase in risk of daily mortality on the worst day in the life of the mine would be estimated to be 1 in 9.31 million. This would be a small risk and the increase in risk for hospital admission would also be low.

Concentrations of lead, silver and zinc were also modelled for different mine materials and applied to the TSP levels, to determine total pollutant concentrations. The modelling results predicted no exceedances of DERM's air quality objectives at any of homesteads or Cannington Mine accommodation village.

The EIS excluded sulfur dioxide (SO_2) as part of their studies. The EIS concluded that low sulfur content of Australian diesel in combination with mining equipment that would be widely dispersed over mine sites would be such that it would not cause sulfur dioxide (SO_2) goals to be exceeded. As such, on site SO_2 emission would not contribute to the generation of acid rain or acidification of other atmospheric condensation. For this reason, no detailed study was considered necessary for SO_2 emissions. Similarly, oxides of nitrogen (NOx) and carbon monoxide (CO) emissions from the project activities would be too small and too widely dispersed to require a detailed modelling assessment. No further assessment of these pollutants was considered necessary.

The EIS further stated that dust emissions would arise from various activities at open-cut mines. Both particulate matter and metals (such as aluminium, antimony, lead, vanadium zinc and silver) may be associated with the dust emissions. Existing operations have been combined with emission factors developed, both locally and by the US Environmental Protection Agency, to estimate the air emissions of the proposed project.

The EIS analysed the mining plans and detailed dust emissions inventories for three separate peak emission scenarios:

- Year 2013: underground and first year of open cut operations
- Year 2018: highest total mass
- Year 2022: final year of operations.

The EIS concluded that no significant air emissions would be expected to be produced as a result of the limited development that would occur during the construction of the project, or as a result of the project operations.

The EIS stated further that no significant odour would be expected as result of the mining and processing activities. The only activities to be conducted that could potentially cause odour would be the disposal of putrescible wastes and the sewage treatment facilities. Given the distance of the nearest residence from these activities, the EIS concluded that it would be highly unlikely that odour nuisance would occur.

Potential impacts of climate change on local air quality were analysed. The EIS concluded that the effects of climate change on the project site were expected to trend towards slightly drier and windier conditions over the 14 year life of the project. This could result in a slight increase in dust emissions. It should be noted that climate change projections apply to a timescale significantly longer than the proposed operational period and the likely changes are small compared with the current year-to-year variation currently experienced. Therefore the project would not be expected to have any difficulty in adapting to the effects that these changes would have on air quality management.

A greenhouse gas assessment (GHG) was conducted for the project. BHPBC estimated the energy production for the project to be 0.797 PJ. Minor emissions expected from decomposition of cleared vegetation were not included in the assessment as the majority of disturbance associated with the project site would be revegetated to replicate current vegetation communities, thereby, over time requisitioning the majority of greenhouse gas emissions consequent of the original clearing. The project was estimated to consume annual maximum energy of 3.358 PJ, generating annual average emissions of 180.7 kt CO_2-e. The model suggested that annual maximum CO2-e emissions would peak at 188.45 kt CO_2-e in 2020, declining soon after. This represented an increase in average annual emissions of approximately 50 kt CO_2-e (30%) based on 2009 estimated emissions. The additional surface mobile fleet and power demand were the most significant contributions to the predicted increase in emissions.

The proponent stated that it is committed to the efficient use of electricity and also implements other operational practises to help minimise the production of greenhouse gas emissions. As the project would be based around the existing Cannington Mine, limitation exist for the replacement of faculties to help decrease greenhouse gases, The proponent would manage greenhouse gases by ensuring that opportunities to reduce the projects emissions further during operations are pursued. The legislative requirement for the project would be to report under the *National Greenhouse and Energy Reporting Act 2007* (Cth).

DERM made a number of comments on the EIS requesting more information on air quality issues. The results of modelling for dust deposition were provided in the EIS on an annual basis, rather than a monthly as required by the Environmental Protection (Air) Policy 2008. Monthly average dust deposition levels were provided in the SEIS and they indicated there would be no exceedence of EPP (Air) policy levels at any sensitive receptor throughout the life of the project. DERM also requested that cumulative 24 hr PM_{10} concentrations should be provided. In response BHPBC used DERM data to predict PM_{10} concentrations for the project alone and cumulatively. None of the sensitive locations are predicted to experience an exceedence of the Queensland air quality objective of 50ug/m3 including the allowable exceedences of five days per year.

DERM also recommended an assessment of metals in dust and fine particulate matter for the respective air quality criteria contained in the EPP (Air) 2008. In response, BHPBC reported in the SEIS that no waste rock samples were found to be significantly enriched with respect to magnesium or vanadium, while only one sample showed enrichment for nickel. It is concluded from these results that there is no significant likelihood of exposing materials enriched in these elements or otherwise liberating the elements. As such, no further assessment was completed for these three metals. Further that the SEIS contains a summary of the predicted annual average TSP or PM_{10} concentrations and the associated metal concentrations has been undertaken for the revised air assessment. The results show no predicted exceedances of DERM or DECCW goals at any homestead or the Cannington Mine accommodation village.

4.12 Noise and vibration

The EIS described the existing environment values that may be affected by noise and vibration from the project.

The noise and vibration assessment characterised acoustic environmental values in terms of existing noise levels (measured and modelled) at noise sensitive receivers relevant to the proposal. The project is in a remote and sparsely populated location, approximately 75 km from the nearest township (McKinlay). As outlined above three occupied homesteads situated closest to the project are the only noise sensitive receivers for the purpose of regulation. The Cannington Mine accommodation village is an existing mine village dedicated for mining operations close to the mine (approximately 4 km), and is evaluated as a sensitive receiver, although it is not relevant for regulatory purposes. Trepell Station is unoccupied and no longer in use and has therefore not been considered as a sensitive receiver.

Noise modelling and vibration calculations were undertaken as part of the EIS in order to predict noise and vibrations levels at the surrounding sensitive receivers. The noise and vibration impacts from the project were assessed against the DERM Ecoaccess Guideline Planning for Noise Control, WHO guidelines and blasting limits contained in the EPP (Noise) 2008, with the following results:

- Noise levels at Glenholme and Squirrel Hills Stations were predicted to meet all noise criteria.
- Those at Cannington Station were predicted to exceed the Ecoaccess design noise guideline level at night for most night-time hours, and some daytime hours.
- The predicted noise levels at Cannington Station exceeded the recommended guideline EM Plan limits, which are based on ‘background plus’ type noise criteria.
- The predicted future noise levels achieved the sleep annoyance goals with the proposed operations.
- The low frequency noise criteria would be met based on predicted future noise levels.
- Air blast and vibration levels were predicted to be acceptable.

The EIS concluded that it would be unlikely that the noise levels would result in a greater exceedance of criteria than those reported in the EIS. The following monitoring and mitigation strategies were proposed to limit possible negative noise related impacts:

- Consultations with residents at Cannington Station regarding the current and predicted noise levels and reach agreement on noise management.
- Noise monitoring to be conducted periodically at the nearest sensitive receivers as outlined in the EIS/EM Plan
- If future noise monitoring indicates an exceedance of noise limits in and the affected resident(s) indicate these noise levels cause annoyance, then a review noise control options for the mine would need to be implemented.

This section of the EIS attracted several comments from DERM. Comments included the lack of a figure showing the location of noise sources and that off-site noise impacts should be addressed. The proponent addressed these concerns in the SEIS including the impact of noise from offsite roads. The SEIS reported that the increase in mine-related traffic between Cannington and McKinlay and on the Landsborough Highway would likely equate to daily traffic noise levels increasing by 0.5 dB(A). An increase in the daily traffic noise level of 0.5 dB(A) would not normally be considered significant, or warrant any further investigation or noise control measures. Therefore, the offsite vehicle impacts are considered acceptable.

