

Appendix N

Preliminary Risk
Assessment

Billy Joe Chambers



WINCHESTER SOUTH PROJECT

Environmental Impact Statement



Whitehaven Coal – Winchester South (WS) Preliminary Risk Assessment

Job RM19013

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Client:	Whitehaven Coal Ltd T/A Whitehaven Winchester South
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Versions

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1 INTRODUCTION

Whitehaven WS Pty Ltd (Whitehaven WS), a wholly owned subsidiary of Whitehaven Coal Limited (Whitehaven), proposes to develop the Winchester South Project (the Project), an open cut coal mine and associated infrastructure within the Bowen Basin, located approximately 30 kilometres (km) south-east of Moranbah, within the Isaac Regional Council Local Government Area (LGA) (Figure 1).

The Project involves the development of an open cut coal mine in an existing mining precinct for export of coal products. Products would include metallurgical coal for the steel industry and thermal coal for energy production. The Project would include construction and operation of a mine infrastructure area (MIA), including a Coal Handling and Preparation Plant (CHPP), train load-out facility and rail spur, which would be used for the handling, processing and transport of coal. An infrastructure corridor would also form part of the Project, including a raw water supply pipeline connecting to the Eungella pipeline network, an electricity transmission line and a mine access road (Figure 2).

The Project is forecast to extract approximately 15 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal, with a forecast peak extraction rate of up to 17 Mtpa, for approximately 30 years. The coal resource would be mined by open cut mining methods, with product coal to be transported by rail to port for export.

This Preliminary Risk Assessment (PRA) forms part of an Environmental Impact Statement (EIS) which has been prepared in accordance with Part 4 of the *State Development and Public Works Organisation Act 1971*. This assessment has been prepared to satisfy the requirements of the *Terms of reference for an environmental impact statement – Winchester South Project* (the Terms of Reference) issued by the Office of the Coordinator-General on 4 September 2019. This PRA is an analysis which identifies potential losses associated with potential impacts and issues associated with the Project.

1.1 AIM AND OBJECTIVE

Aim: To identify potential risks to public safety, employees and property and key environmental issues for further assessment.

