

The background of the slide features a large, abstract graphic. It consists of a grid of dots that form a funnel or hourglass shape, tapering towards the center. The dots are arranged in a pattern that creates a sense of depth and perspective. The top and bottom sections of the slide are a light beige color, while the middle section, where the text is located, is a dark navy blue. The dots in the top and bottom sections are a light beige color, matching the background, while the dots in the middle section are a dark navy blue, matching the background.

Executive Summary

TABLE OF CONTENTS

ES1.1	Aim of the Byerwen Project	1
ES1.2	Project Proponent and Contact Details.....	1
ES1.3	The EIS, Process and Public Submission Information.....	2
ES1.3.1	Scope of Activities Included in the Project.....	3
ES1.3.2	Structure of the EIS	4
ES1.4	Public Consultation	4
ES1.5	Project Outline	5
ES1.5.1	Project Location and Project Area.....	5
ES1.5.2	Project Overview, Pre-Construction, Construction and Operation	5
ES1.5.3	Mine Layout.....	6
ES1.6	Project Rationale, Economics and Alternatives	11
ES1.6.1	Project Economics	11
ES1.6.2	Project Rationale	11
ES1.6.3	Project Alternatives	11
ES1.7	Environmental and Social Values	12
ES1.7.1	Surface Water Quality	12
ES1.7.2	Hydrology and Hydraulics	12
ES1.7.3	Water Management.....	19
ES1.7.4	Groundwater	19
ES1.7.5	Waste Rock and Coal Rejects	20
ES1.7.6	Decommissioning and Rehabilitation.....	21
ES1.7.7	Final Voids	22
ES1.7.8	Climate and Climate Change	22
ES1.7.9	Geology, Topography and Soils	23
ES1.7.10	Land Use, Tenure and Contamination.....	23
ES1.7.11	Terrestrial Ecology.....	26
ES1.7.12	Environmental Offsets.....	26
ES1.7.13	Aquatic Ecology	27
ES1.7.14	Stygofauna.....	30
ES1.7.15	Air Quality.....	30
ES1.7.16	Greenhouse Gas	31
ES1.7.17	Noise and Vibration.....	31
ES1.7.18	Landscape and Visual Amenity.....	32
ES1.7.19	Waste Management.....	32
ES1.7.20	Traffic and Transport.....	32
ES1.7.21	Indigenous and Historical Cultural Heritage	33
ES1.7.22	Social	34
ES1.7.23	Hazard/Risk and Health/Safety	34
ES1.7.24	Cumulative Impacts.....	35
ES1.7.25	Matters of National Environmental Significance	35
ES1.7.26	Environmental and Social Management	36
ES1.8	Glossary, Acronyms and Abbreviations	36

Tables

Table 1-1	Project Approvals	3
Table 1-2	Final Void Extent and Depth.....	22

Figures

Figure ES1-1	Regional Project Location.....	7
Figure ES1-2	Project Layout	8
Figure ES1-3	Proposed End of Life Project Layout South.....	9
Figure ES1-4	Proposed End of Life Project Layout North.....	10
Figure ES1-5	Post -development 1,000 Year ARI Flood Depths	14
Figure ES1-6	Post -development PMF Flood Depths	15
Figure ES1-7	Mine Water Management – Year 5 South	16
Figure ES1-8	Mine Water Management – Year 46 South	17
Figure ES1-9	Mine Water Management – Year 46 North	18
Figure ES1-10	Properties and Receptors.....	25
Figure ES1-11	Drainage Features, Wetlands and Gilgais	29

ES1. EXECUTIVE SUMMARY

ES1.1 Aim of the Byerwen Project

The Byerwen Coal Project (the project) aims to establish coal mining operations in Queensland's northern Bowen Basin as a profitable energy resource for the supply of high quality coking and some thermal coal to international coal markets. The project will produce approximately 15 million tonnes per annum (Mtpa) Run of Mine (ROM) coal and 10 Mtpa product coal. Construction, operations and decommissioning are expected to last 50 years, with construction commencing in 2014.

ES1.2 Project Proponent and Contact Details

The proponent of the project is Byerwen Coal Pty Ltd (Byerwen Coal). The proponent is a joint venture between QCoal Pty Ltd (controlling interest 80%) and JFE Steel (controlling interest 20%). QCoal is a privately owned Queensland company based in Brisbane. QCoal has been active in the Queensland coal exploration and mining industry for over 17 years.

QCoal discovered and developed the Sonoma Mine and remains a major joint venture partner in the mine. In addition QCoal, through subsidiary companies is developing and operating several other coal projects in the region, including:

- the Cows Coal Project, with construction having commenced in early 2013; and
- the Jax Coal project currently operating under an approved mineral development licence.

The Sonoma Mine, Cows Coal Project and the Jax Coal Project operate under approved environmental management plans (EMPs) and environmental authorities (EAs). These EMPs include:

- environmental values likely to be affected
- potential adverse and beneficial impacts on the environmental values
- environmental protection commitments to protect or enhance the environmental values under best practice measures
- environmental protection objectives, standards and measurable indicators
- environmental control strategies
- rehabilitation objectives, indicators and completion criteria.

As an explorer and developer of coal resources, QCoal undertakes significant coal exploration within Queensland with the view to expanding the knowledge of coal located within its exploration tenements. Where coal resources are defined that are suitable for open-cut or underground mining techniques, QCoal plans to pursue development of such tenements for future commercial exploitation.

The public can contact the proponent via:

- website: www.qcoal.com.au
- email: info@qcoal.com.au
- phone: 07 3002 2900

JFE Steel is a subsidiary of the JFE Group of Japan. The JFE Group is Queensland's largest export customer and JFE Steel is one of the largest customers of Queensland sourced coking coal. JFE Steel and associated companies already have direct equity investments in a number of Queensland coal mines.

ES1.3 The EIS, Process and Public Submission Information

The project was declared to be a 'significant project for which an EIS is required' under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) by the Coordinator-General (CG) on 1 March 2011. This declaration initiated the statutory environmental impact assessment procedure requiring the proponent to prepare an environmental impact statement (EIS) for the project.

The Australian Government determined that the project constitutes a controlled action pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) on 13 January 2011, due to the likely significant impacts on matters of national environmental significance (MNES).

On 4 March 2011, the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) determined that the proposed controlled action would be via the bilateral agreement between the Australian and Queensland governments, enabling this EIS to meet impact assessment requirements under both Commonwealth and Queensland legislation.

Under the SDPWO Act, the EIS approvals process comprises a number of steps, beginning with developing the Terms of Reference (ToR) for the project's EIS. In finalising the ToR, the CG considered all properly made submissions received in respect of the draft ToR and presented copies of the submissions to the proponent. In accordance with the SDPWO Act, the proponent must provide an EIS that addresses the ToR to the satisfaction of the CG.

Under the SDPWO Act, when the proponent has prepared an EIS to the satisfaction of the CG, they must publicly notify where a copy of the EIS is available for inspection, where a copy of the EIS may be obtained at a stated reasonable cost, that submissions may be made to the CG about the EIS and the submission period set by the CG during which submissions may be made. Submissions made by the public will be considered by the CG and provided to the proponent (under the SDPWO Act). Based on the submissions, the CG may ask the proponent for supplementary information or comment about the EIS and the project. This may be provided by the proponent as "The EIS Supplementary Report" which will then be considered by the CG as part of the assessment process.

Written EIS submissions are invited from any person during the submission period specified by the CG. Submissions can be made by:

- email: byerwen@coordinatorgeneral.qld.gov.au, or
- mail: Office of the Coordinator-General
Attention: The EIS Coordinator (Byerwen Project)
PO Box 15517,
City East, Queensland 4002

A properly made submission is one that is written, signed by or for each person ("signatory") who made the submission, states the name and address of each signatory, is made to the CG and is received on or before the last day of the submission period. It is a statutory requirement that all submissions will be forwarded to the proponent so that they may consider them and provide a response to the CG. For further information regarding the EIS process for this proposal, contact the EIS Coordinator on:

- phone: 13QGOV (13 74 68), or
- email: info@dsdip.qld.gov.au.

At the completion of the EIS phase, the CG will prepare a report evaluating the EIS and other relevant material that may comprise the EIS, properly made submissions, supplementary information, comments and advice from advisory agencies or other entities, as well as technical reports. The CG's report will include an assessment and conclusion about the environmental and social effects of the project. Public notification of the CG's report will be made by placing it on the Department of State Development,

Infrastructure and Planning's (DSDIP's) website. The report will also be presented to the proponent, the assessment manager, the relevant state government advisory agencies and the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities who will use this report as the basis for an approval of the controlled action under the EPBC Act.

A number of other approvals may be required by the project in addition to those related to the EIS approval process. These project approvals include, but are not limited to those provided in **Table 1-1**.

Table 1-1 Project Approvals

Applicable Act	Permit / Approval / Licence	Administering Authority
<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>	Approval of the project as a 'controlled action'.	Department of Sustainability, Environment, Water, Population and Communities
<i>State Development and Public Works Organisation Act 1971 (Qld)</i>	Completion of an EIS for approval as a 'significant project'.	Queensland Coordinator-General, Department of State Development, Infrastructure and Planning
<i>Environmental Protection Act 1994 (Qld)</i>	Approval of a site specific Environmental Authority (previously a level 1 mining project).	Department of Environment and Heritage Protection
<i>Environmental Protection Act 1994 (Qld)</i>	Approval of relevant ERAs.	Department of Environment and Heritage Protection
<i>Mineral Resources Act 1989 (Qld)</i>	Grant of Mining Leases.	Department of Natural Resources and Mines
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth)</i>	Notification in the event Indigenous human remains are discovered.	Department of Sustainability, Environment, Water, Population and Communities
<i>Aboriginal Cultural Heritage Act 2003 (Qld)</i>	Approved Cultural Heritage Management Plan/s.	Department of Aboriginal and Torres Strait Islander and Multicultural Affairs
<i>Nature Conservation Act 1992 (Qld)</i>	Approval of the relevant permits/exemptions.	Department of Environment and Heritage Protection and Department of National Parks, Recreation, Sports and Racing
<i>Strategic Cropping Land Act 2011 (Qld)</i>	Validation assessment to confirm the presence of Strategic Cropping Land.	Department of Natural Resources and Mines
<i>Sustainable Planning Act 2009 (Qld)</i>	Third party development approval for accommodation facilities.	Regional council supported by referral agencies
<i>Water Act 2000 (Qld)</i>	Water Permits. Riverine Protection Permits.	Department of Natural Resources and Mines

ES1.3.1 Scope of Activities Included in the Project

The accommodation facilities are not part of this EIS. The proponent has an arrangement with a third party who will develop the accommodation facilities in Glenden and seek all relevant approvals for the construction and operation of the facilities. This EIS does however assess the social and community impacts of an accommodation village in Glenden and the traffic and transport impacts of workers commuting between Glenden and the mine site. Localised impacts of the accommodation facility such

as impacts to the ecology within the accommodation facility footprint or noise impacts on nearby sensitive receptors, will be assessed during the application for development approval.

The project is interrelated with a number of other projects across the region and the state. Although project timing and success may be dependent on these other projects, approvals for these projects are not being sought by the proponent and do not form part of this EIS. These interrelated projects are the:

- Goonyella to Abbot Point (GAP) rail line
- Abbot Point Coal Terminal, including any planned expansions
- Supply of water via SunWater's Burdekin to Moranbah water pipeline system
- Electricity supply from the national electricity grid

ES1.3.2 Structure of the EIS

The EIS is comprised of six volumes:

- Volume 1: executive summary and chapters 1 - 18 describing the EIS process, the project and for identified environmental, social or economic aspects, the values, potential impacts and mitigation measures
- Volume 2: chapters 19 – 36 describing the identified environmental, social or economic aspects, the values, the potential impacts and mitigation measures
- Volume 3: appendices 1 – 11 supporting the chapters, including the ToR, management plans and specialist technical reports on identified environmental, social and economic aspects.
- Volume 4: appendices 12 – 18 supporting the chapters, including the ToR, management plans and specialist technical reports on identified environmental, social and economic aspects.
- Volume 5: appendices 19 – 22 supporting the chapters, including specialist technical reports on identified environmental, social and economic aspects.
- Volume 6: appendices 23 – 33 supporting the chapters, including management plans and specialist technical reports on identified environmental, social and economic aspects.

ES1.4 Public Consultation

A stakeholder engagement strategy was implemented, which comprised a range of consultation activities undertaken throughout the project's pre-feasibility and EIS phases, to ensure that all issues and concerns raised by the community and stakeholders were considered. Part of the strategy involved the development of a consultation program designed to align with key project phases. The current project phase is the development phase and production of the EIS.

Findings have been used to refine future consultation methods, finalise the draft ToR and therefore be integrated into the EIS studies, inform the social impact assessment and identify further issues for consideration by the proponent.

Management strategies to address social impacts identified through the consultation process are provided in the Social Impact Management Plan (SIMP) as part of the EIS.

The proponent will undertake two further formal rounds of stakeholder and community consultation. Community relations team members will also be available via phone, email and in person throughout the project planning and delivery. Responses to concerns and complaints will be registered via the proponent's grievance/feedback mechanism and dispute resolution process. Following the completion of the EIS process, community consultation and stakeholder engagement will be ongoing through the implementation and adaptive management of the SIMP.

ES1.5 Project Outline

ES1.5.1 Project Location and Project Area

The project area is defined by the project's six mining lease application (MLA) areas (or project tenement areas) being, MLA 10355, MLA 10356, MLA 10357, MLA 70434, MLA 70435 and MLA 70436. Collectively, the six MLAs cover an area of approximately 22,697 hectares (ha).

The project area is located in the Whitsunday Regional Council and Isaac Regional Council government areas. It is located approximately 20 kilometres (km) west of the mining township of Glenden and lies approximately 140 km west of the regional centre of Mackay. The project is situated immediately to the west of the Xstrata Coal's Newlands Mine and to the north of the Xstrata Coal's Wollombi and Suttor Creek mines.

The project tenements are traversed by the Collinsville-Elphinstone Road and the GAP rail line. Access to the project area will be via the existing Collinsville-Elphinstone Road which connects to the Bowen Developmental Road and Suttor Developmental Road. These are highways from either Bowen via Collinsville or from Mackay via Glenden and Nebo.

The project's location in a regional context and local government boundaries are shown in **Figure ES1-1**.

ES1.5.2 Project Overview, Pre-Construction, Construction and Operation

As part of the project the proponent proposes to develop open cut coal mines with a ROM rate of 15 Mtpa, producing approximately 10 Mtpa of product coal for the export market over the 50 year project life (two years for construction, 46 years of mining operation and 2 years for decommissioning and rehabilitation).

Production from the project will be high quality coking coal with some thermal coal, mined from four mining zones (north, south, east and west), comprising eight open pits. The south phase comprises mining zones in the south, east and west. The north phase comprises mining zones in the north. Mining will be via open cut using a combination of dragline, large excavator, truck and dozer equipment.

Prior to on-site construction activities the pre-construction phase will be undertaken, including detailed design, tenders and early procurement of infrastructure components with long lead times. As such, pre-construction activities planned for the project do not require site based works and therefore will have no associated impacts.