DERM reviewed the SEIS and had concerns regarding the high noise level predicted at Cannington Station during unfavourable meteorological conditions (temperature inversion and light wind from the mine to the homestead). The remodelling in the SEIS stated noise levels at Cannington Station from the fixed plant are estimated at 33 dB(A), which is reasonable at night, even though the background levels are much lower, about 25 dB(A). The noise from the mobile equipment is predicted to be 29±5 dB(A), which is imprecise, and could lead to total worst case levels up to 37 dB(A). Hence, DERM deemed it necessary for the proponent to provide for the installation of noise mitigation measures to this homestead. The proponent responded that the model predicted occasional high noise levels for both existing and proposed scenarios at Cannington Station. The model is considered to be conservative (overestimating) and to date, noise complaints have not been received from Cannington Station. However, BHPBC recognised the potential for elevated noise as determined from the acoustic modelling presented in the EIS. However, as the elevated levels are predicated only to occur at night, and that attenuation of noise inside a dwelling with open windows is expected to be in the range of 5 to 15 dB(A) it is likely that the indoor noise goal of 30 dB(A) is likely to be met. Even so, BHPBC have committed to implement noise mitigation at the dwelling if the 30 dB (A) level is not achieved.

4.13 Nature Conservation

4.13.1 Terrestrial ecology

The project site lies just inside the northern boundary of the Mitchell Grass Downs Bioregion. The North West Highland Bioregion begins approximately 2 km west of the project and the Gulf Plains Bioregion begins approximately 10 km north of the project site.

Four vegetation communities were found on the project site during surveys. All communities are classed as remnant least concern vegetation under the *Vegetation Management Act 1999* (VM Act). No listed threatened ecological communities under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were found. The original vegetation communities within the project site have been modified as a consequence of grazing activities, mineral exploration, changed fire regimes and weed invasion.

A total of 222 flora species were identified, none of which are listed as threatened under the *Nature Conservation Act 1992* (NC Act) or EPBC Act. Several species were introduced with one (Parkinsonia, *Parkinsonia aculeate*) of these being identified as Class 2 pest species under Queensland's *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act).

A total of 84 vertebrate fauna species were found during fauna surveys, comprising 14 reptiles, 47 birds, 18 mammals and five amphibians. One listed threatened species was recorded on site, the Little Pied Bat (*Chalinolobus picatus*), listed as near threatened under the NC Act. Nine of the bird species, listed as migratory and/or marine under the EPBC Act, were observed on the project site. Two introduced species were identified on the project site, the Feral Cat (*Felis catus*) and Dingo (*Canis familiaris dingo*), which are declared as Class 2 pests under the LP Act.

Vegetation communities directly affected by the project are Mitchell Grassland (REs 4.4.1 and 4.9.2), Coolabah Riparian Woodland (RE 4.3.4) and a small area of Gidgee Open Woodland (RE 4.4.1x3). The total surface area of new disturbance would be approximately 380 ha comprising 346 ha of Mitchell Grassland, 25 ha of Coolabah Riparian Woodland and 9 ha of Gidgee Open Woodland, all of which are listed as least concern under the VM Act (Table 4.2). The Mitchell Grassland community would be affected by the WRD, expanded TSF, the diversion of Trepell Creek and the open cut pit. This community was well represented on the project site and widespread throughout the wider region. It would be unlikely therefore that the proposed disturbance would have a significant impact on critical habitat or the ecological values of this community.

The construction of the WRD and the open pit in Trepell Creek would result in a loss of some Coolabah Riparian Woodland (RE 4.4.1x3) along this watercourse. This therefore would cause a loss of some surface pools that persist longer than in Hamilton River and provide nesting habitat for a number of migratory bird species.

Weeds are present to only a minor degree on the project site, only two weed species were recorded during the flora and fauna survey. If invasive weeds were to establish, these may compete against the establishment of native vegetation.

Table 4.2 Regional Ecosystems to be cleared in the project site

Regional Ecosystem	Total area on project Site (ha)	Area to be cleared (ha)	VMA class[1]	Biodiversity status[2]
Mitchell grassland *Astrebla pectinata +/- Aristida latifolia +/- Eulalia aurea* grassland on Tertiary sediments overlying limestone (RE 4.4.1) and *Astrebla lappacea and A. pectinata +/- A. elymoides* grassland on Cretaceous sediments (RE 4.9.2)	9232	346	Least concern	No concern at present
River Red Gum Riparian Woodland *Eucalyptus camaldulensis +/- Melaleuca* spp. woodland on drainage lines (RE 4.3.1)	221	0	Least concern	No concern at present
Coolabah Riparian Woodland *Eucalyptus coolabah* open woodland on drainage lines/plains (RE 4.3.4)	420	25	Least concern	No concern at present
Gidgee Open Woodland *Acacia cambagei* low woodland with a sparse tussock grass ground layer of *Astrebla* spp., *Iseilema* spp. and *Eulalia aurea*. Occurs on older alluvium; self-mulching clays (RE 4.4.1x3)	1190	9	Least concern	No concern at present
Total (ha)	**11063**	**380**		

[1]VMA Class - Conservation status under the VM Act. The proponent used outdated terms in the report: instead of least concern the EIS referred to as 'not of concern'.

[2]Biodiversity status - Conservation status under DERM's Regional Ecosystem Description Database.

DERM commented that the vegetation mapping in the EIS was not undertaken at a suitable detailed manner, also that photo patterns which are evident from satellite images were not mapped. In response, the proponent stated that a survey plan to address sampling intensity of a map present at 1:10,000 scale was in development and that a survey would be undertaken to characterise patterns identified in aerial photographs. Vegetation mapping would be reassessed during a field survey. The proponent also stated that additional ecology surveys were carried out in 2011 and a final 'Terrestrial flora and fauna report', incorporating the 2011 survey results and some of the issues raised by DERM, will be submitted to DERM before a decision on the final environmental approvals has been made.

Other concerns raised by DERM including the land zones, vegetation descriptions incorporating structural terms, species likely to occur within a 150km radius of the project, habitat corridors, further information on potential impacts on terrestrial flora, and sensitive areas, were addressed in the SEIS.

DERM reviewed the SEIS and determined that the responses were adequate to allow the completion of the EIS process.

4.13.2 Aquatic ecology

The ephemeral watercourses and drainage lines presented on the project site were typical of ephemeral systems within the broader region, with no permanent water bodies. Periodically flowing watercourses often occur during the wet season (December through to March) after heavy rainfall events.

Aquatic nekton (actively swimming aquatic organisms) were captured with traps and cast. Identified species were typical of nekton species found in ephemeral stream systems within the northwest Queensland region, such as the Spangled Perch, the Bony Bream, the Eastern Rainbowfish and a freshwater crab (*Austrothelphusa transversa*). These species composition indicated that the nekton fauna was persistent, though not highly diverse, as these are known to be hardy and have the capacity to withstand long, dry periods. A total of 27 macro-invertebrate taxa (Class/Order and Family/Subfamily) were collected. The highest number of taxa per site (n = 16) were collected from were collected from Hamilton River, whereas fewer numbers of taxa per site were recorded in Trepell Creek (n = 11).

Aquatic studies have found that particular macro-invertebrate families are highly correlated and sensitive to stream health. Consequently, the presence or absence of macro-invertebrate families can be used to determine the health state of the local ecosystem. The results of the aquatic studies indicated that water samples were mainly composed of taxa (faunal groups) which are able to tolerate both flowing and standing (ponded) water, which is in keeping with the morphology of the streams. There were no taxa present that could be considered to be very sensitive. The presence of tolerant, macro-invertebrate aquatic fauna on the project site suggests that aquatic organisms were probably already stressed by the natural (existing) environmental factors of the area. These factors include the severe effects of flooding and stream-bed scour during the wet season, as well as cattle grazing and the resultant high total suspended solids (TSS) concentrations that have been recorded in the water column of local streams. The studies also showed that Trepell Creek and Hamilton River catchments supported different stream environments and, hence, different taxa. The report concluded that Trepell Creek was already impacted by either harsh physical conditions, differences in substrate, and / or the presence of contaminants. In contrast, Hamilton River was not a highly diverse habitat, but the stream had more sensitive taxa in its faunal composition.