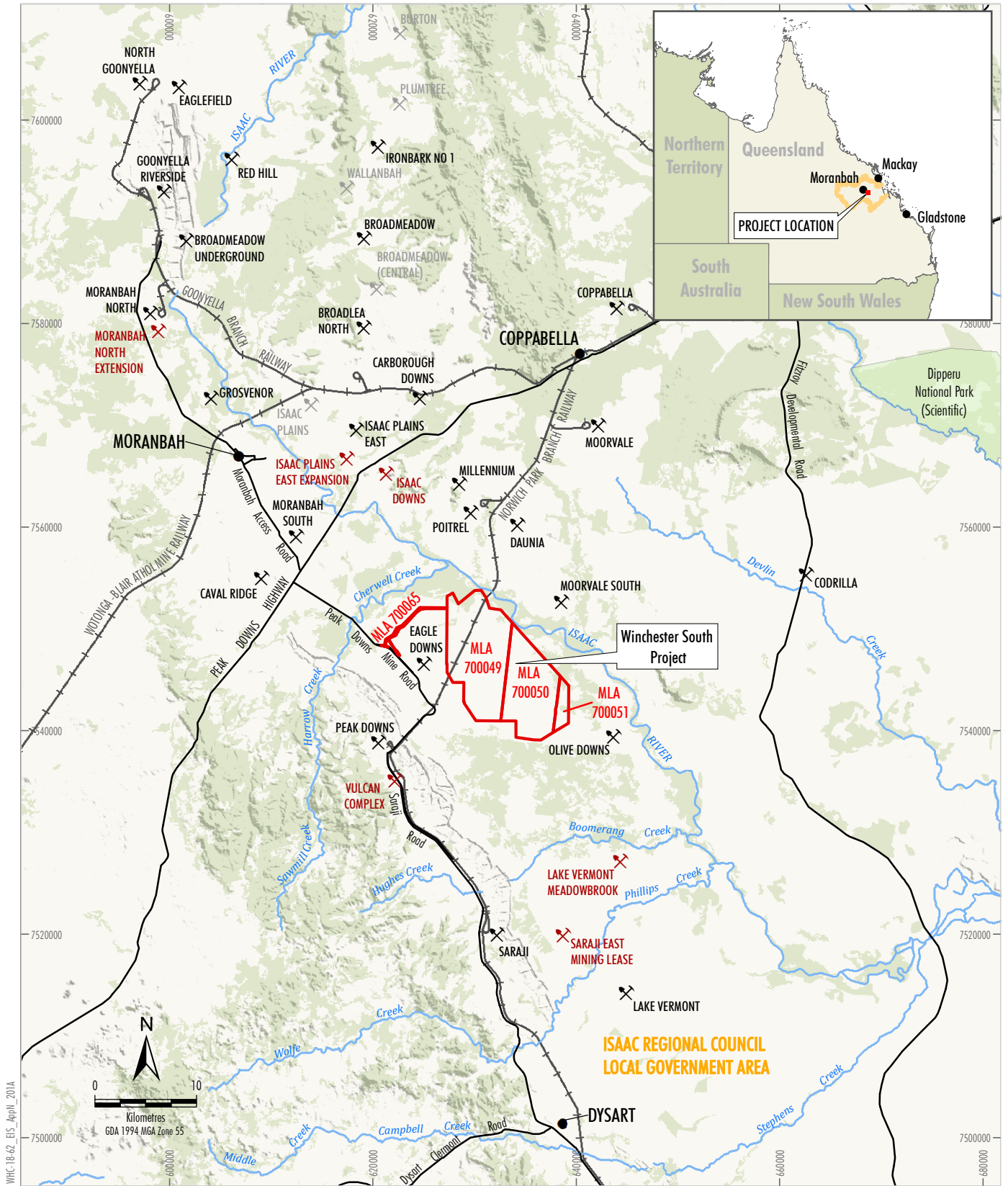
Proponent: Whitehaven WS, a wholly owned subsidiary of Whitehaven.

Scope: Cover the Terms of Reference for the Project, in particular hazards, health and safety, flooding and chemical leaks and spills.

Mandate: To focus on the identification of potential risks to public safety, employees and property and key environmental issues associated with the Project. The identified risks and environmental issues would be addressed as part of environmental assessment process and to confirm that adequate risk treatment measures are applied such that the risk is tolerable.

The scope was refined by reviewing the following:

- the relevant criteria defined by statutory requirements;
- the main findings of community consultation;
- the requirements of the government agencies;
- the relevant guidelines published by the Queensland (QLD) Government;
- the previous observations/information collected from the Project area; and
- any other information.