Construction in the southern tenement area for the south phase will occur prior to any operations and include construction of the southern coal handling and preparation plant (CHPP), mine infrastructure area (MIA) water management infrastructure, and southern train loading facility (TLF). In approximately Year 15 of mining operations, construction in the northern tenement area for the north phase will commence to coincide with the planned commencement of operations of the open pit in the north in Year 17. Construction in the northern tenement area will include the northern CHPP, MIA, water management infrastructure and northern TLF.

When fully developed to the planned production rate, it is expected that the project will require approximately 5,500 ML of water a year. Water is required for the CHPPs, dust suppression on haul roads and potable water. The proponent has commenced discussions with a third party water supplier (SunWater) for the sourcing and delivery of water for the project. SunWater's existing Burdekin to Moranbah water pipeline connects the Burdekin water supply scheme at Gorge Weir to Moranbah and intersects the project area. SunWater are planning to duplicate this water pipeline by constructing a water pipeline parallel to the existing pipeline which will also intersect the project's tenements. The project will source raw water from the existing pipeline in the initial years of construction and operation and from the duplicate pipeline once it is constructed and operational.

Each CHPP will comprise a two stage dense medium cyclone and spiral/reflux classifier and froth flotation operation with a co-disposal system for rejects management. It is likely the southern CHPP will be developed in modules of either two 1,100 tonnes per hour (tph) process train, or three 700 tph process train configurations while the northern CHPP will be a single 700 tph process train.

Product coal will be loaded onto trains via two TLFs, wholly within the project tenement area, located adjacent to the two CHPP areas. Each TLF will comprise rail loop, train loading bin and rail spur. The TLF rail spur will be connected to the GAP rail line. The southern CHPP rail spur and rail loop will be approximately 7 km in length and the northern CHPP rail spur and rail loop will be approximately 3.5 km in length. Product coal will be railed to the Port of Abbot Point coal terminal for distribution to international markets.

It is anticipated that a construction workforce of approximately 350 and 265 personnel will be required to construct the south phase and the north phase of the project respectively. The construction workforces will ramp up over a three year time frame. The operational workforce will progressively ramp up to a peak workforce of approximately 545 permanent employees once both the south phase and the north phase are operational. Depending upon the operational model chosen some employees may be employed by contractors rather than directly by the proponent.

The proponent's preference is for accommodation to be provided in Glenden.

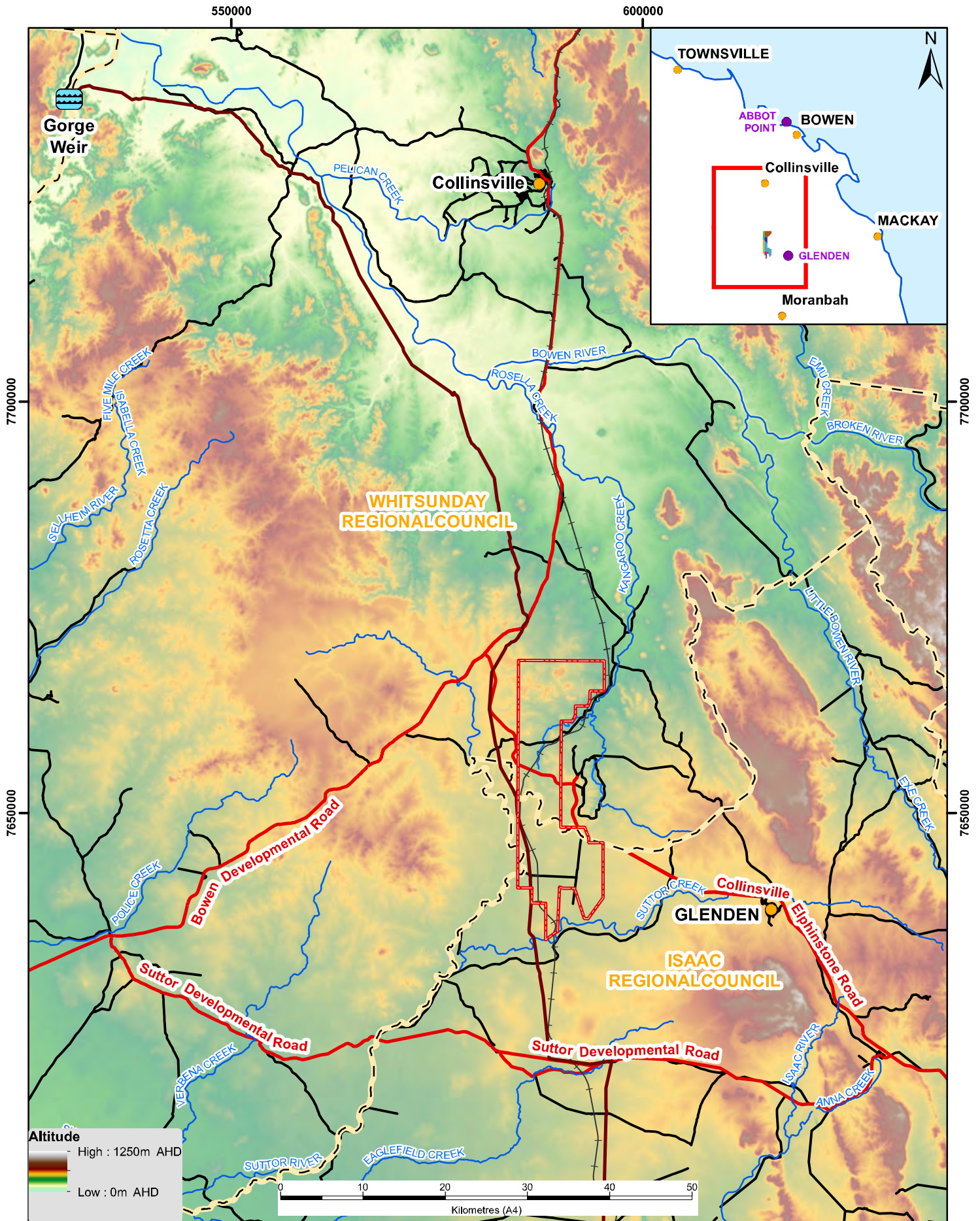
An overview of the project layout is shown in **Figure ES1-2**, which presents key elements of the project including pits, waste rock dumps, roads, infrastructure, dams and water management features.

ES1.5.3 Mine Layout

The proposed end of project life mine layout is shown for the southern and northern sections of the project in **Figure ES1-3** and **Figure ES1-4** respectively.

The total project footprint is approximately 6,997 ha, which comprises of 907 ha for infrastructure (roads, buildings, coal processing, etc.) and 6,091 ha for mine pits and waste rock dumps.

After closure of the mine there will be approximately 5,655 ha of rehabilitated areas and 1,342 ha of final voids.



Legend

- Project Area
- Main Towns
- Burdekin to Moranbah Pipeline
- Watercourses
- GAP Rail line
- Highway
- Main Road
- Local Roads (formed & unformed)
- Local Government Boundary

Regional Project Location



Figure ES1-1 Byerwen Coal Project

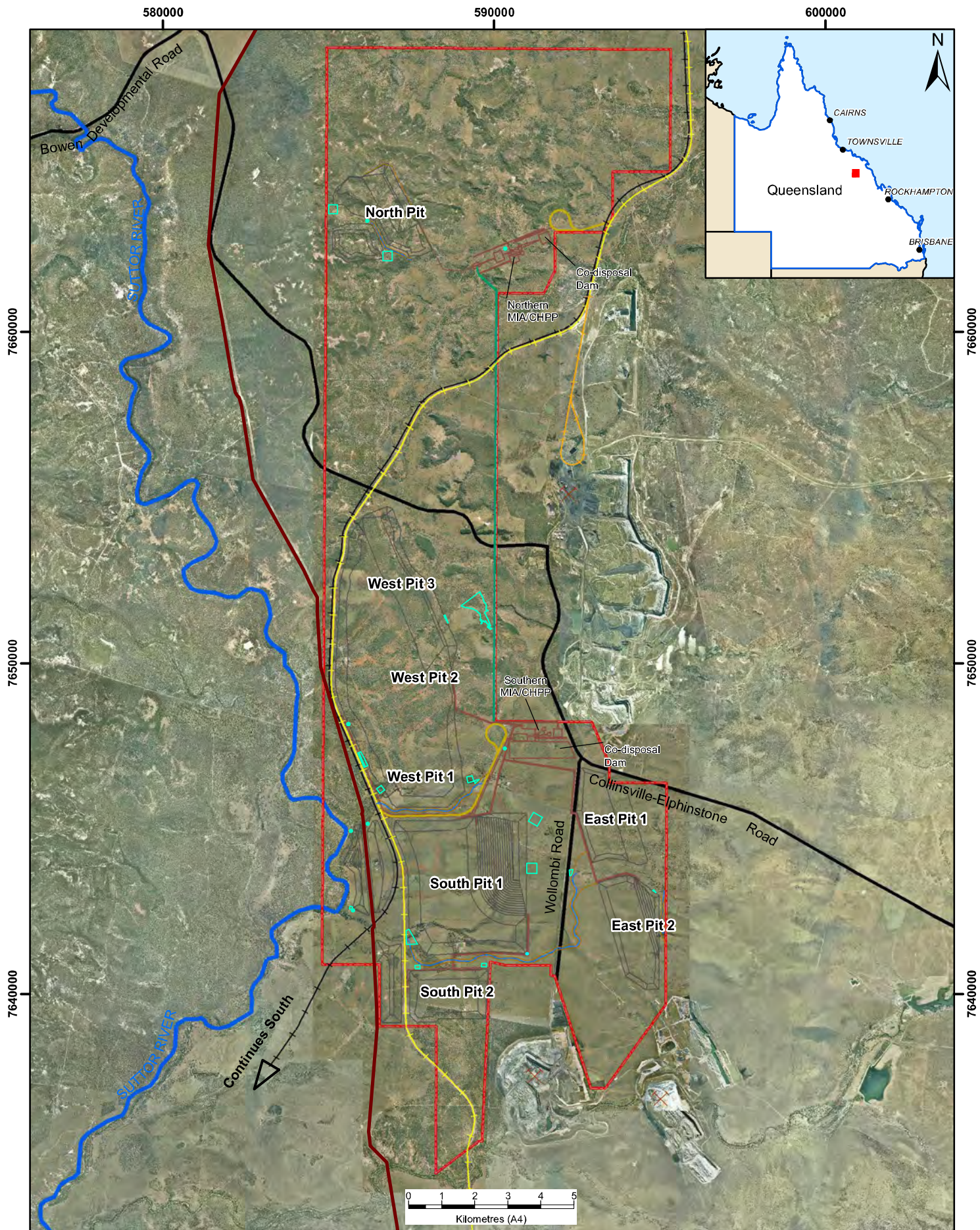
Date: 8/03/2013

Author: samuel Jerguson

Map Scale: 1:600,000

Coordinate System: GDA 1994 MGA Zone 55

Revisions: R1



Legend

- | | | |
|--|--|---|
| Project Area | — GAP Rail line | — Suttor River |
| Waste Rock Dumps and Pits | — Newlands Mine Rail Loop | — Formed Road |
| X Existing Mine Site | — Alpha Coal Project Rail Line | — Drainage Bund |
| — Burdekin to Moranbah Pipeline | — Train Loading Facilities | — Drainage Diversion |
| | — Central Infrastructure Corridor | Dam (mine affected, sediment affected, clean water) |
| | — Mine Infrastructure | |

Project Layout

Figure ES1-2

Byerwen Coal Project

Date: 8/03/2013

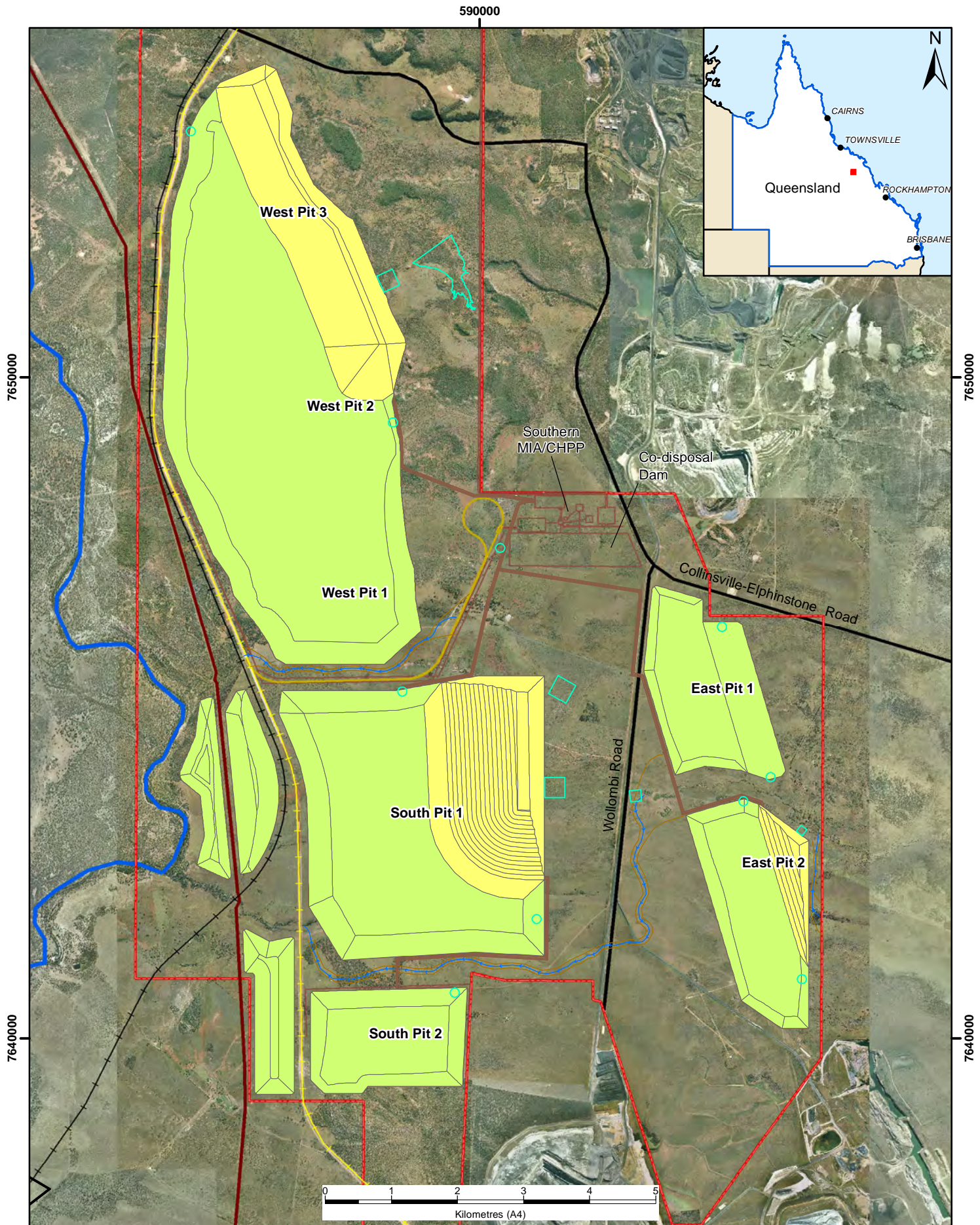
Author: samuel Jerguson

Revision: R1

Map Scale: 1:150,000

Coordinate System: GDA 1994 MGA Zone 55





Legend

- | | | |
|---|---|---|
| Completed Rehab | Project Area | Dam (mine affected, sediment affected, clean water) |
| Final Void | Suttor River | Train Loading Facilities |
| GAP Rail line | Formed Roads | Alpha Coal Project Rail Line |
| Pits labels | Mine Infrastructure | Burdekin to Moranbah Pipeline |
| | Drainage Bund | |
| | Drainage Diversion | |