The EIS identified the following potential impacts on the aquatic ecology values on the project site. The diversion of Trepell Creek may lead to an initial reduction of aquatic habitat, alteration in flow patterns and increased downstream sedimentation. The confinement of surface water would increase energy flows above existing conditions, though, on average, not above that of current best-practice hydraulic criteria for stream diversions in Queensland. In general, predicted flows for the diversion are still relatively low. There may be some transitional implications for upstream biota migration, until the local vegetation becomes established in the diversion channel.

Baseline assessments have identified that Trepell Creek and, to lesser extent Hamilton River, are already impacted by non-mining land-uses through grazing activities. The EIS reported that where cattle had been excluded at the watercourses, the condition of vegetation and landform showed signs of rehabilitation. Hence, the proponent would apply a cattle exclusion zone for the Trepell Creek diversion to aid in the establishment riparian flora and the stabilisation of the diversion.

4.13.3 Mitigation strategies for nature conservation

The proponent outlined that management strategies and monitoring procedures designed to minimise environmental harm have been implemented and refined since the Cannington Mine became operational in 1997. These strategies include procedures for clearing land and preventing the spread of weeds and metal contaminants, such as lead, by vehicles entering / exiting the project site. These strategies would be adapted, as required, to account for the proposed change in above-ground operations and the disturbance associated with these changes as further outlined below. The Cannington Induction Programme informs personnel of the ecological values on the project site, in order to increase staff awareness of the species present.

In the EIS, the proponent committed to only removing native vegetation once:

- Clearance from environmental staff has been obtained.
- The vegetation clearance areas have been plainly delineated and identified to equipment operators and supervisors.

- Weed control have been implemented, in order to prevent the spread of weed species along riparian corridors. The most relevant example of weed migration being Noogoora Burr (*Xanthium pungens*) which was found along most riparian vegetation, but appeared to be more abundant downstream of the mine area.
- Appropriate erosion and sediment-control structures are in place.

Methodologies for the rehabilitation / revegetation works of the project would use the most appropriate species for the landscape elements of the site. Such methodologies would include habitat matching of species to ensure rehabilitation success. Species chosen for revegetation would be selected from the dominant flora of each community. Seeding of as many species as possible would be undertaken at each rehabilitated site, in order to promote more rapid recovery of the local vegetation and lasting groundcover. The maintenance of retained native-vegetation areas could provide a source of seed for mine. Recreated landforms would be contoured to resemble original regional topographic where possible. Reference monitoring sites would be established and maintained, prior to any disturbance taking place and measures would be taken to minimise harm to affected fauna communities by inspecting the vegetation to be disturbed prior to clearing to ascertain whether any fauna are present.

Proposed disturbance areas would be kept to a minimum, particularly in major watercourses such as Hamilton River and Trepell Creek (except the diversion), as these areas provide established habitat and an overstorey with a mixed age structure. The EIS proposed that the design of the diversion of Trepell Creek would reduce the potential for seepage and run-off from the WRD to enter the diversion. Catchment toe drains around the WRD would also insure that run-off from the WRD would be diverted to purpose-built water retention dams. Surface water run-off from WRD structure would not enter the Trepell Creek diversion, with water quality of the creek to remain in line with existing water quality conditions.

Sediment control measures would be introduced as part of the stream diversion process, in order to maintain morphological diversity in downstream receiving areas. Such measures would help to maximise habitat value and retain biodiversity levels.

Erosion controls that are currently in place would be expanded from existing operations to prevent sediment deposition into the Coolabah and River Red Gum riparian woodlands adjacent to and downstream of the mine. The length of existing creek diverted would be minimised (where possible) to help maintain established riparian zones and aquatic habitat. Woody debris may be placed in the diversion to help provide roughness and resting locations for migratory fish and other aquatic species. Trepell Creek would be used in the wet season as a nesting area by migratory birds such as Whitenecked Herons and Brolgas and, where possible, clearing would avoid the period during or immediately following the wet season.

One declared plant species was recorded once during the survey; Parkinsonia (*Parkinsonia aculeata*). Another weed species commonly found along riparian areas on the project site was Noogoora Burr (*Xanthium pungens*). This species is not a declared plant under Queensland legislation; however, it would be managed by BHPBC. The proponent would implement a programme to target Parkinsonia, classified as Class 2 weed. This programme would involve the identification of individuals, the eradication of the identified individuals and also continued monitoring of known previously affected areas.

An updated weed management plan (replacing the current plan) would be developed, in order to limit the spread of these species on the project site. This weed management plan would incorporate the following strategies in order to help minimise the potential for future weed infestations:

- Annual observations would be conducted by onsite staff, in order to monitor any development of weeds of management concern.
- Where weeds of management concern are identified, they should be eradicated from the site in accordance with local best-management practice.
- Areas where weeds have been treated would be monitored in order to confirm the success of any declared weed eradication programme.
- To promote the awareness of weed management issues at the project site, weed management procedures would be incorporated into the site management protocols.

Two mammal pest species were recorded during the survey, namely the Feral Cat and the Dingo. These species are listed as Class 2 pests under the LP Act. A Feral Pest Control Program would be implemented for these and other

pest species that were identified during previous fauna studies. These additional species include the Feral Pig (*Sus scrofa*) and Fox (*Vulpes vulpes*).

4.14 Cultural heritage

The EIS described the existing cultural heritage values that may be affected by the proposed project. This included environmental values of the cultural landscapes in terms of the physical and cultural integrity of the landforms. The EIS has addressed both the Indigenous cultural heritage and non-Indigenous cultural heritage matters raised in the TOR.

Several archaeological and anthropological surveys of the project site have been undertaken previously (1993 - 2001). These assessments collectively describe the Indigenous and non-Indigenous cultural heritage values. These reports were supplemented most recently by a historical cultural heritage assessment completed for this EIS. These are outlined in more detail below.

4.14.1 Indigenous cultural heritage

The EIS reported that notwithstanding the scarcity of Indigenous historical documentation for the project site, the early archaeological surveys identified a number of artefacts, more notably along the banks of the Hamilton River. Large quartz scatter were identified immediately adjacent to the Hamilton River, which was concluded as of scientific significance. The numerous artefacts were found not to be individually but collectively significant. The Hamilton River complex was identified to be protected. However, no sites of significant Indigenous cultural heritage were found. The majority of artefacts identified were hearths (stone-lined fire places) and artefact scatters. These artefacts and their locations have been documented and potential impacts of mining operations on cultural heritage artefacts are managed through statutory processes.

To minimise impacts on identified artefacts BHPBC has adopted a 100 m earth disturbance buffer zone along Hamilton River within which disturbance cannot proceed without further survey, in order to help preserve the Indigenous cultural heritage identified in the area. The area of any disturbance proposed within this zone would be surveyed by site environmental personnel. Subject to the findings of this survey a Land Clearance Certificate must be issued before disturbance can proceed.

4.14.2 Non-Indigenous cultural heritage

A desktop review of the National and Commonwealth Heritage Lists, the Queensland Heritage Register, the Register of the National Estate, and the McKinlay Shire Council Planning Scheme did not identify any cultural heritage area within the vicinity of the project site.

Field studies commissioned as part of the EIS identified six sites of historical interest and a historical archaeological site on the project site (limestone crossing, early fence alignment, remnant dingo proof fence, bore site, Trepell homestead complex, Cannington station and Spider's campsite). Only one of these described sites was found to be within the proposed disturbance footprint. An early fence alignment runs north-south through the proposed WRD footprint and was identified as a site of historic interest. This fence alignment is an example of boundary / paddock fencing which would have been common throughout the area in earlier times. The six strand fence line was parallel to the Boulia Road (Toolebuc – McKinlay Road) and run alongside a modern fence. The historical archaeological site, a limestone crossing over Hamilton River, was identified on the project site and is located on a stock route, which was previously identified in historical maps. While the site would be located outside of the development footprint it would be situated within the project site.