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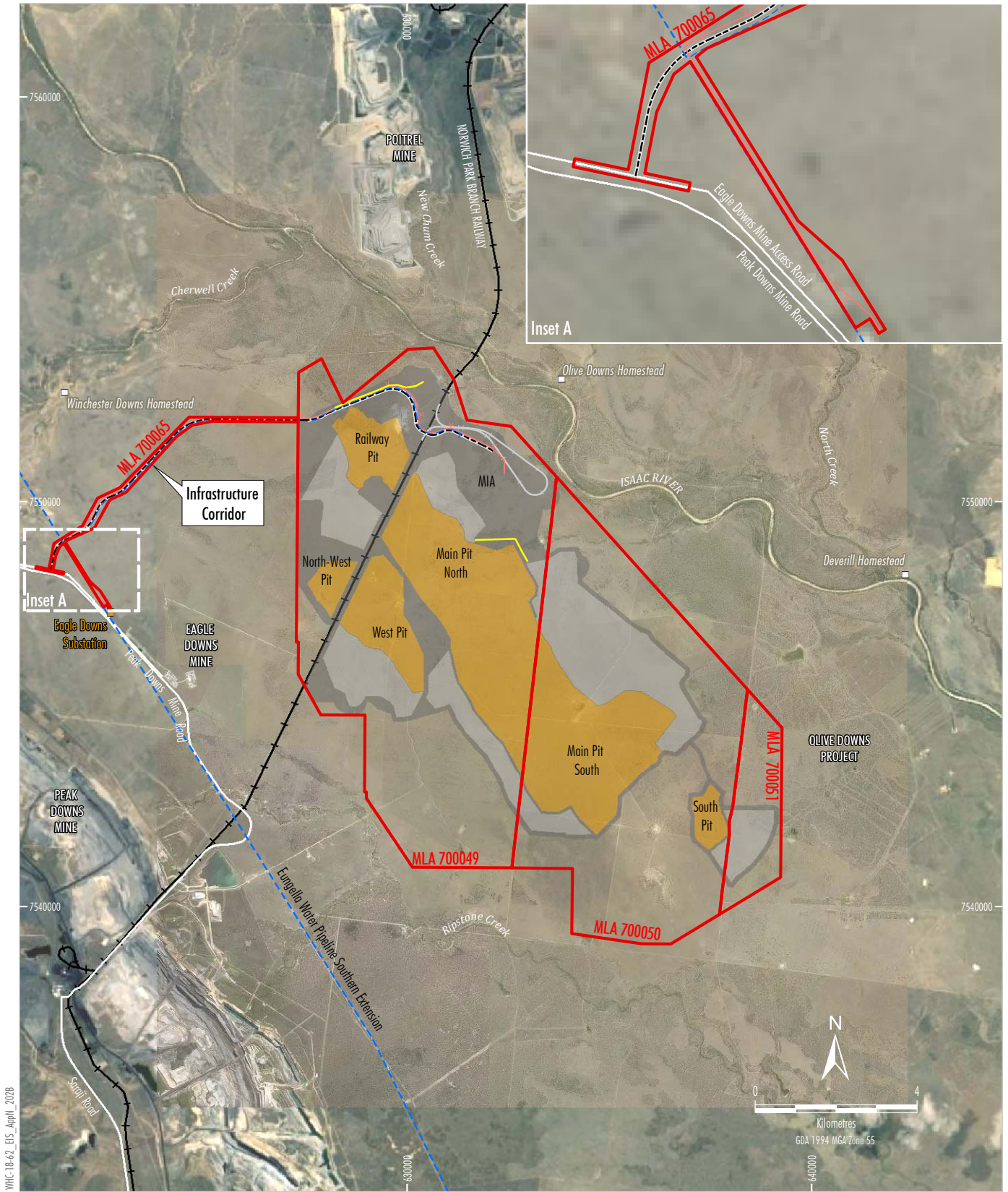
Source: The State of Queensland (2018 - 2020);
Geoscience Australia (2018).

- LEGEND**
- Mining Lease Application Boundary
 - Approved/Operating
 - Proposed
 - Care and Maintenance
 - Local Government Area Boundary
 - Railway
 - Road



WINCHESTER SOUTH PROJECT
Project Location

Figure 1



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- LEGEND**
- Mining Lease Application Boundary
 - Eungella Water Pipeline Southern Extension
 - Railway
 - Substation

- Project Component***
- Indicative Infrastructure Area
 - Indicative Out-of-pit Waste Rock Emplacement
 - Indicative Open Cut Pit Including In-pit Waste Rock Emplacement
 - Indicative Mine Access Road
 - Indicative Rail Spur and Loop
 - Indicative Electricity Transmission Line
 - Indicative Raw Water Supply Pipeline
 - Indicative Flood Levee

*Note: * Excludes some project components such as water management infrastructure, access tracks, topsoil stockpiles, explosives magazines, power reticulation, temporary offices, other ancillary works and construction disturbance.*

Source: The State of Queensland (2018 - 2020); Whitehaven (2020).
 Orthophoto: Google Image (2019); Whitehaven (2017).