Proposed End of Life Project Layout South



Figure ES1-3

Byerwen Coal Project



Date: 16/05/2013

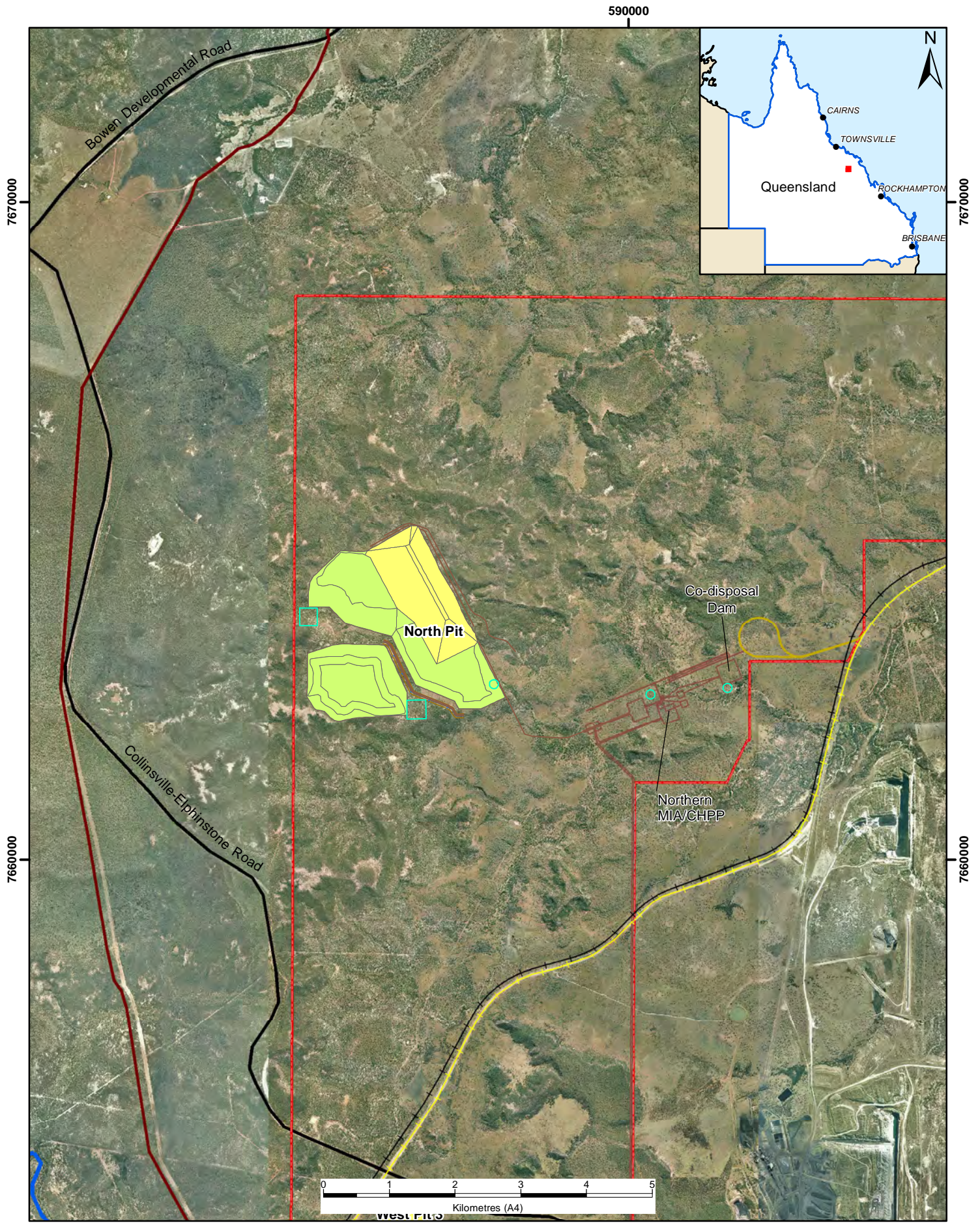
Author: samuel.ferguson

Map Scale: 1:75,000

Revision: R1

Coordinate System: GDA 1994 MGA Zone 55

G:\CLIENTS\A-TO-D\BYE GEN - Byerwen EIS\GIS\Maps\EIS Chapters\EIS_Executive_Summary\BYE GEN_ES1-3_EOL_South.mxd



Legend

- | | | |
|---|--|--|
| Project Area | — Sutor River | Dam (mine affected, sediment affected, clean water) |
| Completed Rehab | — Formed Roads | — Train Loading Facilities |
| Final Void | — Mine Infrastructure | — Alpha Coal Project Rail Line |
| — GAP Rail line | — Drainage Bund | — Burdekin to Moranbah Pipeline |
| Pits labels | — Drainage Diversion | |

Proposed End of Life Project Layout North



Figure ES1-4

Byerwen Coal Project



Date: 16/05/2013

Author: samuel.ferguson

Map Scale: 1:75,000

Revision: R1

Coordinate System: GDA 1994 MGA Zone 55

G:\CLIENTS\A-TO-D\BYEGEN - Byerwen EIS\GIS\Map\ES1-4_EOL_North.mxd

© State of Queensland (Department of Environment and Resource Management (DERM), Department of Natural Resources and Mines (DNRM)). ELP has produced this map for the purpose of presenting a summary of relevant spatial information based on or containing data provided by the State of Queensland (DERM, DNRM) [2012] and other sources at the time the map was prepared. In consideration of the State permitting use of this data you acknowledge and agree that both the State and ELP give no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws. Imagery outside of project area accurate +/- 100m.

ES1.6 Project Rationale, Economics and Alternatives

ES1.6.1 Project Economics

Royalty payments to the Queensland Government for the coal production are predicted to be approximately \$13.2 billion over the life of the project. In addition, mining lease rentals, payroll tax, company tax, income tax and goods and services tax will be paid to State and Federal governments as a result of the project.

The economic impact assessment estimates that the project will provide significant economic net benefits to the region, State and rest of Australia, during both construction and mine operations. Over the period of the first phase of construction the project is estimated to have the following direct and indirect economic benefits in the region and State:

- \$2,712 million in output
- \$1,309 million in gross value added (outputs less inputs)
- \$700 million in household incomes
- Up to 5,609 full time equivalent (FTE) jobs (direct and indirect) in any one year.

During the operations phase the project is estimated to have the following average annual (following the initial four years of ramp up) direct and indirect economic benefits:

- \$2,299 million per annum in output
- \$1,133 million per annum in gross value added (outputs less inputs)
- \$482 million per annum in household incomes
- 6,206 FTE jobs per annum (direct and indirect).

ES1.6.2 Project Rationale

The project aims to establish an open cut coal mine in the Bowen Basin as a commercial energy resource for the supply of coking and thermal coal to the international coal markets. The project will be well positioned to take advantage of existing and planned coal transport infrastructure and port facilities to capitalise on increases in global demand for coal. Demand for coking coal and high quality thermal coal is expected to increase over the next decade – particularly from Asian and Indian markets. Australia's proximity to these countries gives it a significant commercial advantage in the international market place.

If the project did not proceed, there is potential for the on-going global demand for coking and thermal coal to be lost to an international competitor, with losses of export revenue, State coal royalties, local, regional and state employment and ancillary business opportunities. Direct and indirect economic opportunities to the region, Queensland and Australia would not be realised, including the creation of approximately 6,200 FTE direct and indirect jobs per annum.

The social impact assessment demonstrates that the project will provide considerable social benefits to the region during both construction and mine operations.

Under the do nothing scenario the environmental and social impacts of the project would not be realised. However, this EIS concludes that, with appropriate mitigation measures, negative environmental and social impacts do not outweigh the benefits of positive social and economic impacts.

ES1.6.3 Project Alternatives

The proponent has considered a range of alternatives for the project including for mining methodology, mine scheduling, waste rock coal removal, coal handling and processing, rejects management, water

management and waste management. Social, economic and environmental considerations informed the selection of preferred alternatives.

The location of the project and the activities within the project is largely determined by the location of economically recoverable coal; therefore no alternative project locations are feasible given the location of the targeted coal seams.

However, the locations of out of pit waste rock dumps have been selected to minimise the sterilisation of any economically recoverable coal, avoid third party linear infrastructure, optimise mine planning, avoid defined watercourses, wetlands and drainage features where possible, and also to integrate in-pit and out of pit waste rock dumps into a single landform for rehabilitation.

Mine infrastructure and water management infrastructure is planned to be situated in an area that would minimise the sterilisation of any economically recoverable coal, haul distances for ROM coal and impacts on environmentally sensitive areas and sensitive receptors.

ES1.7 Environmental and Social Values

ES1.7.1 Surface Water Quality

The project is located within the Rosella Creek and Upper Suttor River sub-catchments, of the Bowen River and Suttor River catchments respectively. These catchments constitute part of the headwaters of the Burdekin Basin. Two key watercourses have been identified within the study area. In the north Kangaroo Creek, which is ephemeral, drains the project area, flowing into Rosella Creek which drains into the Bowen River. In the south the Suttor River drains the project area, which flows into the Burdekin Falls Dam downstream of its confluence with the Belyando River. Adjacent to and within the project area, the Suttor River is ephemeral, with flow less than 40% of the time.

It will be necessary for the project to release water to the environment to balance the mine water inventory. This will be achieved through a controlled release strategy allowing discharge into waterways, when specific flow and water quality criteria have been satisfied. A receiving environment compliance monitoring location with an associated upstream flow monitoring location is proposed for the Kangaroo Creek drainage system for the north of the project and the Suttor River for the south of the project.

For the majority of parameters, the adopted Water Quality Objectives (WQO) values are the default Queensland Water Quality Guidelines (QWQG); however for some parameters such as pH, electrical conductivity (EC), turbidity, total nitrogen, aluminium, copper and zinc, baseline data was used to determine site appropriate objectives. The proposed WQOs were used as the basis for developing mine water release criteria. Release criteria (end of pipe or hard limits) comprise maximum values for certain parameters which must be met for the water intended for release, including pH, turbidity and sulphate.

A monitoring program will be developed to monitor water quality in project water management infrastructure (i.e. dams and at release points) and in the receiving environment, prior to, during and after any releases, as well as during non-release periods to continually monitor the water quality and increase the available data of the area. A specific receiving environment monitoring programme (REMP) will also be undertaken to include ongoing water quality and aquatic ecology monitoring in the surrounding project area.

ES1.7.2 Hydrology and Hydraulics

Flood modelling for the Suttor River was undertaken along with a modelling of smaller key drainage features on the project and a review of state-wide floodplain modelling.

The only project activities potentially affected by a 1,000 Year annual recurrence interval (ARI) or probable maximum flood (PMF) event, are sections of the West Pit, South Pit 1 and South Pit 2 waste rock dumps and the south western corner of South Pit 1 (**Figure ES1-5** and **Figure ES1-6**). This indicated a requirement for rock armouring of the western waste rock dumps up to the 1,000 year ARI flood level or relocation of the toe of the dump outside the flood extent, which would mitigate any project impacts due to flooding in the Suttor River to a negligible level. Additionally, the levees that form part of the drainage diversions works will be extended to protect South Pit 1 and West Pit 1 from 1,000 year ARI regional flooding in the Suttor River at all intervals of the mine life.

There are no scenarios where the regional PMF flood event reaches any of the final voids.

The peak flood level and average velocity of flood water across the key areas of the project area was modelled to determine any change associated with the project. The peak flood level may increase by a maximum of 0.2m and the average velocity may increase by a maximum of 0.1m/s, both of which are considered negligible.

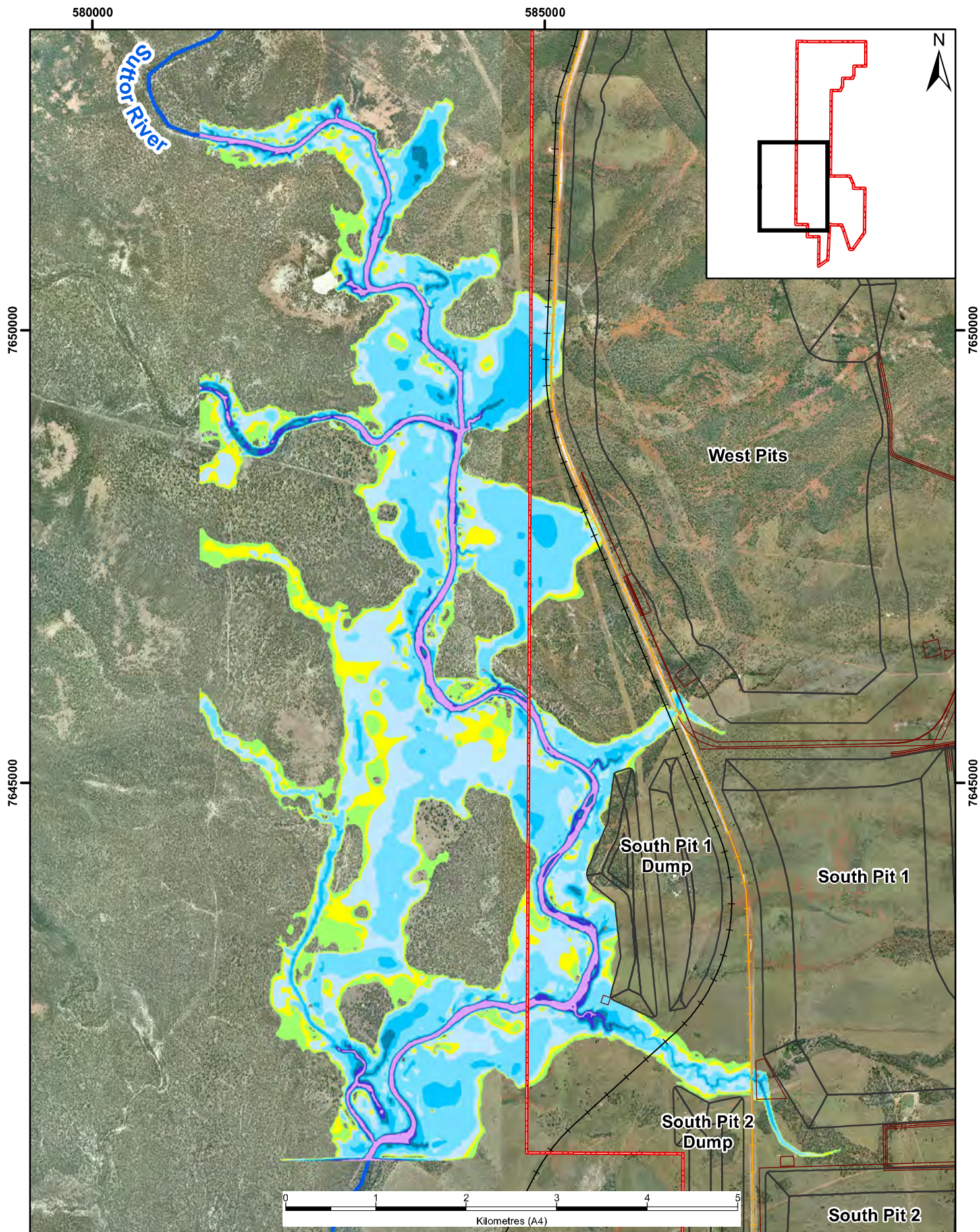
The southern MIA is not at risk from flooding as it is located at the top of a catchment. While the northern MIA is not likely to be flooded itself, it may require culverts or a bridge to provide access and protect the area.