The cultural heritage significance of the project site was determined to range from low to moderate when assessed against each of eight criteria established under s.35(1) of the *Queensland Heritage Act 1992*. In summary, the project site was found to represent pastoral and settlement activities within the North Gregory Pastoral District from early times. The site is important, to a small degree, in demonstrating the evolution or pattern of the local area's history of low-intensity grazing and sparse settlement patterns in an isolated region of Western Queensland.

The current infrastructure layout for the project indicates that the historical interest site 1 (early fence line) would be directly impacted by the proposed project. This site is of low, to no individual cultural heritage significance and therefore, no mitigation strategy would be required if the fence has to be dismantled.

The limestone crossing is located across the Hamilton River to the south of the proposed open-cut pit. As the limestone crossing is outside the disturbance area, it would be unlikely to be directly impacted. However, if it would be subject to any direct or indirect impact by the proposed project further site assessment would be conducted. If the assessment would determine that the crossing would be of sufficient cultural heritage significance, further actions would be taken to protect this site, including detailed mitigation measures and consultation with relevant stakeholders.

4.15 Social

This section of the EIS assessed the potential impacts on the lifestyle, wealth, safety, health and wellbeing of the community surrounding the project. Baseline data in the EIS was sourced from desktop studies, statistical and demographic reports as well as stakeholder engagement.

The project has the potential to cause direct and indirect beneficial and adverse impacts during its construction, operation and decommissioning phases. The EIS reported that in order to try and prevent impacts on the liveability and quality of lifestyle of the sensitive receivers, Cannington Mine carries out routine monitoring of environmental parameters, such as dust and noise emissions. In the event of a legitimate noise or air complaint, BHPBC would conduct monitoring of conditions at the receiver for comparison with project limits, accepted standards and criteria and baseline conditions. The need for further action would be determined based on this monitoring and additional consultation. An ongoing monitoring programme for surface and ground water quality has been designed for early detection of contamination sources thereby assisting in efficient remediation and prevention of downstream impacts on surface and ground water quality, thus, minimising impact on surrounding landholders.

The EIS stated that the existing Cannington Mine regularly provides information to and consults with the community about environmental and community issues through the Cannington Community Engagement Group and the bi-monthly CANdid Newsletter. The newsletter keeps the local community informed of issues, incidents, functions and performance at the mine and upcoming events supported by BHPBC. Community members are able to contact Cannington Mine with enquiries or complaints on a dedicated contact phone number.

In the rare circumstance that BHPBC would be unable to resolve a key issue raised by an affected person, BHPBC may offer to provide a form of compensation to the affected person.

The EIS concluded that it would be unlikely that there would be an impact on the demographic structure of the community in the Statistical Area as a result of the project. Employees would continue to be sourced from Townsville, Brisbane, Cairns, and the Mt Isa region. Approximately 98% of the workforce would be transported to and from site in a similar manner to the existing FIFO roster systems. Workers would then be transported by bus from the existing Trepell Airport to the accommodation village.

The majority of employees and contractors would work either an 8 days on 6 days off (professional, technical and administrative), 7 days on 7 days day off (mining, processing and maintenance operators), or a 4 days on 3 days off (supervisors) FIFO roster. Some of the workforce currently works a 14 days on 7 days off roster; however, this would be gradually eliminated during the project. Supervisors may also work a combination roster of 8 days on 6 days off and 4 days on 3 days off. All employees of the project would be accommodated at the dedicated mine village. BHPBC has an established Employee Assistance Programme to help personnel deal with personal or work issues.

The proponent would be committed to operating in a transparent, responsive and positive manner with community members. The Cannington Mine supports community programmes to improve socio-economic conditions through the Cannington Community Fund (CCF) and BHPBC's Sustainable Development Policy supports public reviews of its mining operations. The Sustainable Development Policy states that the proponent would be committed to regularly review (their) performance and to publicly report (our) progress. BHPBC produces an annual Health, Safety, Environment and Community Report, which monitor performance and identify issues specific to the Mine’s circumstances, regional context and stakeholder needs.

The EIS anticipated that the project would positively impact industries such as mining, construction, administrative and support services, public administration, safety, education and training. The local economy would be also expected to benefit from the project via rates payment, investment, purchase of consumables, use of service industries, and payment of royalties and taxes. A potential indirect economic impact of the high incomes likely to be paid to employees of the project would be wage competiveness in other employment industries. BHPBC would

continue with its established graduate and vacation employment schemes, tertiary scholarships and apprenticeships. Post graduate education and training would be supported by BHPBC for its employees. The proponent has developed an Indigenous Participation Strategy 2009 / 2010 in order to foster open and effective relationships with local Indigenous people by providing educational and employment opportunities and to ensure the BHPBC workforce would be culturally aware.

DEEDI commented on this section of the EIS and recommended that the EIS should:

- Include reference to the use of locally sourced goods and services.
- Explain associated impacts for other industries and businesses in the region and the Queensland mining industry generally due to any attraction of workers from other business and industry.
- Provide information on any strategies to be implemented to minimise impacts on other business and industry.
- Consider reference to the scope of skills sets required.

In response, the SEIS stated that in recognition of the opportunity to build on its existing support for local businesses and the local economy, BHPBC formed a local business and economy working group in 2010. Furthermore, BHPBC has developed the McKinlay Area Training and Employment (MATE) Programme in 2010 in order to align Cannington Mine activities with community needs and goals around increasing participation of local employment. BHPBC has taken further steps through the implementation of a Cultural Awareness Training package for all employees. The North West Queensland Indigenous Awareness Course was developed and is owned by traditional owners of the region and will be provided site-wide during 2011.

DEEDI recommended further that the proponent should develop a Community Safety Plan (CSP) to provide the local community with a documented framework to ensure that community safety issues and priorities are addressed in a coordinated manner which involves all key stakeholders in the community. BHBPC responded that it is committed to the ongoing safety of all of its workforce and the greater community. As such, BHPBC has included in its work program the development of a CSP. This plan would be developed before the construction of the project begins.

Another comment made by DEEDI included the need to develop strategies to manage any potential increased use of social infrastructure and services and access to these services by employees and/or contractors. The proponent replied that the EIS has adequately addressed this issue and that no foreseen impacts on community or government infrastructure or services are anticipated to result directly or indirectly from the project.

DEEDI recommended that in order to assist in addressing concerns regarding groundwater, surface waterways, noise, dust and lead pollution, the proponent is strongly encouraged to develop a robust stakeholder engagement mechanism. While the proponent is likely to have a complaints/disputes mechanism in place for the project as a whole, DEEDI was of the view the proponent documents how this mechanism would cover the management of any social issues, should they arise. As a result of this comment the SEIS has been amended to further describe the complaints register process and how it would cover the management of any social issues, should they arise.

DEEDI recommended that the proponent should ensure that traditional owners have been included in any discussions relating to subsidence and rehabilitation, waste and land contamination and flora and fauna. Furthermore, the proponent should actively support various mechanisms to ensure positive employment outcomes for Indigenous people, including considering business and contracting opportunities to assist Indigenous parties to establish business opportunities related to mining activities. The SEIS has been amended to incorporate onsite training regarding Indigenous and non-Indigenous cultural heritage and as part of the Indigenous Participation Strategy, BHPBC would deliver a trial project in 2011 to increase Indigenous participation at Cannington Mine with the ultimate aim of providing access to traineeship qualifications and real world experience.

4.16 Health and safety

The Health and Safety section of the EIS addressed existing community values for public health and safety that may be affected by the project.