WHITEHAVEN COAL
WINCHESTER SOUTH PROJECT
Project General Arrangement

Figure 2

The PRA workshop team (PRA team) identified the following items as desired outcomes from the process (Section 3.2):

1. identify key issues to be addressed in the EIS;
2. identify potential controls which should be confirmed as appropriate in the detailed studies of the EIS; and
3. develop a document suitable for inclusion in the EIS and prepared in accordance with Australian Standard/ New Zealand Standard International Standards Organisation (AS/NZS ISO) 31000:2018 Risk Management – Principles and Guidelines (AS/NZS ISO 31000:2018).

1.2 CLARIFYING POINTS

The following clarifying points regarding the scope were made:

- The PRA workshop and associated reporting is intended to cover all aspects of the Project.
- Only the contributions of the Project which accounted for over 10% or more impact from baseline conditions (related primarily to road and rail) were considered.

1.3 RISK ASSESSMENT PROCESS

The risk assessment process was based on the framework provided on Figure 3 (based on AS/NZS ISO 31000:2018, Recognised Standard 02 from the QLD Department of Natural Resources, Mines and Energy, MDG1010 *Minerals Industry Safety and Health Risk Management Guideline* [NSW Department of Trade and Investment, 2011] and HB 203:2012 *Environmental Risk Management – Principles and Process* [HB 203:2012]). The risk ranking exercise integrated the principles outlined in the documents above and the standard risk assessment approach used by Whitehaven.

This PRA draws upon the outcomes of a PRA team workshop in March 2020.

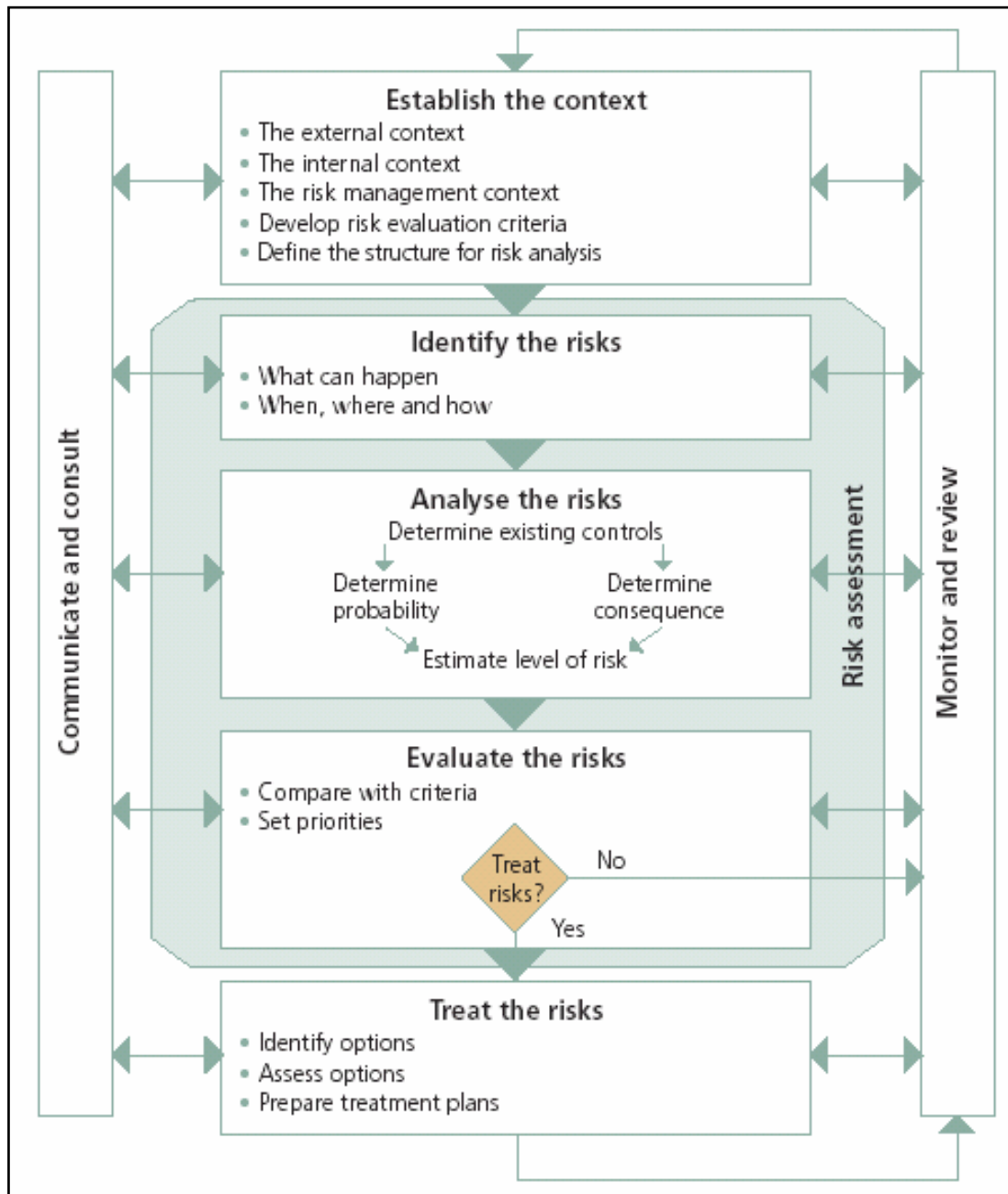
1.4 RESOURCING, SCHEDULE AND ACCOUNTABILITIES