The GAP rail line flood immunity is not affected by the project.

Five diversion channels are proposed to divert local watercourses and drainage lines around open pits and waste rock dumps (refer **Figure ES1-7** to **Figure ES1-9**). The hydraulic parameters (such as flow rate, velocity, etc.) in the constructed diversion channels will be within guideline values for natural watercourses in the Bowen Basin and diversion channels have been designed to match the length of the natural channel being diverted. As such negligible change in flow or velocity is expected to occur in the waterways receiving water from diversions.

With appropriate design and construction, impacts to catchment hydrology, localised flooding, geomorphology and ecological integrity from diversions are expected to be negligible to minor.

The operation of the water management system in accordance with the planned release strategy will have negligible impact on the hydrology of the Suttor River and Kangaroo Creek. Impacts will be minor in local tributaries in the project area as maximum release rates are well within the design capacities of diversion channels.



Legend

- Project Area
- Waste Rock Dumps and Pits
- Mine Infrastructure
- Alpha Coal Project Rail Line
- GAP Rail Line

Maximum Flood Depth (m)

- | | | |
|------------------|------------|-----------|
| < 0.05 Not Shown | 0.05 - 0.3 | 2.0 - 3.0 |
| 0.3 - 0.5 | 0.5 - 1.0 | 3.0 - 4.0 |
| 1.0 - 2.0 | > 5.0 | |

Post-development 1,000 Year ARI Flood Depths

Figure ES1-5

Byerwen Coal Project

Date: 8/03/2013

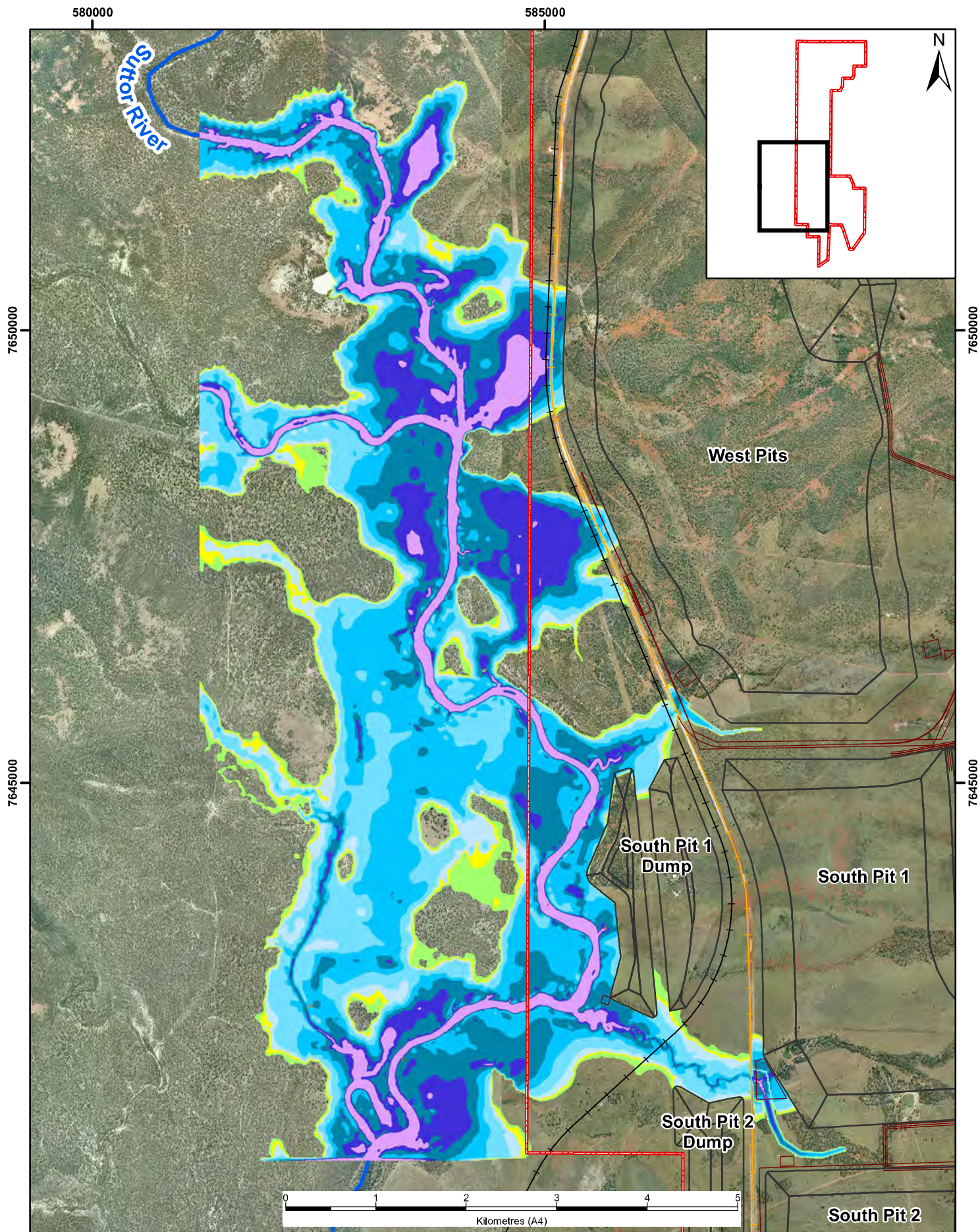
Author: samuel Jerguson

Revision: R1

Map Scale: 1:55,000

Coordinate System: GDA 1994 MGA Zone 55





Legend

- Project Area
- Waste Rock Dumps and Pits
- Mine Infrastructure
- Alpha Coal Project Rail Line
- GAP Rail Line

Probable Maximum Flood Depth (m)

- | | |
|--|--|
| < 0.05 Not Shown | 2.0 - 3.0 |
| 0.05 - 0.3 | 3.0 - 4.0 |
| 0.3 - 0.5 | 4.0 - 5.0 |
| 0.5 - 1.0 | > 5.0 |
| 1.0 - 2.0 | |

Post-development PMF Flood Depths

Figure ES1-6

Byerwen Coal Project

Date: 8/03/2013

Author: samuel Jerguson

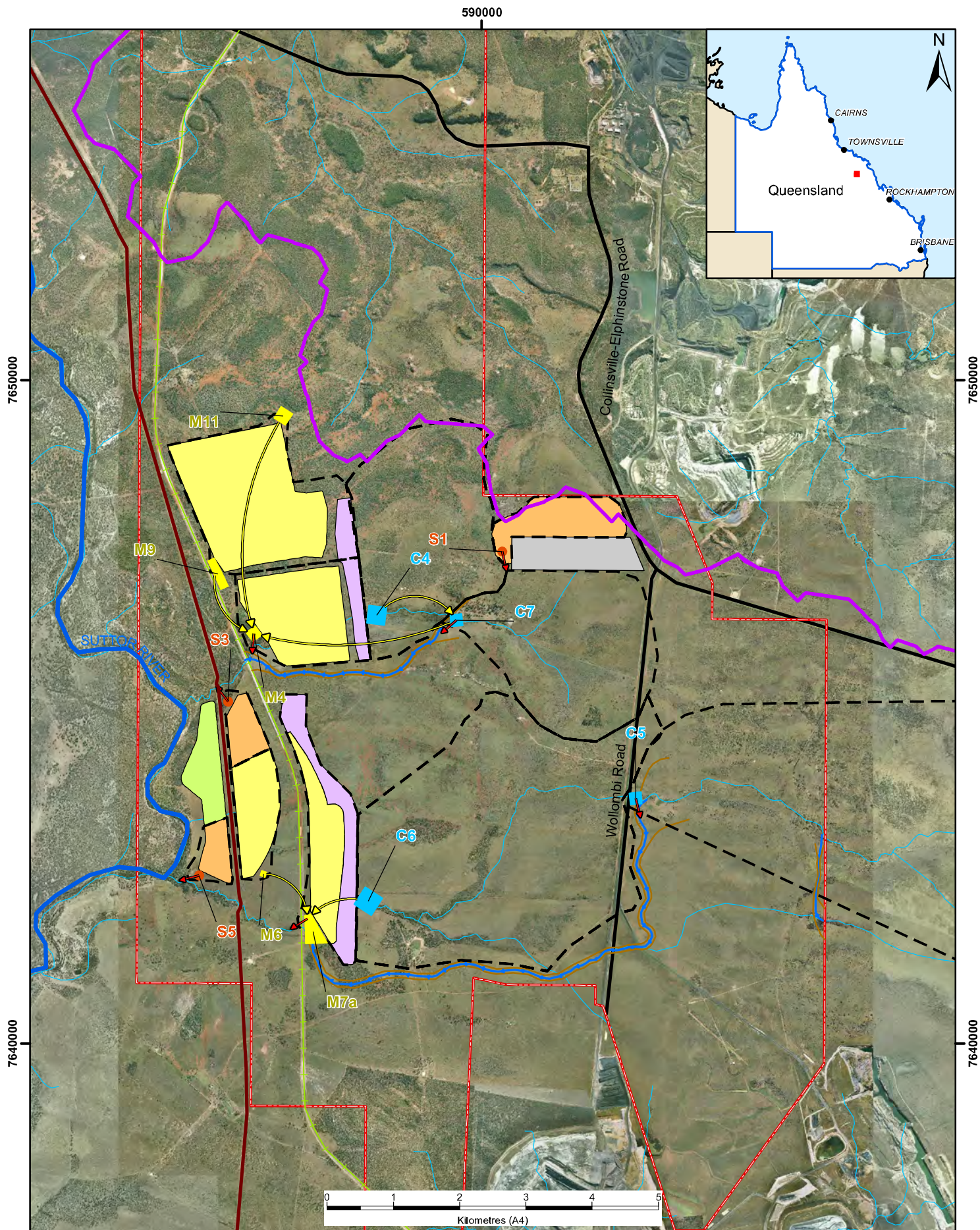
Revision: R1

Map Scale: 1:55,000

Coordinate System: GDA 1994 MGA Zone 55



© State of Queensland (Department of Environment and Resource Management (DERM), Department of Natural Resources and Mines (DNRM)). ELP has produced this map for the purpose of presenting a summary of relevant spatial information based on or containing data provided by the State of Queensland (DERM, DNRM) [2013] and other sources at the time the map was prepared. In consideration of the State permitting use of this data you acknowledge and agree that both the State and ELP give no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws.



Legend

- | | | |
|--|--|---|
| <ul style="list-style-type: none"> Project Area Main Catchment Divide Burdekin to Moranbah Pipeline GAP Rail line Drainage Bund Drainage Diversion Drainage Lines | <ul style="list-style-type: none"> Subcatchments → Release to Environment → Water Transfer → Clean Water Dam → Mine Affected Water Dam → Sediment Affected Water Dam → Formed Roads | <p>Area Type</p> <ul style="list-style-type: none"> Mine Affected Water Catchment Rehabilitated Waste Rock Dump Sediment Affected Water Catchment Pre Strip Co-disposal Area |
|--|--|---|

© State of Queensland (Department of Environment and Resource Management (DERM), Department of Natural Resources and Mines (DNRM)). ELP has produced this map for the purpose of presenting a summary of relevant spatial information based on or containing data provided by the State of Queensland (DERM, DNRM) [2013] and other sources at the time the map was prepared. In consideration of the State permitting use of this data you acknowledge and agree that both the State and ELP give no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws. Imagery outside of project area accurate +/- 100m.

Mine Water Management Year 5 South



Figure ES1-7

Byerwen Coal Project



Date: 8/03/2013

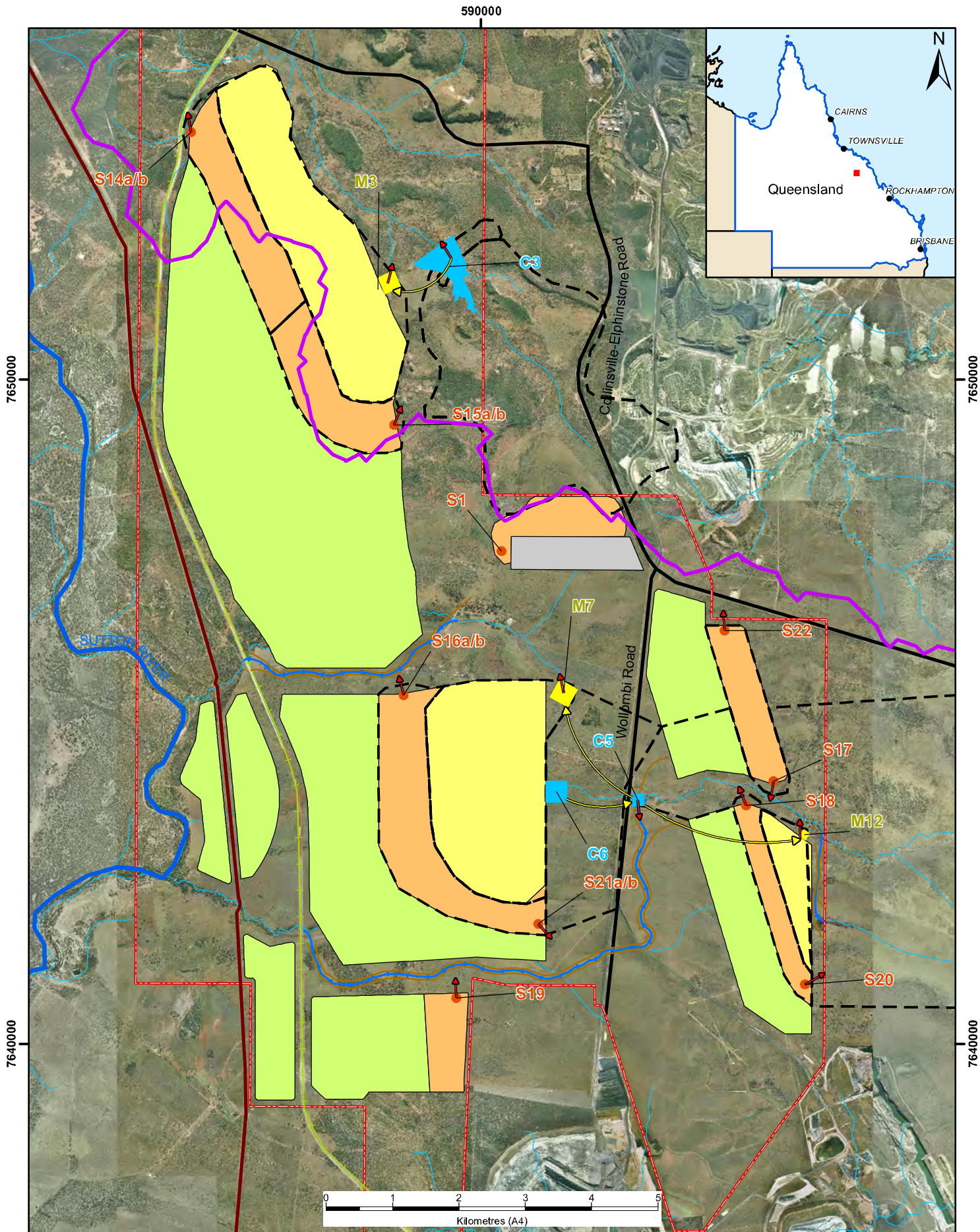
Author: samuel Jerguson

Map Scale: 1:75,000

Coordinate System: GDA 1994 MGA Zone 55

Revision: R1

G:\CLIENTS\A-TO-D\BYEWEN - Byerwen EIS\GIS\Maps\BIS Chapters\BIS_EIS_Executive_Summary\BYEWEN_ES1-7_MWM_Y5_S.mxd



Legend

- | | | |
|---|---|---|
| Project Area | Subcatchments | Mine Affected Water Catchment |
| Main Catchment Divide | Formed Roads | Rehabilitated Waste Rock Dump |
| Burdekin to Moranbah Pipeline | Release to Environment | Sediment Affected Water Catchment |
| GAP Rail line | Water Transfer | Pre Strip |
| Drainage Bund | Clean Water Dam | Co-disposal Area |
| Drainage Diversion | Mine Affected Water Dam | |
| Drainage Lines | Sediment Affected Water Dam | |

© State of Queensland (Department of Environment and Resource Management (DERM), Department of Natural Resources and Mines (DNRM)). ELP has produced this map for the purpose of presenting a summary of relevant spatial information based on or containing data provided by the State of Queensland (DERM, DNRM) [2013] and other sources at the time the map was prepared. In consideration of the State permitting use of this data you acknowledge and agree that both the State and ELP give no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws. Imagery outside of project area accurate +/- 100m.