The EIS identified the following main health and safety values that may be affected by the project:

- Air quality impacts from the operations arising from TSP, PM_{10}, dust.
- Health impacts from lead levels in dust.

- Noise impacts from the project.
- The health and safety of employees due to the operational hazards of the project.
- The release of waste or stormwater contaminants from the project.

The nearest sensitive receivers are Cannington Mine accommodation village (approximately 4 km from existing mining infrastructure area), Cannington Station, Glenholme Station and Squirrel Hill Station. The mitigation strategies presented in the EIS combined the existing Cannington Health, Safety, Environment and Community Management System (CHSECMS) strategies with additional proposed strategies for the project.

Air quality assessments that have been conducted for the project have indicated that all legislative Air Quality Goals can be met at the sensitive receivers, including PM_{10}, TSP and dust deposition concentration. A quantitative health based risk assessment (HBRA) of impacts associated with the fine particulate emissions from the mine was undertaken in conjunction with the EIS' Air Quality Impact Assessment Report. The project would be managed so that the 24-hour PM_{10} concentrations do not increase above 50 $\mu g/m^3$, which would be equivalent to limiting the increase in 24-hour average $PM_{2.5}$ concentrations to 6 $\mu g/m^3$. The HBRA emphasises that the predicted human health risk would be related to the most exposed individual on the worst day in the life of the project and the worst year in the life of the project, not the average day or average year. Concentrations of lead, silver and zinc were modelled for different mine materials and applied to the TSP levels, to determine total pollutant concentrations. The modelling results predict no exceedances of DERM's air quality objectives (EPP (Air) 2008).

The EIS assessed the noise and vibration impacts from the project against the DERM Ecoaccess Guideline Planning for Noise Control, WHO guidelines and blasting limits contained in the EPP (Noise) 2008, with the following results:

- Noise levels at Glenholme and Squirrel Hills Stations were predicted to meet all noise criteria.
- Those at Cannington Station were predicted to exceed the Ecoaccess design noise guideline level at night for most night-time hours, and some daytime hours.
- The predicted noise levels at Cannington Station exceeded the recommended guideline EM Plan limits, which were based on ‘background plus’ type noise criteria.
- The predicted future noise levels achieved the sleep annoyance goals with the proposed operations.
- The low frequency noise criteria would be met based on predicted future noise levels.
- Air blast and vibration levels were predicted to be acceptable.

Mitigation methods to manage the predicted noise levels at Cannington Station were addressed in Section 4.12 of this report.

Potential water impacts of the project on the health and safety of the surrounding community would be prevented by allowing only clean water to leave the project site. This would be achieved through comprehensive water management strategies described in section 4.10 of this report.

Based on existing Cannington Mine Operational Health and Safety procedures, the proposed safety system for the project would include inductions and training programmes to maintain a safe workplace environment, information on risk assessment, fire prevention and safe work practices, on-site lead management strategies (e.g. procedures for working safely with lead), personal protective equipment (PPE) and other procedures and requirements.

4.17 Economy

The EIS reported that the project would continue to support economic stability in the local region, provide economic benefits and opportunities for employment and export trade to Queensland and Australia. Some other operations in the region are reaching the latter stages of their life, and other companies planning mining operations nearby have been delayed and / or have reduced in size and employment. Consequently the development of CLEP would play an important role in the stability of the region and to the economics of the Queensland State.

The estimated establishment cost of the project would be in excess of $100 million. The CLEP would continue to produce silver rich lead and zinc concentrates suitable for domestic markets and for export to overseas markets. In accordance with Queensland legislation the proponent would continue to pay mineral royalties to the Queensland Government for the right to mine the State’s resources. These royalties would be paid on an *ad valorem* basis and

would be calculated as a percentage of the value of the mineral as determined by the Minister. Project royalties of over $500 million are expected to be paid over the life of the project.

The project's construction phase would contribute directly to the local Queensland and Australian economies through the purchase of equipment, goods and services. The extended operation would continue to bring positive flow-on effects to the local and regional economy and community. BHPBC would employ a workforce of approximately 954 persons for the open cut and underground mine, on a FIFO basis.

Employees would be housed in an on-site accommodation camp while on site. BHPBC would employ a fulltime workforce of approximately 501 positions and 453 fulltime equivalent contractors. Specifically, the mine extension would employ an additional 140 employees for its construction and 60 for its operation. Local residents, including those in Cloncurry and Mt Isa, would have access to employment opportunities based on availability and suitability. The remainder of the workforce would be sourced from Brisbane, Townsville and Cairns.

The local economy from Mount Isa through Cloncurry to Townsville currently benefits directly and indirectly from the flow-on effects of Cannington Mine. The EIS anticipated that these communities would continue to experience economic benefits from this project.

4.18 Hazard and risk

An assessment into the hazards and risks associated with the project was undertaken to identify the potential of specific impacts to occur before and after the implementation of mitigation strategies. This risk assessment compared the likelihood and consequence of a range of environmental and social risks associated with the development of the project.

BHPBC established a process for the identification and assessment of the hazards. As part of the continued health risk management protocols, quantitative surveys of the occupation risks are conducted at the existing Cannington Mine.

The EIS identified a number of parameters that could adversely affect the health of people (workers, visitors and the community) or the environment. These risks are then ranked according to the likely level of exposure relative to their Occupation Exposure Limit (OEL).

In summary, 136 risks where identified for the project. Prior to applying risk control strategies 47 extreme risk, 53 high risks, 29 moderate risks and 7 low risk rankings were identified. Once mitigation strategies were applied the following residual risk rankings changed to 7 extreme risk, 6 high risk, 37 moderate risks and 86 low risks.

The following incidents were found to have an extreme level of inherent risk:

- contamination of groundwater, surface water and soil resources
- degradation of terrestrial and aquatic habitats
- depletion of land resources
- disturbance of native fauna
- increased blood lead levels
- sedimentation in watercourses downstream
- silicosis.

Of the other extreme inherent risks, all were reduced to a residual risk factor of low to moderate following mitigation, except for some contamination risks which remained high. These included contamination of surface water and soil in the event of the failure of the tailings structure during the operational phase and contamination of groundwater as a result of generation of ARD in the final void during and following, the decommissioning phase.

The EIS outlined that the implementation of appropriate risk control strategies would ensure a reduction in the residual risk of incidents over the life of the project. As such, the EIS considered the identified risks to be manageable for the duration of the project.

The handling of chemicals would be controlled through hazard and chemical handling protocols and management systems. Chemicals that would be used for the duration of the project's construction and operation would include fuels, lubricants and oils, flocculants, acids, solvents and domestic cleaning agents. Existing management and

response procedures for the existing mine would be reviewed and updated to incorporate the elements of the project. BHPBC's high health and safety standards would continue to be audited and improved throughout the project's life.

Fuel, lubricants and reagents for the mining fleet and the small aircraft would be stored on site. Storage tanks would be appropriately bunded according to the Australian Standard. For the duration of the project, existing fuel storage and handling procedures would be updated to incorporate the project's operations and advances in best practice techniques.

The explosives needed for the mining process would be stored within an approved explosives magazine. The EIS outlined that this would take the form of two separate storage units, one for the explosives and one for the detonators. The storage units would conform to the relevant regulations regarding the storage of explosives. The magazine area would be bunded. Access to the magazine would be restricted to authorised personnel only. Dangerous Goods Code Class 5.1 would be handled by a third party contractor. Storage and handling would comply with Australian Standards.

The inhalation of silica over periods of time can lead to the development of lung related diseases and other potential adverse health effects. Consequently, silica management at Cannington Mine is of the highest importance. The existing mine implements controls to help protect personnel from exposure. These include the use of water for dust suppression, mine ventilation, cabin air-conditioning and filtration, the use of teleremote bogging and PPE. Qualitative surveys would be routinely carried out and personnel would use static and in-vehicle monitors to determine the level of respirable fraction of dust. Collected dust would be analysed to determine the concentration of crystalline silica and hence level of exposure to personnel.