The following resources were allocated in order to effectively conduct the PRA:

1. A team of personnel with suitable experience and knowledge of mining operations, water management and environmental issues in the area associated with the Project;
2. External facilitators for the risk assessment and write-up of results; and
3. Aerial imagery, drawings and the Office of the Coordinator-General's Terms of Reference.

The outcomes of the PRA and associated accountabilities were understood by the PRA team as being intended to be integrated into the EIS and overall Whitehaven management systems so that they are effectively reviewed, implemented and monitored.

Figure 3 - Risk Management Process (AS/NZS ISO 31000:2018)



Source: after AS/NZS ISO 31000:2018.

1.5 METHODOLOGY

1.5.1 Framework

Figure 3 outlines the overall framework utilised for the PRA. This framework is further discussed in later sections with respect to the Project.

1.5.2 Key Steps

The key steps in the process included:

1. confirming the scope of the PRA;
2. listing the key assumptions on which the PRA is based;
3. reviewing available data on the Project including reports, plans, maps and aerial imagery (both prior to and during the workshop);
4. conduct of a team-based risk assessment that:
 - a) provided detailed descriptions of the tasks to be undertaken and the proposed method;
 - b) identified hazards and assessed the level of risk; and
 - c) developed a list of controls / approaches to be considered in the detailed studies to treat the risk (through prevention, monitoring, management and rehabilitation strategies);
5. reviewing documentation and presentations by Whitehaven personnel on the features of the Project;
6. preparing a draft report in accordance with AS/NZS ISO 31000:2018 and Recognised Standard 02 Control of Risk Management Practices (Department of Natural Resources, Mines and Energy, 2018) for review by Whitehaven personnel and other participants of the PRA workshop;
7. incorporate comments from Whitehaven and other participants of the PRA workshop; and
8. finalise the report and issue as controlled copy for ongoing use.

With respect to the overall framework (Figure 3), Steps 1 to 3 above represent the 'Establish the Context' phase and Steps 4 and 5 represents the 'Identify Risks', 'Analyse Risks', 'Evaluate Risks' and 'Treat Risks' phases.

As described in Section 1.1, the outcomes of the PRA and associated accountabilities have been integrated into the EIS and Whitehaven management systems so that they are effectively reviewed, implemented and monitored.

1.5.3 External Facilitation

The PRA team was facilitated through the process by **Risk Mentor (RM)**, a company specialising in risk assessment and risk management programmes. The facilitator, Dr Peter Standish, is experienced with open cut coal mining and many aspects of safety management systems, environmental monitoring and rehabilitation.