Mine Water Management Year 46 South



Figure ES1-8

**Byerwen Coal
Project**



Date: 8/03/2013

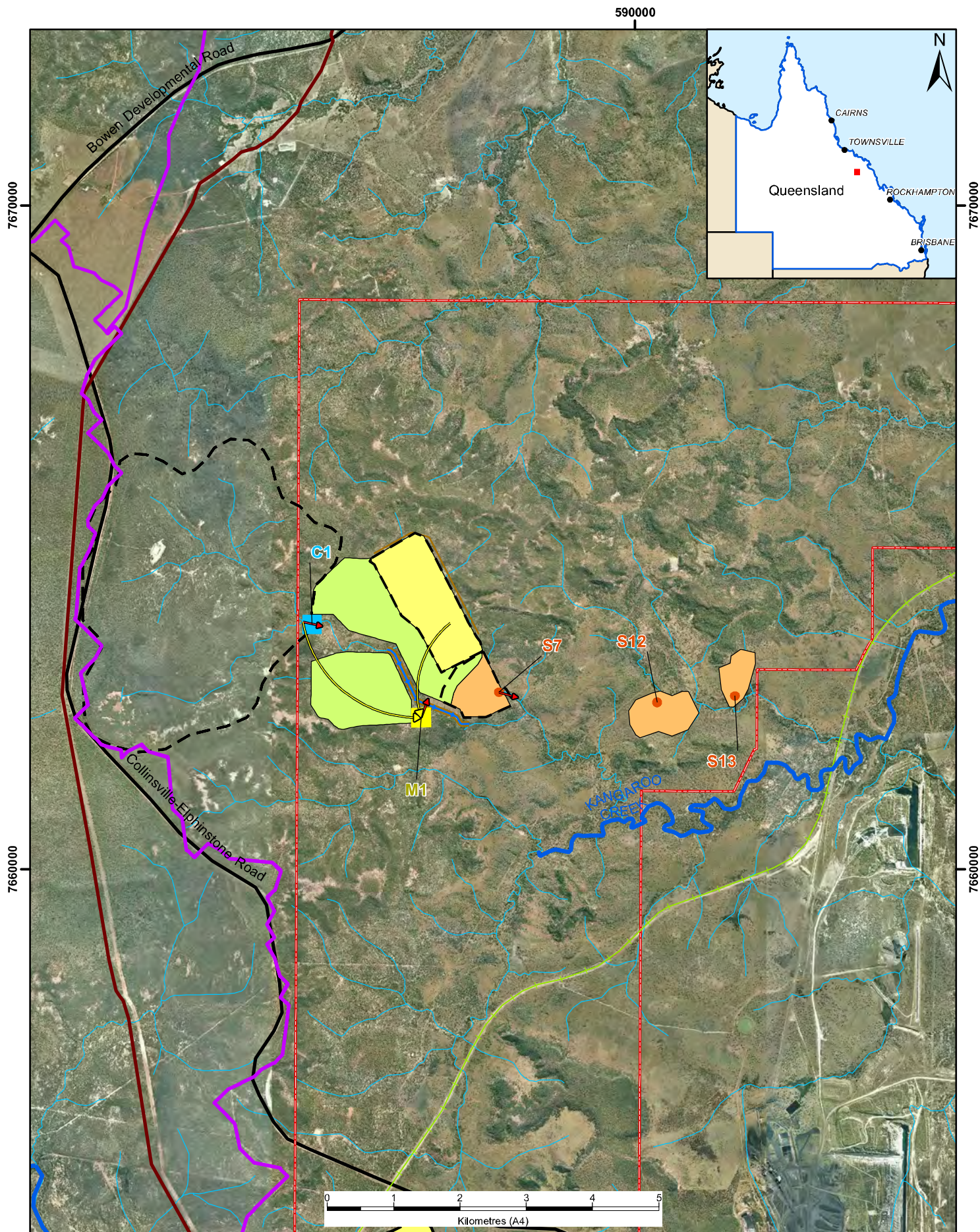
Author: samuel Jerguson

Map Scale: 1:75,000

Revision: R1

Coordinate System: GDA 1994 MGA Zone 55

G:\CLIENTS\A-TO-D\BYEWEN - Byerwen EIS\GIS\Maps\BIS Chapters\BIS_Executive_Summary\BYEWEN_ES1-8_MWM_Y46_S.mxd



Legend

- | | | |
|---|---|---|
| Project Area | Subcatchments | Mine Affected Water Catchment |
| Main Catchment Divide | Formed Roads | Rehabilitated Waste Rock Dump |
| Burdekin to Moranbah Pipeline | Release to Environment | Sediment Affected Water Catchment |
| GAP Rail line | Water Transfer | Pre Strip |
| Drainage Bund | Clean Water Dam | Co-disposal Area |
| Drainage Diversion | Mine Affected Water Dam | |
| Drainage Lines | Sediment Affected Water Dam | |

© State of Queensland (Department of Environment and Resource Management (DERM), Department of Natural Resources and Mines (DNRM)). ELP has produced this map for the purpose of presenting a summary of relevant spatial information based on or containing data provided by the State of Queensland (DERM, DNRM) [2013] and other sources at the time the map was prepared. In consideration of the State permitting use of this data you acknowledge and agree that both the State and ELP give no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws. Imagery outside of project area accurate +/- 100m.

Mine Water Management Year 46 North



Figure ES1-9

Byerwen Coal Project



Date: 8/03/2013

Author: samuel Jerguson

Map Scale: 1:75,000

Revision: R1

Coordinate System: GDA 1994 MGA Zone 55

G:\CLIENTS\A-TO-D\BYEWEN - Byerwen EIS\GIS\Maps\EIS_Chapter9\EIS_Executive_Summary\BYEWEN_ES1-9_MWM_Y46_N.mxd

ES1.7.3 Water Management

The objective of the project water management strategy is to be able to manage water generated or captured within the project area for reuse or controlled releases to the environment in a manner that does not cause adverse impacts to water quality or stream hydrology. Release criteria were developed to ensure that releases do not result in unacceptable water quality in the receiving environment and considered several key factors to ensure this objective is met, including receiving environment flow, receiving environment water quality, mine release rate and mine release water quality.

Water within the project area will be segregated based on quality, maximising reuse, minimising mine water on site and minimising changes to the hydrological regime (e.g. by allowing clean water to pass around disturbed areas). It also provides an opportunity to undertake controlled blending of different water types to improve the quality of water proposed for release. Three water classifications have been nominated for the project:

- mine affected water- disturbed catchments or groundwater inflow into open pits, potentially unsuitable for direct uncontrolled discharge
- sediment affected water - disturbed catchments, suitable for discharge after sediment removal
- clean water - undisturbed catchments bypassing mine affected areas, suitable for natural discharge.

Raw water will be imported to site from SunWater's Burdekin to Moranbah water pipeline system and along with decant water from the co-disposal facilities can be recycled to the process plants for coal washing. Process water associated with the CHPPs and co-disposal facilities will be managed in a closed circuit not connected to the mine water management system, such that there are no planned releases of process water.

The project will involve five drainage diversions where existing watercourses or drainage lines are located within the footprint of open pits and / or waste rock dumps. The mine water management system at various stages of mine life is shown in **Figure ES1-7** to **Figure ES1-9** (south Year 5 and 46 showing water management at commencement and completion, and north at Year 46 as the water management in the north is similar for all years of operation).

The mine water infrastructure requirements includes a number of clean water dams, mine affected water dams, in-pit sumps and sediment affected water dams. Construction, operation and decommissioning of these features will be staged over the life of the project, as required, such that dams will not be built until they are required. A dam hazard assessment, in accordance with The Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (EHP 2012) (the Manual) was conducted for all proposed dams over the lifetime of the project. All clean water dams and sediment affected water dams were classified as low hazard and are therefore not regulated dams. Mine affected water dams and the co-disposal dams are considered regulated dams and as such will be subject to construction and operational conditions.

Approved water management protocols will be implemented which will consider stormwater control, dams and release conditions, as well as operational, monitoring and reporting requirements for water management on the project.

ES1.7.4 Groundwater

Information on the hydrogeology and groundwater in the study area was obtained from dedicated groundwater monitoring bores installed for the project, publically available records and previously existing mineral exploration bores. Pump tests on the bores indicated that the hydraulic conductivity values for all lithologies tested are generally low. Groundwater gradients were to the north east and to the south with a groundwater divide running east west across the centre of the project area.

There are no alluvial aquifers of any significance in the project area. Tertiary aquifers do not appear to be in hydraulic connectivity with the deeper Permian sequence sandstone aquifers. There are no aquifers of significance in the basement. Therefore the hydraulic connectivity within the coal seam aquifers is considered limited. The aquifers within the project area are not hydraulically connected to the Suttor River or any of the major watercourses and there is generally a significant thickness of low permeability material above any noted aquifers. The majority of the recharge to the Permian coal sequence aquifers is considered to derive from slow infiltration through the Suttor Formation as there is no recharge directly from the alluvium to the Permian sequence aquifers.

Chemistry results indicated that the groundwater in the target coal measures has a naturally moderate to high salinity and moderately to high alkalinity. Some groundwater samples indicated that the groundwater also has naturally occurring concentrations of lead and sulphate above the ANZECC/ARMCANZ 2000 stock water guideline values.

Groundwater inflow was modelled for the open pits, using a low permeability and conservative high permeability case, with the low permeability case considered more pertinent given the results from bore pump tests showing low permeability. Inflow estimates under the low permeability case were between 0 and 320 m³/day across the project.

Accordingly groundwater drawdown contours were modelled. The modelling focussed on South Pit 1 as it is the deepest and most extensive pit and therefore the worst case scenario for any radius of drawdown for any pit on the project. The maximum expected radius of drawdown from South Pit 1 is 2,300 m. All other pits are expected to have a lesser radius of drawdown and as such, applying that maximum radial extent to the other pits is a notably conservative measure.

There are eight privately owned groundwater facilities close to the project area. All of these are outside of the conservative 2,300 m drawdown radius except for a single bore, which is approximately 1,950 m east of East Pit 2 at Year 35 of mining operations. That bore was noted as having water quality only suitable for stock watering, being naturally too high in chloride and sulphate for human consumption, and having an extremely shallow depth of 6.4 m. As such dewatering from any mining activities in the project area is expected to have negligible or no impact on privately owned groundwater facilities.

No springs, seeps or swamps are known in the project area and there is no direct connectivity between the aquifer sequences and the watercourses that traverse the project area, including the Suttor River. With the exception of stygofauna (which is specifically addressed in the EIS) it is concluded that there are no groundwater dependent ecosystems which can be impacted by the project's mining activities.

There is minimal likelihood of final void (final voids are specifically addressed in the EIS) water stabilising above the surrounding groundwater level and as such the potential for seepage into the surrounding groundwater is minor.

A groundwater monitoring strategy will be implemented, comprising the existing dedicated groundwater monitoring bores. Groundwater levels will be measured and recorded in all the groundwater monitoring bores at quarterly intervals. The monitoring data will be reviewed at minimum six-monthly intervals and reported as required. In the unlikely event of regional depressurisation of the water table, the dedicated project groundwater monitoring bores are well located to measure any potential impacts.

ES1.7.5 Waste Rock and Coal Rejects

A total of 238 waste rock and 41 potential coal reject samples were tested as part of the geochemical assessment. All geochemical results were considered typical of the region, which is well understood. The total sulfur and sulphide-sulfur concentrations of the overwhelming majority of waste rock samples were low, considered negligible, with 97% of waste rock samples classified as non-acid forming (NAF).

As such the waste rock materials for the overall project are considered to be NAF and have available buffering capacity.

Some alkaline, medium to high salinity seepage may occur from approximately 50% of the waste rock (being weathered waste rock) with the other 50% (being unweathered waste rock) expected to have alkaline low salinity seepage. The salinity of the waste rock is considered unlikely to impact local groundwater resources as the groundwater in the local area is naturally highly saline, only half of the waste rock is expected to produce any notable salinity. In addition waste rock used for final landform covering will primarily comprise unweathered material, which has a low salinity and the lower potential for dispersion.

Total metal and metalloid concentrations were generally low and below the adopted health based guideline levels for soil. Several instances where concentrations were noted as being slightly elevated, were commensurate with the typical natural concentrations for rock material in the Bowen Basin.

A Mine Waste Management Plan will be developed to characterise and classify waste rock and guide the placement of waste rock within each waste rock dump with the objective of placing the most benign waste rock near the surface of the waste rock dump. The Rehabilitation Management Plan will guide any amelioration required of surface waste rock, covering of waste rock with stripped soils and re-vegetation of waste rock dumps.

The rejects management system includes co-disposal dams for fine and mid-size reject in the initial years of operation, disposal of coarse reject in the waste rock dumps (encapsulated within waste rock) and in-pit co-disposal in later years of operation (which will be progressively encapsulated beneath waste rock). Co-disposal dams will be regulated dams and designed, constructed and operated to minimise discharges to surface waters and groundwater.

ES1.7.6 Decommissioning and Rehabilitation

Mine closure planning will consider the choice of post-mining land use. This final land use may not necessarily be the original use and will largely be dependent on pre-mining land suitability, landholder preferences, design of rehabilitated landforms, and the existing use or environmental values of surrounding land.