In comments on the EIS, the Department of Community Safety recommended that the project manager would keep Queensland Ambulance Service updated on any issues that increases the potential for paramedic response to the project site or may impact on any emergency response to an accident, illness or injury as a consequence of this development. BHPBC responded that it would inform Queensland Ambulance Service of any issues that may arise during the course of the project.

The Queensland Fire and Rescue Service accepted the safety procedures and mitigation measures contained in the EIS and EM Plan and had no further comments or concerns.

4.19 Rehabilitation and decommissioning

The EIS addressed options, strategies and methods for progressive and final rehabilitation of the environment disturbed by the project. Furthermore, the EIS outlined the means of decommissioning the proposal, in terms of the removal of plant, equipment, structures and buildings, and the methods proposed for the stabilisation of the affected areas.

The EIS committed to rehabilitating 62% of disturbed land to pre-mining land use (although at a lower capacity); while the remaining disturbed area (38%) would be downgraded from Land Suitability Class 3 to Class 5. This later area includes the void, TSF and WRD (total of 504ha). It does not include the area of the Trepell Creek diversion.

The EIS reported that the project's rehabilitation strategy has been developed in addition to BHPBC's existing environmental and rehabilitation policies. Rehabilitation would occur for the entire project site and would include the TSF, WRD, open cut pit, stockpiles, accommodation camp, offices, warehouses and the processing facility.

The main objectives of the rehabilitation strategy as described by the proponent were to:

- Carry out progressive rehabilitation works, where possible, to ensure that a minimal amount of land would be disturbed at any one time.
- During rehabilitation of the project, disturbed areas would be stabilised to ensure that the proposed final land form would not be compromised by surface instability or erosion.
- Return the majority of disturbed land to a condition similar to the pre-existing condition of low intensity grazing or native habitat or to an agreed use.
- Ensure that constructed landforms are geo-chemically stable to the extent that they have no unacceptable impact on surface water or groundwater quality and downstream users.

BHPBC committed to the progressive rehabilitation of disturbed areas, including temporary access tracks, TSF embankments and the outer slopes of the WRD consistent with rehabilitation acceptance criteria of BHPBC for the existing Cannington Mine and designed to complement BHPBC's existing rehabilitation.

Where mine and other infrastructure currently exists, existing final landform and land-use commitments would be upheld.

General rehabilitation processes were described in the EIS. This included a description of the clearing of areas for the open cut pit, WRD and other infrastructure, water and sediment management structures would be constructed and topsoil and vegetation would be removed from the footprint area and stockpiled in accordance with existing topsoil management practices. The mining and rehabilitation progression would be taken into consideration when stockpiling topsoil with the aim to minimise storage time to ensure the seedbank remains viable.

The surface of the post-disturbance rehabilitation sites would be topsoiled to the depth consistent with the proposed final land suitability. Some areas such as walls of the TSF may be designed to replicate rocky slopes and would have minimal topsoil included in the final surface.

The preparation of landforms prior to the establishment of vegetation would involve surface contouring to minimise erosion and maximise beneficial land use. During operations, slopes between benches would mimic natural landforms in the area. Slope lengths would be less than 30 m between benches. This distance may need to be reduced to achieve acceptable levels of slope stability.

The main concern highlighted in comments on rehabilitation focused on the nature of the covers proposed for the WRD and to a lesser extent, the TSF. This matter is further discussed in the following subsections as well as other aspects of the proposed rehabilitation and decommissioning of specific mine features and infrastructure.

4.19.1 Built infrastructure

During the decommissioning phase all non-permanent structures including accommodation units, offices, administration buildings, laboratories, ablutions, and recreational buildings would be on-sold, packed down and removed from site. Any permanent structures remaining would be demolished and scrap materials would be recycled where practicable. Concrete footings would be broken down and removed from site. Roads may remain by agreement with the landholders. If site or access roads are not needed post decommissioning, the concrete/bitumen base would be removed and the area would be ripped, topsoiled and revegetated.

4.19.2 Final void

The EIS identified that the goal of the final void design is to ensure the residual void would be as small in volume and size as practicable, whilst being stable. The EIS anticipated that the pit would be allowed to develop into a pit lake following the completion of mining, covering approximately 55 ha. Modelling indicated however, that the long-term pit water quality would be unlikely to be suitable for stock water (45,000mg/l at 300years after mine closure). A safety bund wall would be constructed around the void. The final void would function as a groundwater sink in perpetuity and would have negligible potential for the pit lake water to enter the groundwater system. Based on the appraisal, a 100 m offset from the pit perimeter for the post-closure safety berm would be considered to be conservative. However, the EIS stated that further studies would be undertaken during the operational phase of the project to investigate long-term geotechnical stability and define the final set-back of the post-closure safety berm. Until this work is completed, no permanent facilities (such as the WRD) should be located within 200 m of the design pit perimeter.

DERM had concern regarding the proposed wall design for the final voids. The strong faulting associated with the shear zone and the presence of mica schists may create some structural issues, particularly for pit wall stability. It was considered that were was the potential for wall failures during rainfall periods. DERM recommended that the SEIS should address the potential for wall failures due to the geology in the area of the proposed pit. As a result of this comment, the EIS was amended and the SEIS outlines the final void design how it would be constructed. It also stated that all major structures are known to the project with respect to spatial distribution and extent in relation to the proposed open pit. The proposed bench face angles have been designed taking into consideration the fabric and discontinuity shear strength. While the pit is being developed, ongoing assessments will be conducted to optimise the pit slope angles whilst maintaining pit wall stability.

In comments on the EIS, DERM requested further clarification on whether the final void would be allowed to flood and develop as a pit lake and whether the clean catchments upstream of the final void would be diverted into the pits or routed into the Hamilton River or Trepell Creek. This appeared to be inconsistent with the rehabilitation goals that indicated that the final void would be bunded. If clean catchments were to be diverted to the pit post closure this would be considered to be take of overland flow water and the proponent would need to apply to the Department to authorise the take of water in accordance with the provisions of the *Water Act 2000*, the Water Resource (Georgina and Diamantina) Plan 2004 and Georgina Diamantina Resource Operations Plan. The proponent responded that a backfill or rehabilitation of the final void is not proposed, but to make the final void safe and limit access post-mining. The final rehabilitation would minimise, as far as is practicable, clean water being captured and directed to the final void. This would maximise reporting of clean water to natural systems, and would minimise water reporting to the pit void lake. Hydrological modelling indicated that the pit lake would have adequate capacity and very low risk of overtopping with virtually no catchment reporting to it. Planning would be undertaken during detail design to ensure that as far as is practical, clean water would be directed away from areas where the quality may be impacted during the operational phase. Planning, research and monitoring would be undertaken during detail design and the operational phase to ensure as far as is practical, clean water would be directed away from the pit void following mine closure.

In comments on the EIS, DERM requested that the water balance for the residual void include evaporation assumptions that are demonstrated soundly based and also take account of any limitations due to the physical location and chemical content of the water. This matter was addressed adequately in the SEIS and the additional information provided by BHPBC in March 2011. Hence the use of corrected pan evaporation rates in the assumptions for the modelling of the void water balance is considered to be conservative. It was stated that the pit would act as a groundwater sink in perpetuity. Further details regarding evaporation processes which supported the earlier predications, were also provided by BHPBC in June 2011.