In accordance with the Environment and Heritage Protection (EHP) guideline 'Rehabilitation requirements for mining projects', the following objectives have been derived for decommissioning and rehabilitation of areas disturbed by the project:

- safe to humans and fauna
- rehabilitated to a stable, non-polluting and self-sustaining condition where the maintenance requirements are consistent with an agreed post-mining land use
- allow for land use capabilities as per an agreed Rehabilitation Management Plan (RMP)
- current and future water quality, other than water quality impacts associated with subsequent land users, to meet defined water quality criteria
- vegetation cover will be established to reduce rates of erosion and sediment loss
- final rehabilitation will be designed as permanent self-sustaining landforms requiring no ongoing maintenance or management.

Progressive rehabilitation of waste rock dumps will be undertaken as mining progresses. This approach allows for:

- more stable landforms having been allowed to settle
- progressive construction to final landform design minimising reshaping at the end of mining

- faster re-use of topsoil into its final form
- contour ripping immediately after topsoil placement to control erosion
- seeding with an appropriate seed mix prior to the wet season to maximise the benefits of subsequent rainfall
- managing direct rainfall and runoff from the rehabilitated landforms into sediment dams until revegetation uptake is stable and adequate to naturally control erosion.

The proponent will develop a Mine Closure Plan four years prior to final coal processing.

ES1.7.7 Final Voids

The project will create four final voids that will remain as permanent depressions following the completion of the mining operations. The extent and pit depth of final voids is provided in **Table 1-2**.

Table 1-2 Final Void Extent and Depth

Pit / Infrastructure	Void footprint (ha)	Pit depth (m)
West Pit 3	548	295
South Pit 1	543	430
East Pit 2	88	120
North Pit	163	210

Pit lakes will form within the final voids which will reach a steady state condition where water losses are equal to water inputs. A water balance model was used to evaluate the water level conditions within the voids. There were no modelled scenarios where the level of the pits lakes reached the ground level (void rim), with freeboard remaining between 20 m and 135 m across the site modelled for peak probability lake levels.

The model indicated that it is highly likely (85% - 95%) that the steady state water level within all the pits will be lower than the regional groundwater table. This will create a permanent groundwater sink, preventing water from the pit from moving off-site via groundwater flow. It is therefore not likely that environmental discharge to surrounding groundwater will occur.

With the proposed void designs including self-sustaining, stable levees up to a 1 in 1,000 year storm event where required, all modelled scenarios predicted that lake levels will not reach ground levels and flow into surface waters. This remained the case even for the Suttor River during a PMF event, scenarios with higher than expected groundwater inflows or anthropogenic climate change increasing rain and reducing evaporation.

The change in final void water quality was modelled over time. The salinity of near surface water is expected to be much lower than at depth, with high dissolved oxygen, neutral to slightly alkalinity, with low to very low dissolved metal concentrations. These conditions should support an aquatic ecosystem that can function independently of the poorer quality water below surface water.

Final voids will be safe and stable over the long term. Bunding and levees that are permanent, self-sustaining and requiring no ongoing management, will limit access to the voids by humans and fauna.

ES1.7.8 Climate and Climate Change

Assessment of current climate information available for the project region reveals the following:

- The project site experiences a tropical climate characterised by high variability seasonal rainfall subject to cyclic wet and dry seasons, variable temperature and evaporation.

- Seasonal temperatures for the project region are typical of the tropical Queensland climate, with warmer summer months and cooler winter months
- The median rainfall for the region is approximately 550 mm, with 69% of the annual mean rainfall occurring between December and March.
- The project region experiences on average, higher relative humidity in the morning.
- Winds experienced for the site are either from the north to north-north-east, approximately 23% of the time or from the east to south-east, approximately 47% of the time.

The likelihood of climate extremes with the potential to impact the project were identified, including temperature, droughts, floods, winds, cyclones and bushfires. Risks to the environment associated with climate extremes affecting the project (such as uncontrolled releases of water, rehabilitation failure, etc.) were assessed as low to medium for all potential impacts. Current and proposed future controls are expected to reduce the risk of those potential medium level impacts to an acceptable level (such as water management, progressive rehabilitation, levee and dam designs, etc.).

The residual risk to the environment associated with climate change affecting the project was assessed as low for all potential impacts except for medium risks to rehabilitation success and water supply. The proponent will continually consider actual and predicted climate changes over the duration of the project to determine the likely success of rehabilitation strategies. These will be amended over the life of the mine to provide the best probability of rehabilitation success, considering a range of inputs such as climate, ecology and soils, at that time.

Detailed design and planning of site water management will consider water supply under conditions of increased frequency and duration of droughts.

ES1.7.9 Geology, Topography and Soils

The coal resource will be effectively utilised. It is considered that the mining method chosen, and mine plan is the optimum for maximizing utilisation of the currently known resource.

There are a variety of surface and subsurface soils in the project area, with varying degrees of suitability for use in rehabilitation. The soils best suited to rehabilitation have been identified and will be salvaged from areas of disturbance.

Final voids, waste rock dumps and decommissioned co-disposal dams will impact the topography of the project site. Surface water diversions will remain following mine closure to permanently divert water around areas of altered topography. All permanent changes to topography will be rehabilitated to their final landform design according to an approved Rehabilitation Management Plan.

A Soil Management Plan will be developed to manage the disturbance of soils, identify soils best suited to rehabilitation and manage the stockpiling of soils for use in rehabilitation. Following the initial years of soil stripping and stockpiling, soils will be used directly in rehabilitation in preference to stockpiling. An Erosion and Sediment Control Plan (ESCP) will be developed and implemented to manage erosion and stability issues and impacts to waterways. This will be complemented by water management measures to limit release of sediment affected water.

With the implementation of the proposed mitigation measures, impacts on soil quality, erosion potential and local waterways are expected to be minor.

ES1.7.10 Land Use, Tenure and Contamination

The project is located within the boundaries of the Mackay, Isaac, Whitsunday Regional Plan (MIWRP) area in an area zoned as 'Regional Landscape and Rural Production Area'. The project area is also zoned as rural under local planning schemes.

Seven dwellings that will be occupied during project activities have been identified surrounding the project area (refer **Figure ES1-10**), with the nearest 1.2 km from the project area boundary and 5.4 km from project activities. Potential receptors R1, R4 and R9 (as shown in **Figure ES1-10**) will either not be occupied during project activities or are not dwellings, and as such are not considered to be sensitive receptors for this EIS.

There are 7 leasehold properties that are either within or intersected by the project area which have been predominantly used for pastoral activities (refer **Figure ES1-10**). The property that will experience the greatest impact relative to property size is owned by a wholly owned subsidiary of the proponent. The proponent will negotiate with landholders regarding ongoing use of land within the project area, which is not subject to disturbance, for existing land practices, such as grazing. The proponent will negotiate compensation with landholders for impacts to agricultural activities and infrastructure, including the provision of alternative infrastructure and crossing points where project linear infrastructure intersects properties. With the implementation of proposed mitigation measures, impacts on properties, receptors and residences are expected to be minor.

A land suitability assessment was conducted which demonstrated that 88% of the project area is unsuitable for rain-fed broadacre cropping, 58% is unsuitable for beef cattle grazing and a further 15% requires significant inputs for suitability as beef cattle grazing. Good Quality Agricultural Land (GQAL) was classified, indicating that agricultural land quality is lower than mapped by publically available datasets. The project will result in approximately 7,000 ha of land disturbance, including 1,638 ha of Class A GQAL, 4,528 ha of land suitable for beef cattle grazing, 1,636 ha of land suitable for rain-fed broadacre cropping and 1,430 ha of potential strategic cropping land (SCL).

The proponent will undertake the necessary process under the *Strategic Cropping Land Act 2011* (SCL Act) to either validate SCL or apply for a temporary or permanent impact in the Strategic Cropping Management Area.

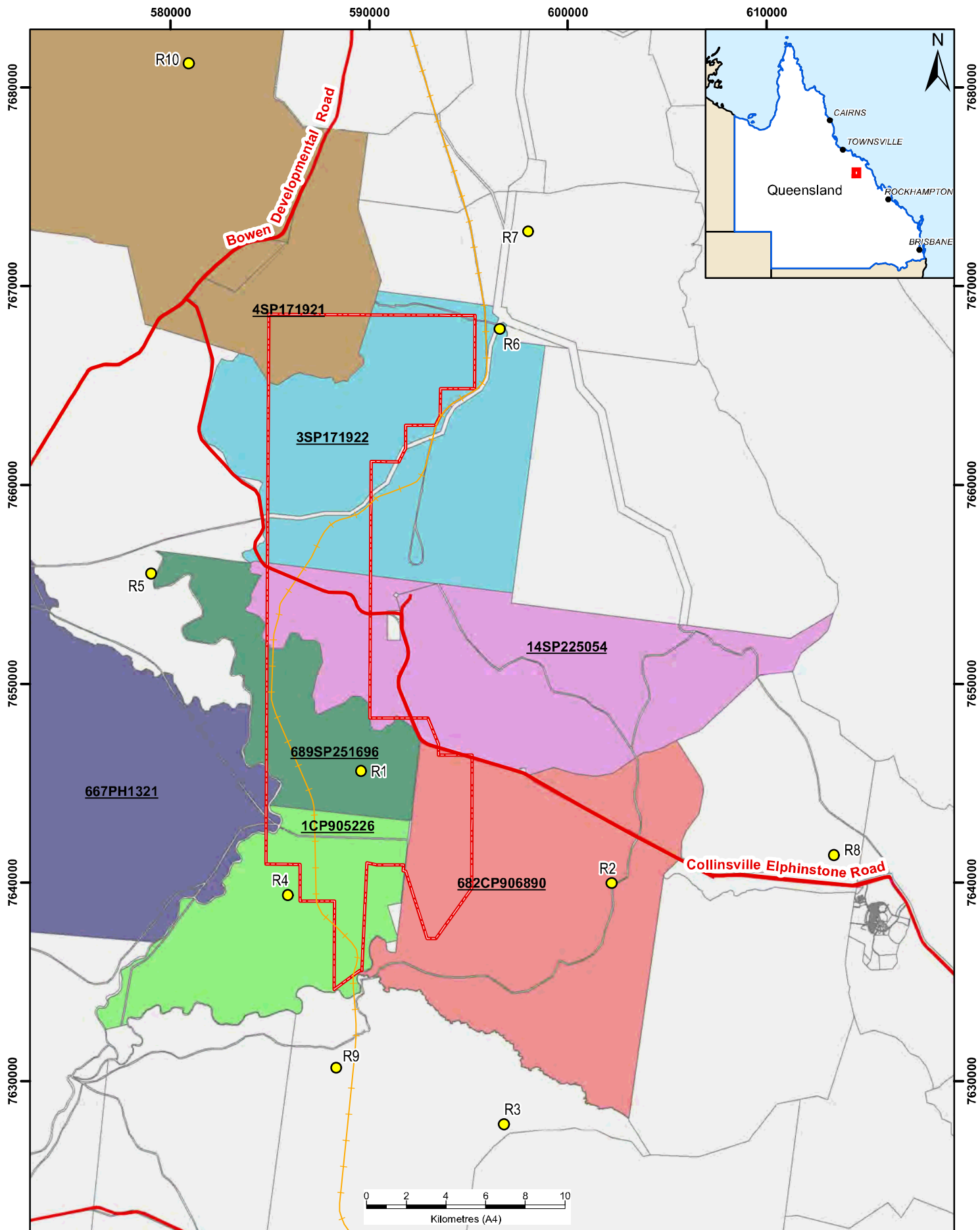
With the implementation of proposed mitigation measures, impacts on land suitability, GQAL and SCL are expected to be minor to moderate.

There is one stock route across the project area which is designated as unused or inactive by the Queensland government and hence project activities will have a negligible impact on the use of this stock route.

A number of third party owned linear infrastructure exists or is proposed within the project area including two rail lines, water pipelines, gas pipelines, power lines and roads. The proponent will provide buffers between third party infrastructure and project activities and/or work closely with third party infrastructure owners where crossing points or other interactions are required. With the implementation of proposed mitigation measures, impacts on third party infrastructure are expected to be minor.

There are six overlapping tenures with mineral exploration, petroleum exploration, pipeline licence and mining lease for transport tenement holders. The proponent will comply with all regulatory requirements to notify and consult overlapping tenure holders.

A preliminary site investigation was conducted to determine the existence of existing contaminated or potentially contaminated sites within and surrounding the project area, and to assess the potential impacts, if any, from these existing contamination concerns during the mine's construction and operational phases. No sites of concern were identified. If contaminated sites are identified during activities, then an investigation will be undertaken to delineate and manage the contamination.



Legend

- | | | |
|------------------------------|------------|-------------|
| Project Area | Main Road | 4SP171921 |
| Cadastre | 14SP225054 | 667PH1321 |
| Potential Sensitive Receptor | 1CP905226 | 682CP906890 |
| GAP Rail Line | 3SP171922 | 689SP251696 |

Properties and Receptors

Figure ES1-10

Byerwen Coal Project

Date: 8/03/2013

Author: samuel Jerguson

Revision: R1

Map Scale: 1:250,000

Coordinate System: GDA 1994 MGA Zone 55



© State of Queensland (Department of Environment and Resource Management (DERM), Department of Natural Resources and Mines (DNRM)). ELP has produced this map for the purpose of presenting a summary of relevant spatial information based on or containing data provided by the State of Queensland (DERM, DNRM) [2013] and other sources at the time the map was prepared. In consideration of the State permitting use of this data you acknowledge and agree that both the State and ELP give no warranty in relation to the data (including accuracy, reliability, completeness or suitability) and accept no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of or reliance upon the data. Data must not be used for direct marketing or be used in breach of privacy laws.

ES1.7.11 Terrestrial Ecology

The project area supports a range of vegetation communities and terrestrial flora and fauna species. While large parts of the project area have been previously cleared, there are areas of remnant vegetation associated with the Suttor River in the west, Kangaroo Creek and surrounding areas in the north, and the east-west band of terrestrial vegetation associated with elevated areas in the centre of the project. The project area also supports areas of the brigalow, semi-evergreen vine thicket and natural grasslands threatened ecological communities (TECs).

Key habitat resources for fauna were identified and multiple surveys were undertaken to identify fauna present on the project area. In total six threatened fauna species were recorded and a possible sighting of a seventh was noted. In addition based on the potential for suitable habitat, three threatened fauna species are considered likely to occur in the project area.

The project area is known to support two threatened flora species and one previously undescribed genus in the family Amaranthaceae (*Kelita uncinella*) which was discovered during field surveys. The project avoids this species and therefore it will not be impacted.

In total five migratory fauna species were recorded from the project area with a further five species considered likely to occur in the project area.

Land clearance and habitat loss associated with the establishment of open cut pits and supporting infrastructure are the main impacts on the terrestrial flora and fauna values of the project area. The project will result in the loss of approximately 2,391.1 ha of remnant native vegetation from within the footprint. This will result in an overall reduction in the extent of endangered (313.9 ha) and of concern (465.2 ha) vegetation communities in the project area. Impacts on terrestrial flora and fauna values have been mitigated by concentrating development in cleared areas in the south of the project area, and:

- maintaining adequate buffers from the Suttor River riparian corridor, and providing appropriate scour and erosion protection to maintain the integrity of vegetation and ecological function
- provision for fauna movement along riparian corridors associated with Kangaroo Creek and the appropriate design of waterway crossings where this intersects the central infrastructure corridor
- measures to limit vegetation loss and impacts on connectivity where the central infrastructure corridor intersects laterite 'jump-ups' in the central part of the project area
- management of edge effects and habitat for less mobile species in areas of terrestrial vegetation which will be isolated by the establishment of the West Pits.