As the final void would act as a sink for any leachate or seepage from the WRD, DERM was concerned that the quantity of this material may adversely impact on the water balance in the void. This scenario was investigated by BHPBC and the company reported that seepage rates of 16 L/s would be required to raise the pit lake level above the pre-mining elevation. It was stated that this would equate to >35% of the mean annual precipitation from both the WRD and TSF reporting to the void, or over 75% for the WRD. In modelling potential seepage from the WRD and TSF, a figure of 2% of the mean annual precipitation was used based on the cover that would be applied to these structures post mining. Further, sensitivity analysis of the water balance was analysed and it found that very high and unrealistic infiltration rates, of greater than 80% of mean annual precipitation, would be needed to compromise the water level in the final void. Additional information provided in the Response to DERM Notice of Extension and Matters to be addressed, June 2011 estimated that at year 200 (post mining) the void volume below the pre-mining groundwater level would be 12.7 Million cubic metres and that 1,650mm rainfall would be required to raise the pit water level 10m, taking account of all runoff and seepages inflows from surface facilities that report to the pit.

Following the review of information provided in the SEIS, DERM requested further clarification on the commitments made by the proponent to ensure that decommissioned and rehabilitated structures (final void, WRD and TSF) would survive probable maximum flood (PMF) events. DERM also sought clarification on whether the measures taken to achieve this would be sustainable for the foreseeable future (post mining). BHPBC responded that immunity for the PMF is proposed for closure. Immunity of the critical facilities on site (access portals, ventilation shafts) was addressed in the Cannington Project Feasibility Study, Existing Conditions Flood Study Volume One and Addendum (BHP Engineering, 1994) as part of the EIS study. Recommendations were made that access portals and ventilation shafts be protected to PMF levels with 0.5 m freeboard allowance. The processing plant was recommended to be set on a platform 0.5 m above the predicted 500 year ARI level. These recommendations were implemented and the flood risk and protection of the critical facilities on site was fully taken into account during planning and implementation. The proposed mine expansion would be provided with 1,000 year ARI flood immunity operationally and PMF flood immunity after closure. The levee crest levels will be set according to the hydrodynamic modelling results, with suitable freeboard provision.

DERM drew attention to a statement in the SEIS that the salinity of the water in the void would not rise over time to levels that would significantly affect evaporation estimates, and that (based on mining experience) temperatures in the residual void would overcome any other factors limiting potential evaporation, including the absence of

wind. Pan evaporation data with high pan factors have been accepted as a basis for these predictions. However, DERM noted that the basis for these assumptions needs to be demonstrated, as well as the basis for concluding that the decommissioned WRD would not contribute seepage that would compromise the water level in the final void. BHPBC replied that it is considered that the application of SILO pan evaporation data corrected by an open water factor of 0.7, combined with additional sensitivity modelling using a range of values for evaporation, to be an appropriate and conservative approach to predicting the behaviour of the pit lake. BHPBC further outlined that seepage from the WRD was incorporated in the water balance model.

4.19.3 Waste rock dump

The EIS outlined that the objectives of the closure strategy for the WRD would be to:

- minimise the generation of acidic or otherwise contaminated leachate,
- separate clean surface run-off water from potentially contaminated seepage water and decanting to Trepell Creek,
- limit erosion and sediment release to run-off,
- ensure long term and short term geotechnical stability of the landform and
- minimise the need for ongoing maintenance and/or active management by adopting a 1:1,000 year AEP storm event for design purposes.

DERM raised a number of concerns regarding the WRD in comments on the EIS and subsequent documents. Key concerns were the proposed 'store and release' cover (including the effectiveness of co-location of NAF and PAF material to minimise contaminated seepage), flood immunity (particularly when in the EIS the WRD was to be partially located in original Trepell Creek) and the integrity of the foundation cretaceous mudstone.

The last two matters have been dealt with in Section 4.11.2 (as the WRD will have the same level of flood risk as the final void) and in Section 4.9.4, which deals with the location and construction of the WRD.

Regarding the proposed final cover on the WRD, BHPBC has consistently argued that the 'store and release' type cover system will limit, to the extent possible, infiltration and maximise clean surface water runoff. A significant number of reports and information was generated by BHPBC during the assessment of this project to support this position. DERM reviewed all of this informationded and, based a lack of regionally relevant evidence that this form of cover would be effective (particularly for high intensity rainfall events and strongly seasonal environments such as those at BHPBC), considered that an alternative cover type which prevented to prevent infiltration and shed incident rainfall, should be considered. The findings of the Independent Peer Review concerning the issue of cover also highlighted the need to limit infiltration.

Information provided by BHPBC indicated that the probable quality of leachate and seepage from the WRD would be poor (high salinity and elevated metaquality leachate from the waste rock by allowing ongoing chemical reactions within the WRD.

On this matter, the Independent Peer Review commissioned by BHPBC recommended a review of alternative cover designs for waste rock with consideration of progressive reclamation or test plots during operation. While it appears BHPBC accepted this recommendation, it would be appear to be with some caveats, one being that the cover would be a 'store and release' cover.

Taking into account the significant long term risks associated with the WRD, should it generate poor quality leachate for an extended period post mining and notwithstanding that this leachate should report to the final void, commitment to a suitable cover design that incorporates an effective barrier to infiltration is needed early in the life of the project to ensure it is incorporated in the design, construction and progressive rehabilitation of the WRD.

It is recommended that the findings of the Independent Peer Review that a review of alternative cover designs (not only 'store and release') be undertaken by BHPBC and that this review include all aspects of the WRD including the characteristics of the waste material, interactions with air and water in WRD, sequencing of mining and availability of waste rock with suitable characteristics as well as conducting site specific field trials where hydraulic, chemical and vegetative performance are measured and analysed.

4.19.4 Tailing storage facility

At closure the final TSF surface would be graded and a soil cover system would be placed over the entire facility. The cover system would be designed to promote surface run-off and allow clean water to discharge to the environment and to limit infiltration. The outer slopes would be decreased to achieve a final slope of 1V: 3H to enable the conversion of toe drainage collection trenches to buried toe seepage collection drains to intercept any toe seepage from the TSF and route the flows to the open pit at closure. The final TSF surface would be graded to provide a positive drainage slope for closure. Rock-fill would be placed to achieve a final graded slope that would shed water.

While attention was primarily focused on the rehabilitation of the WRD throughout the assessment of the project, it is understood that many of the concerns regarding the proposed 'store and release' cover proposed for the WRD also apply to the TSF.

4.19.5 Stockpiles

Remaining stockpiles and depleted stockpiles, such as the ROM pads, would have all contaminated material removed and placed in the TSF, or removed off site by an appropriate contractor. The TSF evaporation dam would be decommissioned back to the natural surface level. Any contaminated materials would be removed and placed in the TSF. The land would then be topsoiled and revegetated. Surface water retention dams may be retained for future livestock and animal use. Water and sediments would be tested to determine if contamination would be present. If contamination would be present, the contaminated material would be scraped out and placed into the TSF. Where water retention dams / sediment traps would not be required post closure, they would be filled with waste rock or re-contoured for drainage, covered with a layer of topsoil and ripped and seeded.

4.19.6 Water storages post-mining

The EIS stated that most of the stormwater dams, sediments ponds and roads on site would be returned to their pre-mining land use and suitability unless the landholder wishes to retain these structures for grazing proposes through a written agreement with BHPBC.

DERM commented that the EIS implied that some dams would be remained to be used post mining. The taking of overland flow water under an EA is to facilitate mining and should only be of a volume necessary to facilitate the mining operation including meeting the requirements of the environmental authority. It is not about the take of water for further uses post-mining, unless it is to be used for rehabilitation purposes or meets other requirements as provided for in the Water Resource (Georgina and Diamantina) Plan 2004. Hence, DERM considered that any dams constructed under the current provisions of the Water Resource Plan including those that were constructed to meet the requirements of an EA would need to be removed post-mining unless they would be used for rehabilitation purposes or meet one of the other requirements provided for in the Water Resource (Georgina and Diamantina) Plan 2004 in relation to overland flow. DERM also outlined that post-mining water capture (stormwater dams, sediments ponds, etc) would need to meet the requirements of an EA. Before the mining licence would be surrendered the storage would have to be decommissioned unless the storage would be used for rehabilitation purposes or meet one of the other requirements provided for in the Water Resource (Georgina and Diamantina) Plan 2004 in relation to overland flow.