With the implementation of proposed mitigation measures, the project is expected to result in minor residual impacts on terrestrial flora and fauna values. Site-scale impacts on connectivity are expected to have a minor impact on regional-scale connectivity and the value of State-significant biodiversity corridors to the north.

Residual impacts will be addressed in the offset strategy, which was developed as part of the EIS.

ES1.7.12 Environmental Offsets

Environmental values of State and National significance will be impacted by the project. The EPBC Act Environmental Offsets Policy (EOP) and Queensland Government Environmental Offsets Policy (QGEOP) set out principles for environmental offsets.

Under EOP, offsets must be provided if significant adverse residual impacts (i.e. impacts after avoidance and mitigation measures) are likely on MNES. Based on an assessment of potential impacts of the

project on MNES against Significant Impact Guidelines, it is considered that the project has the potential to result in significant residual (post avoidance and mitigation) impacts on the following MNES:

- Threatened ecological communities (TECs)
 - Brigalow (*Acacia harpophylla*) dominant and co-dominant (Brigalow)
 - Semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar Bioregions (SEVT)
 - Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (Natural grasslands)
- Threatened species
 - Ornamental snake (*Denisonia maculata*).

The proponent proposes to offset areas of TECs within the project footprint and an area of potential habitat for the ornamental snake corresponding to endangered and of concern REs associated with habitat requirements for the species which will be impacted by the project.

The proposed offset approach is to initially locate offset areas within parts of the project area (i.e. the mining leases (MLs) comprising the project) that are not identified for development. The proponent and affiliated companies own several pastoral properties in the Brigalow Belt Bioregion and these have been assessed at the desktop level for biodiversity values and these properties will be used for offsets subsequent to the project area. Any values that cannot be offset within the project area or other proponent related properties will be located on third party properties, away from significant mine development areas.

An assessment of available offset options revealed there is excess suitable land available for use as offsets within a 150 km radius of the project. Depending on outcomes of detailed ecological equivalence assessment, if required, additional offset supply will be sourced outside of the 150 km radius.

All direct offset sites will be secured using one of the legally binding mechanisms on Title that are available to ensure the protection of the offset and implementation of the Offset Area Management Plans (OAMPs).

Regular monitoring and reporting on the progress of the offset will be provided to the regulator and will provide a record of comparability over the term of the offset and the overall progress of the offset in returning to remnant vegetation status.

ES1.7.13 Aquatic Ecology

The waterways transecting the project area incur flow intermittently and are characterised by high inter-annual flow variability. Several wetlands within the project area provide semi-permanent water. The wetlands, waterways, and associated riparian corridors of the project area are presented in **Figure ES1-11**.

No endangered, vulnerable or near threatened (EVNT) aquatic flora species are likely to occur within the project area. No 'Threatened Ecological Communities' have been detected in the project area, nor are any expected to occur. The project is unlikely to impact on any wetlands of international significance (Ramsar wetlands) or wetlands of national importance.

A high ecological significance (HES), palustrine wetland is located on the western boundary of the project area but is not within the project's disturbance footprint. However, during mining the wetland's catchment will be reduced by 43% for approximately 16 years, after which the West Pit complex waste rock dump is rehabilitated and the wetland catchment will return to a pre development hydrological regime. The plant species present within the wetland suggest a semi-permanent nature and ecosystem naturally adapted to periods of wetting and drying. Provided that a core area of wetland remains

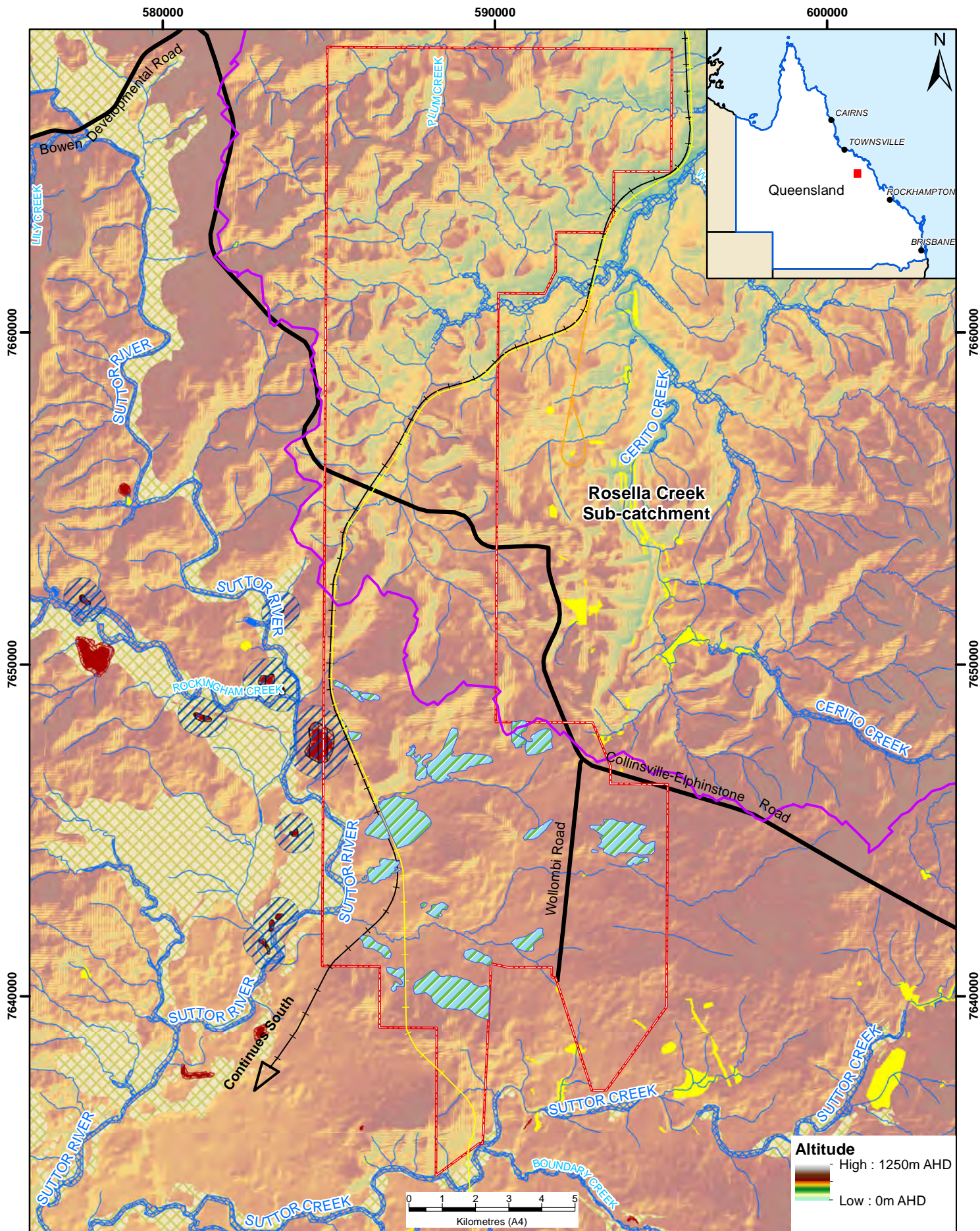
seasonally inundated, a representative suite of plants should persist and enable a return to predevelopment ecology, correlating with the return to pre development hydrology.

Field surveys included both macroinvertebrate and fish sampling, where adequate water was present. Overall data from surveys indicate that most sites surveyed were significantly impaired, with one site being severely impaired. Comparison of macroinvertebrate taxonomic richness and biotic sensitivity indices, suggest that most aquatic survey sites had been under long-term stress from a pre-existing decline in water quality (possibly natural or from past and present land uses), harsh physical conditions (intense seasonal runoff and erosion and deposition of fine sediments), or other pre-existing anthropogenic effects.

Fish surveys identified eight species of native fish. No EVNT or Special Least Concern (platypus) aquatic fauna species, were recorded, or are likely to occur within the project site. A number of Priority fish species are either known, or may occur within the waterways transecting the project site; however, all direct and indirect impacts on these species through habitat modification are deemed to be short term and confined to the establishment phase of the project. Mitigation measures to reduce impacts from dewatering of water bodies, would include relocating of aquatic species as per a General Fisheries Permit, Species Management Program or Damage Mitigation Permit, as required. With the implementation of proposed mitigation measures, impacts on aquatic fauna are expected to be minor.

The project will have some direct and indirect impacts on the aquatic values of Kangaroo Creek, the Suttor River, and their tributaries. These impacts are deemed to be short and medium term only, generally confined to the life of the project.

With the implementation of proposed mitigation measures, the project is expected to result in minor impacts on threatened or Priority aquatic species, aquatic ecological communities or their habitats. The impact to the ecological integrity of the Suttor River, Kangaroo Creek or their downstream receiving environs is expected to be minor.



Legend

- Project Area
- Main Catchment Divide
- Formed Roads
- Drainage Lines
- Indicative extent of gilgai wetland habitat

Water Bodies

- Riverine
- Lacustrine
- Palustrine

Wetland Regional Ecosystem

- Riverine
- Palustrine

Areas that may include wetlands

- Remnant regional ecosystem
- 1-50% wetland (mosaic units)

Great Barrier Reef Wetland Protection Area

- Wetland
- Trigger Area

Drainage Features, Wetlands and Gilgais



Figure ES1-11

Byerwen Coal Project

Date: 22/04/2013

Author: samuel.ferguson

Revision: R1

Map Scale: 1:150,000

Coordinate System: GDA 1994 MGA Zone 55



ES1.7.14 Stygofauna

A stygofauna Pilot Study was conducted in accordance with ToR requirements to apply the Western Australian (WA) Guidelines 54 and 54a (2003 & 2007). The pilot study identified the presence of stygofauna in groundwater associated with the project.

To enhance the spatial and temporal coverage of stygofauna data in order to better inform the EIS, historical stygofauna data from Xstrata Coal's Newlands Mine which adjoins the Byerwen mining lease and which shares common hydrogeology with the project, has been incorporated. The combined Byerwen and Newlands Mine stygofauna datasets incorporates 28 sampling sites and 75 samples collected over a 4 year timeframe (2008 to 2011). This provides a very comprehensive and significant dataset from which to assess project stygofauna.

From the Xstrata Coal's Newlands Mine data, only two common and widespread (at the Order/Family level of taxonomic resolution) stygofaunal taxa have been recovered from one of twenty bores sampled annually for 4 years. It is therefore considered that stygofauna are low in diversity and abundance in this locality. The Byerwen Pilot Study data also failed to identify significant stygofaunal communities. Collectively, these data suggest that stygofauna (i.e. stygophiles, stygobites and phreatobites) are poorly represented within the project and localised hydrogeology.

Any proposed mining activities associated with the Byerwen Project will not threaten or put at risk the survival of the amphipod and copepod taxa at the Order/Family level of taxonomic resolution. It is therefore concluded that stygofauna at the order/family level of taxonomic resolution, do not represent a relevant environmental factor in the assessment of the Byerwen EIS, and no further survey work is recommended.

ES1.7.15 Air Quality

Ambient air quality was measured within and surrounding the project area. The air quality objectives in the Environmental Protection (Air) Policy 2008 (EPP (Air)) and other relevant EHP guidelines were used to establish air quality objectives for the project's dust emissions at sensitive receptors and for flora. The primary impact on air quality from the project is dust as other sources of gaseous emissions are widely dispersed, have low levels of emission, very localised impacts and minimal risk of exceeding air quality objectives at receptors.

Three conservative modelling cases were developed for dust emissions representing various stages of operation and scenarios where higher than likely maximum dust emissions may occur. The initial modelling results showed exceedences of the PM₁₀ (24 hour) air quality objective at sensitive receptor R5, which only occurred during adverse meteorological conditions, but that air quality objectives were met for all other air quality objectives at all other receptors.

A range of operational and direct dust control mitigation measures, in addition to assumed standard and enhanced dust watering, were then modelled which showed that all air quality objectives could be met at all sensitive receptors, including R5. These mitigation measures will only be required during specific meteorological and operational conditions. To enable the proponent to react to the adverse meteorological conditions and sequentially implement dust controls and / or modify operations, dust monitoring will be undertaken at sensitive receptors.

A Dust Management Plan will be developed and implemented to sequentially implement mitigation measures in response to meteorological conditions and to monitor the results. Mitigation measures would be implemented until such time as the meteorological conditions return to a state where monitoring demonstrates that mitigations are no longer required.

ES1.7.16 Greenhouse Gas

A greenhouse gas assessment established an inventory of projected Scope 1 and Scope 2 annual emissions for each relevant greenhouse gas (GHG) attributable to the project, and also considered the impact of these emissions on national greenhouse gas inventories. The project will result in emissions of approximately 568 kt CO₂-e per annum. Fugitive emissions from coal production are expected to have the greatest contribution to the total emissions from the project (approximately 255 kt CO₂-e per annum), with purchased electricity the next largest contributor (approximately 242 kt CO₂-e per annum).

The 'liable entity' for the project under the *Clean Energy Act 2011* will comply with the requirements and intent of this Act, including the requirement to purchase carbon permits. This is the primary legislative mechanism in Australia to reduce GHG emissions as it creates an economic incentive to reduce emissions. The proponent will implement a range of strategies to minimise GHG emissions including procurement of energy efficient equipment and plant, effective mine planning and optimisation of schedules and routes, and implementing a GHG management and continuous improvement plan.

ES1.7.17 Noise and Vibration

Existing noise levels were measured at four locations surrounding the project. The noise levels at all the homesteads are low and industrial or commercial noise is not currently a feature of the existing noise levels at the homesteads. This assessment modelled noise levels over a variety of modelling scenarios, including adverse meteorological conditions and assuming the worst case operational scenario.

The Environmental Protection (Noise) Policy 2008 (EPP (Noise)) acoustic quality objectives were considered relevant as they are designed to protect the amenity of an acoustic environment. In addition EPP (Noise) noise objectives for background creep are more stringent than the acoustic quality objectives and are the most stringent noise level objectives applied in Queensland.

The modelled noise levels generated by the project comply with the acoustic quality objectives during the day, evening and night at all sensitive receptors. The noise modelling shows that at all times the indoor noise level objectives to protect sleep disturbance are met at all sensitive receptors. The modelling also shows that the calculated noise levels at the identified sensitive receptors are expected to comply with the identified objectives to avoid background creep for all time periods.

The World Health Organisation (WHO) European night time goals are expected to be met at all sensitive receptors. The low-frequency noise level goals are also expected to be met at all sensitive receptors. The blasting vibration and blast overpressure levels are expected to meet the objectives at all sensitive receptors.

There are no buildings and infrastructure that are expected to experience vibration levels in excess of the criteria. As a conservative measure if blasting encroaches within 1 km of any linear infrastructure (including the GAP and Alpha Coal project rail lines) the blast vibrations will be monitored to demonstrate compliance. The project will limit blasting to the hours of 9 am to 3 pm, Monday to Friday, and from 9 am to 1 pm on Saturdays unless there is no likelihood of persons in a noise-sensitive place being affected because of the remote location of the blast site.