As a result of these comments, the SEIS now stated that all water storages developed for the Project would be removed at project closure, unless they are to be used for rehabilitation purposes or meet one of the other requirements provided for in the Water Resource (Georgina and Diamantina) Plan 2004 in relation to overland flow. Water storage sites would be tested for contaminants and remediated if required. The site would then be re-contoured for drainage, covered with a layer of topsoil and ripped and seeded.

4.19.7 Monitoring of reference and rehabilitation sites

The EIS outlined that the rehabilitation success would be monitored by comparing a number of variables between rehabilitation areas and existing ecosystems (reference sites) over time. Some rehabilitation of borrow pits and disturbed areas has been previously undertaken by the proponent following construction of Cannington Mine and upgrade of the Toolebuc-McKinlay Road. However, the current operation is underground mining with negligible waste rock brought to the surface with limited opportunity for progressive rehabilitation.

A basic rehabilitation monitoring programme was established for Cannington Mine. This would be extended as open pit mining would be initiated and would continue for the duration of the project. The programme would involve establishing and monitoring suitable reference sites to develop site specific rehabilitation success criteria, as well as incorporating rehabilitated areas into the programme progressively as they become available. Monitoring of reference and rehabilitation sites would be carried out annually. If permanent rehabilitation would be required (no potential for future disturbance) exploration drill holes would be rehabilitated according to current operational procedures. Should natural regeneration not be successful after the first year, seed from species native to the region would be sown before the following wet season to enhance revegetation.

Erosion monitoring on the project site would be conducted at a number of locations, focusing on constructed landforms with steep or longer outer slopes which may present the greatest erosion risk. The most appropriate monitoring technique would be adopted at the time of closure, but may include the establishment of permanent photographic and / or laser imaging points to facilitate annual post wet season monitoring of slope areas of the following the WRD and TSF embankment walls. Remedial works would generally be required for any erosion rate that would be increasing in size from one year to another (i.e. has not stabilised on its own) or if the rate of erosion exceeds agreed parameters. Landscape function analysis (LFA), a monitoring methodology designed to use rapidly and reliably acquired field-assessed indicators to determine the biogeochemical functioning of landscapes, has already been set up at two preliminary reference monitoring sites as part of a flora and fauna baseline assessment for the project. Rehabilitation trials have been implemented by the existing mine and additional trials would be conducted during the project's operation on different growing media to ascertain the best method of rehabilitation on newly created landforms.

Prior to the surrender of the ML, a final rehabilitation report would be compiled which would involve a site investigation, risk assessment and a site management plan, as well as details regarding the rehabilitation status of all disturbed areas. Preliminary rehabilitation success criteria for the project have been developed with reference to DERM's guidelines.

5 Adequacy of the environmental management plan

The revised EM Plan submitted in March 2011, included input from DERM, other state government departments, local organisations, industry and the public. The EM Plan was found to be essentially complete and to contain sufficient commitments to future actions to inform the EIS process. However, amendments will be needed as a result of the changes to project outlined in the advice submitted in October 2011 and this assessment report. Specific details on a number of aspects, including water management, the WRD and the TSF, would be needed to complete conditions for the draft environmental authority. Hence, an amended EM Plan will be required that addresses the finding of this assessment and includes the necessary details for DERM to prepare the draft environmental authority for the project.

It is recommended that BHPBC seek specific advice on the various aspects of the EM Plan and proposed conditions from the delegate responsible for the enviornmental authority located in the Mining and Heavy Industries Unit in the Cairns office of DERM before submitting any amended documentation.

6 Recommendations about the suitability of the project

The EIS process has compiled information about the proposed project, the values of the site and the potential impacts to those values. A range of mitigation measures and residual impacts are set out in the EIS and are summarised above in this assessment report. Importantly, one of the principal tools to implement those mitigation measures and environmental commitments is the environmental management plan (EM Plan). The EM Plan sets out how each matter is to be managed to deliver the acceptable environmental outcome.

This report recommends that the following outstanding matters be addressed prior to the project proceeding:

- development and approval of a Trepell Creek Detailed Design Report (reference - Notice of Amendment October, 2011)
- update the Cannington Environmental Monitoring Manual (reference - Notice of Amendment October, 2011)
- Revised details on the location, design, construction, management and rehabilitation of the waste rock dump.
- Revised Stormwater Management Plan that takes account of the revised design of the WRD and Trepell Creek diversion
- Revised Terrestrial Flora and Fauna Report
- Details of the design and construction of the foundations of the TSF and WRD.
- Revised flood study taking into account the altered location of the WRD and changes to the stream diversion off take from Trepell Creek.
- Revised design of the levee system taking into account changes ot the WRD and stream diversion off take.
- Plan for the investigation (including tials) for the design of the cover system of the WRD and TSF.

7 Recommendations for conditions for any approval

7.1 Environmental Protection Act 1994

Throughout this EIS process, including the development of the draft EM Plan, a range of environmental impacts and mitigation measures have been identified. Where that is the case and where legislation, policy or guidelines dictate, the actions of the project need to be constrained to achieve an acceptable environmental outcome.

This report has indicated that all the identified impacts as a result of the project are acceptable and can be adequately managed. However, while the proposed draft environmental authority conditions in the EM Plan are comprehensive and substantially meet the requirements under the Act, numerous details would need to be addressed in consultation with the administering authority before a finalised suite of conditions could be applied through a draft environmental authority.

7.2 Approvals under other legislation

7.2.1 Water Act 2000

As outlined in section 4.2 of this report and discussed within relevant sections of this report a number of separate water licences and associated development approvals under the *Water Act 2000* would be required for the CLEP Project. These approvals relate to the diversion of Trepell Creek, additional water allocations under the Water Resource (Great Artesian Basin) Plan 2006 and a permit for take of water from the mine pit.

However, the EIS has provided insufficient detail about the engineering designs, rehabilitation and monitoring for diversion, the groundwater extraction and for the proposed pit dewatering operation, for this EIS assessment report to be able to include recommended conditions for those water licences and development approvals. Conditions for these activities will be decided when the proponent has lodged water licence and development approval applications subsequent to the EIS process being completed.

7.2.2 Sustainable Planning Act 2009

A Development Permit for the construction of operational works for interfering with the flow of water associated with the Trepell Creek Diversion will be required from DERM.

7.2.3 Transport Infrastructure Act 1994

As outlined in section 3.2 of this report and discussed within section 4.7.1 of this report a number of licences and permits for works within the state-controlled road network associated with the transport route and intersection upgrades under the *Transport Infrastructure Act 1994* would be necessary for the CLEP Project. Furthermore, excess mass, over-dimensional loads or non-standard vehicle movements on state-controlled roads will require a permit under the *Transport Operations (Road Use Management) Act 1995*.

DTMR has advised that while they considered that the majority of road related issues were adequately addressed, it was concerned with possible pavement deterioration and road safety problems due to the increased traffic at the Toolebuc-McKinlay Road / Landsborough Highway intersection and access from the State controlled road to the loadout facility. DTMR recommended that the proponent assess the likelihood of any increase in road safety risk with potential pavement impacts at these intersections. Once the assessment has been undertaken, the proponent should consult with DTMR's regional office to determine whether impact mitigation is required.

8 Suitability of the project

DERM has considered the submitted EIS, all submissions and the standard criteria. The project is assessed here as being suitable on the basis of the EM plan being completed and the subsequent environmental authority, if granted, being conditioned suitably to implement the specific environmental protection commitments set out in the EIS and summarised here in this EIS assessment report. Consequently, the project is considered suitable to proceed to the next stage of the approval process noting that the recommendations of this EIS assessment report should be fully implemented.

9 Approved by

16 December 2011

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