Due to the large separation distances between the TLFs and sensitive receptors, all sensitive receptors readily comply with the Queensland Rail (QR) (now Aurizon) noise level goals.

The generation of road traffic by the site is minor leading to a maximum increase of less than 1 dB(A) along the most adversely affected road. This is considered a minor increase in traffic noise in comparison to the 3 dB(A) increase which would require further investigation and complies with the project noise level goals for road traffic noise.

ES1.7.18 Landscape and Visual Amenity

Direct extractive mining activities during operation will result in high magnitude of change to the landscape character of the project area. Other supporting activities, such as mine infrastructure, will result in low to moderate magnitude change to landscape character. However, following progressive and final rehabilitation of waste rock dumps, and decommissioning of infrastructure, the magnitude of change across the entire project was assessed as being low to moderate.

The project is in a remote, rural location with existing mining activities and a low, dispersed population. The visual sensitivity of the landscape in the project area was assessed as being low in the southern area (where the majority of project activities occur) and moderate in the northern area. Therefore the level of impact to landscape character of the project area and surrounds at the end of mine life is low in the southern area and moderate in the northern area. Furthermore there will be no occupied residences within 5 km of project activities with views of project activities and as such there would be insignificant visual amenity impacts to sensitive receptors surrounding the project area.

There are expected to be some visual amenity impacts to public viewpoints along Collinsville-Elphinstone Road; however there are low traffic volumes on this road and existing vegetation will be retained as a screen to the MIA. There would be a low to moderate level of impact to these viewpoints during operations and insignificant to low impact following decommissioning and rehabilitation.

The existing night-time visual environment of this region is one already affected by mines. Lighting will be designed to ensure any impact to surrounding viewpoints would be minimised. However, there are a number of components of the mine that would be lit at night such as the MIA and CHPP. There are no sensitive receptors (i.e. private, occupied houses) within a 5 km area that may view a sky glow at night. It is anticipated that at some locations along the Collinsville-Elphinstone Road lights would be seen, particularly those of the south MIA and CHPP, which would be located 1 km from that road and relatively brightly lit. Retention of vegetation buffers will contribute to further screening this lighting and reducing the impact to low.

ES1.7.19 Waste Management

Waste streams associated with waste rock, coal rejects from processing and washing, as well as runoff from disturbance areas, were specifically considered in the EIS including management of those waste streams.

All other waste streams during construction, operations and decommissioning were identified and management methods for these waste streams proposed. Waste management strategies have been proposed to manage wastes in accordance with the waste management hierarchy, minimise environmental harm and to ensure proper disposal of the waste streams identified where reuse and recycling are not available. With appropriate management these streams are expected to have negligible impact on environmental values. A detailed Waste Management Plan will be developed and will form part of the project's overall environmental management systems.

ES1.7.20 Traffic and Transport

Project impacts on the capacity and operation of Mackay Airport from personnel movements, and the Ports of Brisbane, Mackay and Gladstone from imports of material and equipment, have been assessed as negligible in the context of current throughput quantities at these locations.

The project will use road transport for the supply of materials, equipment and the transport of workers. The project area is intersected by the State-controlled Collinsville-Elphinstone Road which is linked to other regional highways and which will be the primary access routes to the project. Current road use levels of State-controlled roads surrounding the project are low (e.g. Collinsville-Elphinstone Road has

annual average daily traffic volumes of between 286 and 1,111). Traffic volumes on State-controlled roads surrounding the project are expected to increase by between 3% and 10% over five years.

The impact of the project on traffic volumes was estimated for five phases over the life of the project corresponding to various construction and operational periods, for equipment, materials and workers. The project will transport all workers between Glenden accommodation and the mine site by bus (other than administration workers) and approximately half of all non-resident (in Glenden) workers between Glenden and Mackay by bus. This reduces the number of vehicles on the road, improving safety for workers and other road users, and decreasing pavement impacts.

The only link in the road network that meets the Transport and Main Roads (TMR) criterion of “equal to or greater than 5% of the annual average daily traffic (AADT)” is Collinsville-Elphinstone Road south of the project to Glenden. The project’s impacts on traffic volumes on regional roads are negligible to minor other than for the Collinsville-Elphinstone Road south of the project to Glenden, where impacts are moderate.

The only road upgrades required for the project are two intersection upgrades for the intersection of the northern and southern area site access roads with the Collinsville-Elphinstone Road. Project haul roads and access roads will intersect other linear infrastructure such as the GAP rail line. Crossings will be designed to minimise safety risks and impacts to third party infrastructure.

Pavement impacts are determined on the basis of equivalent standard axels (ESAs). There are four sections of road where the project’s estimated ESAs increased the expected road ESAs by 5%:

- Collinsville-Elphinstone Road north of the project site to Bowen Developmental Road
- Collinsville Elphinstone Road between the project site and Glenden
- Collinsville-Elphinstone Road between Glenden and Suttor Developmental Road
- Suttor Developmental Road between Elphinstone and the Peak Down Highway.

A maintenance contribution was estimated across the life of the mine for the pavement impacts on these roads. The proponent will comply with all relevant traffic and transport regulations and establish project specific procedures for road safety, road use management, transport of dangerous goods and hazardous substances and traffic management.

ES1.7.21 Indigenous and Historical Cultural Heritage

The Birriah People and the Jangga People are the relevant Aboriginal parties within the project area. Cultural Heritage Management Plans (CHMPs) were developed between the proponent and each Aboriginal party to provide a process by which known heritage values and other potential heritage values within the project area can be managed. Both CHMPs have been approved by the Department of Aboriginal and Torres Strait Islander and Multicultural Affairs (DATSIMA) and lodged with DATSIMA’s Cultural Heritage Coordination Unit.

Twelve sites containing historical cultural heritage values, in and surrounding the project area, were identified. No sites of national, state or regional significance were identified on any registers of historical cultural heritage. Of these twelve, two are within the project area and are considered to have low local significance, while a third near the project area boundary is considered to have medium local significance. These three were assessed as having negligible to low impact from project activities including vibration. All other sites are considered to be at a distance from project activities where there would be no or negligible impacts. As such the significance of project impacts on historical cultural heritage is considered to be minor.

ES1.7.22 Social

The project is located approximately 20 km from Glenden. The town of Glenden is defined as the primary social and cultural area of influence relating to the project. As there are likely to be some broader project related effects, a secondary social and cultural area of influence has been defined as the Northern Bowen Basin. The potential social impacts associated with the project, were defined through the assessment of potential project effects against the attributes of the existing social environment, for both the primary and secondary social areas of influence.

The sensitivity of a social value to the effects of a potential impact was derived through consideration of the fundamental characteristics of the existing social environment along with an appreciation of the attachment or importance held by the community either to the value or the potential impact. The assessment found that the project is likely to have a range of positive and negative social impacts.

The proponent has developed five individual action plans to address social impacts associated with the project. The actions plans are included as part of the SIMP.

The action plans are detailed under the following themes:

- Housing and Accommodation
- Employment, Training and the Local Economy
- Indigenous Community
- Social Identity and Cohesion
- Health and Community Infrastructure.

The implementation of the mitigation measures included in these actions plans, along with project management strategies including the Workforce Management Strategy and Regional Procurement Program will help to minimise the potential negative impacts and optimise positive impacts associated with the project. The significance of the all the negative residual impacts were assessed as low following the effective implementation of mitigation measures and management strategies, except for two which retained a moderate impact, being increased demand for regional and local health services, and increased overall demand on regional emergency services.

The most highly significant positive impacts, with a moderate level of impact, are:

- provision of employment opportunities
- increased demand on education services
- injection of wealth into local and regional economy.

On balance it is assessed that following the application of mitigation measures and management strategies, the project will generally have a positive social effect on the local and regional area. The implementation of monitoring, reporting and review processes will ensure the appropriateness of mitigation measures and management strategies by enabling review and amendment of the SIMP.

ES1.7.23 Hazard/Risk and Health/Safety

The risks of hazards to people and property associated with the project were identified and evaluated. The risks associated with each identified hazard were determined based on the likelihood and consequences of the hazard and risk, taking into account standard risk treatment measures. The risk assessment resulted in the following:

- The majority of hazards associated with the activities have a “low” or “medium” risk level
- Some risks were determined as “high” due to the higher consequences even though the likelihood of an event was assessed as rare or unlikely

- No “extreme” risks were identified.

This assessment is a preliminary hazard and risk assessment for the project. A framework for the ongoing assessment and management of risks is detailed in the draft risk management plan provided in the EIS. Routine operational health and safety risks have been identified and will be managed in accordance with legislation, standards and codes of practice.

Potential health and safety impacts have been identified and mitigation measures for protecting or enhancing health and safety community values are described. Objectives relating to water, air, noise, visual and traffic are included in the relevant chapters in this EIS, including the means by which these objectives and measures are to be achieved and monitoring regimes to be implemented. These objectives will form part of an overall Environmental Management Plan that will be monitored, audited and reviewed.

The project is not expected to adversely impact the health and safety of the community and workforce with the implementation of proposed mitigation measures and compliance with all relevant legislation and codes of practice governing health and safety.

ES1.7.24 Cumulative Impacts

Over 50 proposed and existing projects in the region with the potential for cumulative impacts with the Byerwen project were identified. Cumulative impacts can occur on a spatial or temporal level and may occur at a local, catchment or regional level, depending of the environmental social or economic consideration. Therefore not every project considered contributes to cumulative impacts for each environmental and social value.

Overall the cumulative impacts in the region were assessed for all environmental social and economic considerations as being negligible or minor, with the exception of impact on natural grassland TEC. The cumulative impact on natural grassland TEC is considered moderate for the regional projects considered; however, the Byerwen project’s contribution to cumulative impacts is assessed as being minor.

The project will implement a range of mitigation measures for residual ecological impacts (e.g. offsets). It is expected that other projects that contribute to cumulative impacts will implement comparable mitigation measures.

In addition it should be noted that the below potential contributions to cumulative impacts in the region are not minor but are of notable benefit and have a positive impact:

- Byerwen project’s impact on economic benefits assessed as a moderate to major positive contribution to regional cumulative impacts.
- Byerwen project’s impact on social values was assessed as a moderate to high positive and negative contribution to cumulative impacts, depending on the values assessed and the potential projects proceeding in the region.

ES1.7.25 Matters of National Environmental Significance

The project was determined to be a controlled action with the relevant controlling provisions being ‘listed threatened species and communities’ (sections 18 and 18(a)) and ‘listed migratory species’ (sections 20 and 20(a)). A combination of desktop assessments and field surveys were conducted to determine the potential for listed threatened species, migratory species and communities to be impacted by the project.

Three of the EPBC Act listed threatened ecological communities (TECs) identified by the desktop assessment as potentially occurring were confirmed as present within the project area: brigalow (*Acacia*

harpophylla) dominant and co-dominant, natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin and semi-evergreen vine thickets of the Brigalow Belt (north and south) and Nandewar Bioregions.

Desktop assessments identified eleven flora species listed as threatened under the EPBC Act with the potential to occur in the project area. However no threatened flora species were recorded during field surveys or are considered likely to occur in the project area.

Fifteen fauna species listed as threatened under the EPBC Act were identified by desktop assessment as having potential to occur in the project area. Of these threatened species, four are known or considered likely to occur in the project area and as such may be impacted by the project. These species are the ornamental snake, squatter pigeon, black-throated finch (southern) and Australian painted snipe. The Australian painted snipe is also listed as a migratory species. A further nine migratory species were recorded or are considered likely to occur in the project area and as such may be impacted by the project.

Land clearance and habitat loss associated with the establishment of open cut pits and supporting infrastructure are the main impacts on threatened species and communities in the project area. Removal of permanent water sources associated with farm dams may also result in the loss of a habitat resource for some threatened and migratory species. Measures to minimise impacts through avoidance or mitigation have been proposed, however there will be residual impacts on MNES.

The assessment considered the potential impacts of the project on MNES against the Significant Impact Guidelines. Based on this assessment, it is considered that the project has the potential to result in significant residual (post avoidance and mitigation) impacts on one threatened species (the vulnerable ornamental snake) and three threatened ecological communities (brigalow, native grassland and SEVT ecological communities) listed under the EPBC Act. The project will therefore need to consider the EPBC Act Environmental Offsets Policy, as described in Section **ES1.7.12**

There are unlikely to be significant residual impacts on other listed threatened species and communities or listed migratory species.

ES1.7.26 Environmental and Social Management

This EIS describes the project's social and economic benefits, as well as potential impacts on environmental and social values, and proposes measures to mitigate those impacts. Mitigation measures are described in the project's EMP and SIMP.

The EMP is subject to approval and is an active document which is actioned and implemented on the mine. A catalogue of all commitments made by the proponent to mitigate all identified impacts is also provided in the EIS.

ES1.8 Glossary, Acronyms and Abbreviations

Term	Definition
AADT	annual average daily traffic
ANZECC/ARMCANZ	Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand
ARI	annual recurrence interval
CG	Coordinator-General

Term	Definition
CHMP	Cultural Heritage Management Plan
CHPP	Coal Handling and Preparation Plant
DATSIMA	Department of Aboriginal and Torres Strait Islander and Multicultural Affairs
dB(A)	decibels (A weighted)
DSDIP	Department of State Development, Infrastructure and Planning
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities
EC	electrical conductivity
EHP	Environment and Heritage Protection
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EOP	Environmental Offsets Policy
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
EPP (Air)	Environmental Protection (Air) Policy 2008
EPP (Noise)	Environmental Protection (Noise) Policy 2008
ESAs	equivalent standard axels
ESCP	Erosion and Sediment Control Plan
EVNT	endangered, vulnerable or near threatened
FTE	full time equivalent
GAP	Goonyella to Abbot Point
GHG	greenhouse gas
GQAL	Good Quality Agricultural Land
ha	hectare
HES	high ecological significance
km	kilometre
kt CO ₂ -e	kilotonnes carbon dioxide equivalent

Term	Definition
m	meters
mm	millimeters
m ³	cubic meters
MIWRP	Mackay, Isaac, Whitsunday Regional Plan
MIA	mine infrastructure area
ML	megalitres
ML	Mining lease
MLA	mining lease application
MNES	matters of national environmental significance
Mtpa	million tonnes per annum
NAF	non-acid forming
OAMP	Offset Area Management Plan
PM ₁₀	Particles in the air environment with an equivalent aerodynamic diameter of not more than 10 microns.
PMF	probable maximum flood
QGEOP	Queensland Government Environmental Offsets Policy
QR	Queensland Rail
QWQG	Queensland Water Quality Guidelines
REMP	Receiving Environment Monitoring Programme
RMP	Rehabilitation Management Plan
ROM	Run of Mine
SCL	Strategic Cropping Land
SDPWO Act	State Development and Public Works Organisation Act 1971
SEVT	Semi-evergreen vine thickets
SIMP	Social Impact Management Plan
TEC	threatened ecological communities

Term	Definition
the Manual	The Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (EHP 2012)
TLF	train loading facility
TMR	Transport and Main Roads
ToR	Terms of Reference
tph	tonnes per hour
WHO	World Health Organisation
WQO	Water Quality Objectives