The PRA team was encouraged and challenged to identify a wide range of environmental impacts or hazards.

It is important to understand that the outcomes of this PRA:

1. are process driven;
2. challenge current thinking and may not necessarily appear appropriate or reflect pre-conceived ideas; and
3. are the result of the PRA team assembled to review the topic and not the result of any one individual or organisation.

2 ESTABLISH THE CONTEXT

2.1 PROJECT SUMMARY

The main activities associated with the Project would include:

- development and operation of an open cut coal mine within mining lease application (MLA) 700049, MLA 700050 and MLA 700051;
- development and operation of an infrastructure corridor within MLA 700065, located outside MDL 183;
- use of open cut mining equipment to extract ROM coal with a current forecast rate of approximately 15 Mtpa (and up to 17 Mtpa);
- a mine life of approximately 30 years;
- placement of waste rock (i.e. overburden and interburden) in out-of-pit waste rock emplacements and within the footprint of the open cut voids;
- construction and operation of the MIA, including a CHPP, ROM pads, workshops, offices, raw and product handling systems, coal processing plant and train load out facility;
- construction and operation of a rail spur and loop to connect to the Norwich Park Branch Railway, including product coal stockpiles for loading of product coal to trains for transport to ports;
- progressive rehabilitation of out of pit waste rock emplacement areas;
- progressive backfilling and rehabilitation of the mine voids with waste rock behind the advancing open cut mining operations (i.e. in-pit emplacements);
- installation of a raw water supply pipeline;
- construction of a 132 kilovolt (kV)/22 kV electricity switching/substation and 132 kV ETL to connect to the existing regional power network;
- on-site excavation, if suitable, and/or the use of the existing hard rock quarry for construction activities;
- drilling and blasting of competent overburden/waste rock material;
- construction of a mine access road (including associated railway crossing) from the Eagle Downs Mine Access Road, off Peak Downs Mine Road, to the MIA;
- construction and operation of ancillary infrastructure in support of mining, including electricity supply, consumable storage areas and explosives storage facilities;
- connection to the existing telecommunications network;
- co-disposal of coal rejects from the Project CHPP within the footprint of the open cut voids and/or out of pit emplacement areas;
- progressive development and augmentation of sediment dams and storage dams, pumps, pipelines and other water management equipment and structures (including up catchment diversions, drainage channel realignments and levees);
- progressive construction and use of soil stockpile areas, laydown areas and gravel/borrow areas (e.g. for road base and ballast material);
- progressive development of haul roads, light vehicle roads and services;

- wastewater and sewage treatment by a sewage treatment plant;
- discharge of excess water off-site;
- an on-site landfill for the disposal of selected waste streams generated on-site; and
- ongoing exploration activities and other associated minor infrastructure, plant and activities.

2.2 RISK MANAGEMENT CONTEXT

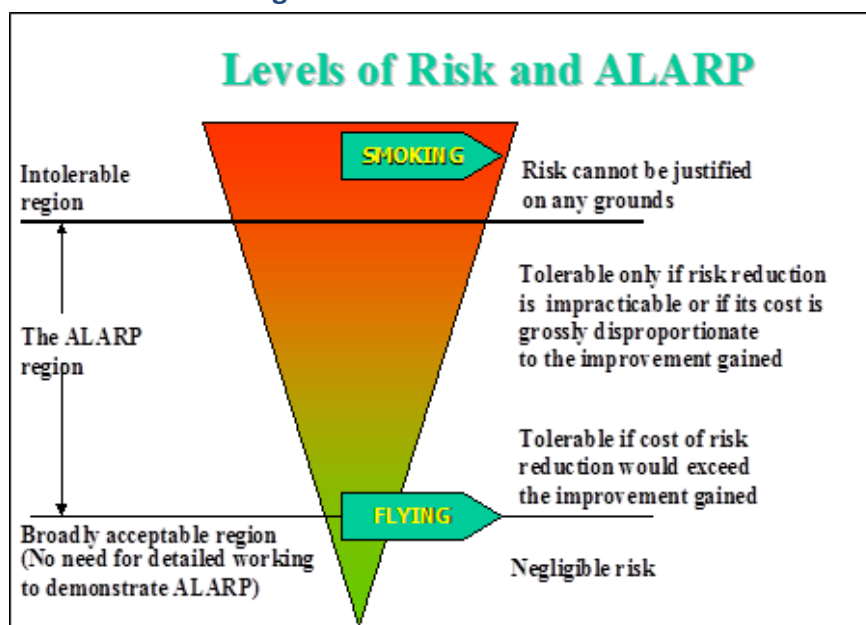
This PRA has been conducted in accordance with the Office of the Coordinator-General’s Terms of Reference for the Project. In addition, the PRA was prepared in consideration of the following guidelines and standards:

- AS/NZ ISO 31000:2018;
- HB 203:2012;
- Recognised Standard 02 – QLD Department of Natural Resources, Mine and Energy; and
- MDG1010 *Minerals Industry Safety and Health Risk Management Guideline* (Department of Trade and Investment, 2011).

2.3 RISK CRITERIA

The risk criteria utilised is to reduce the risk to “As Low As Reasonably Practicable” (ALARP) or lower (Figure 4) schematically shows the three risk management zones viz. intolerable, ALARP and tolerable. The middle zone is referred to as the ALARP zone.

Figure 4 – ALARP Risk Criteria



Flying is an example of a risk considered by most people to be a tolerable risk; whilst smoking is generally considered to be an activity which cannot be justified from a risk perspective. This is shown graphically in Figure 4. Intolerable items such as smoking are at the top of the pyramid where much lower risks, such as flying, sit at the lower end of the ALARP zone (close to tolerable).

The risk ranking matrices used during the PRA workshop are presented in Section 4.

3 IDENTIFY RISKS

3.1 OVERVIEW

The identification of risks involved the use of risk assessment tools appropriate for identifying potential loss scenarios associated with the Project. The tools used were:

- Introduction – before the potential issues were discussed it was important that the PRA team had a good understanding of the Project, and this was confirmed by the facilitator.
- Presentation Review – the Project was described in detail by knowledgeable PRA team members and this generated development of potential loss scenarios that were added to the Risk Ranking Table.
- Modified Hazard and Operability (HAZOP) Analysis – this involved the review of key words (drawn from the Terms of Reference for the Project) and aerial imagery, plans, and the consequent identification of potential issues at each logical location / node during each phase of operation.

3.2 PRELIMINARY RISK ASSESSMENT WORKSHOP TEAM

The PRA team met via a Zoom meeting for the PRA workshop in March 2020. A team-based approach was utilised in order to have an appropriate mix of skills and experience to identify the potential risks, environmental issues and potential loss scenarios. Details of the PRA team members and their relevant qualifications and experience are included in Table 1.

Table 1 – Preliminary Risk Assessment Workshop Team

Name	Position/Affiliation	Relevant Qualifications and Experience
Kirsten Gollogly	General Manager - Health, Safety & Environment, Whitehaven	B Eng (Env) & M Env Mgt, over 20 years of experience in the industry.
Tony Dwyer	Group Manager - Approvals and Environment, Whitehaven	BSc, GradDip Nat Res, Masters of Environment and Business Management, over 20 years of experience in industry.
Brendan Dillon	Approvals Manager, Whitehaven	B EnvSc, LLB & Grad Dip Legal Prac and over 10 years of experience in the resource sector.
Rob Simpson	Study Manager, Whitehaven	BE(Hons), BA, FAICD, FIEAust, CPEng, RPEQ and over 25 years of experience in mining and heavy industry operations and projects.
Derwin Lyons	Principal Hydrogeologist, SLR	B Sc (Hon) Hydro Geology and over 10 years of experience in QLD coal mining and approvals.
Matt Briody	Principal Engineer, WRM	B Eng (Civil), over 18 years of experience as surface water specialist in the resource industry.
Chris Mahoney	Principal Social Scientist, SMEC	M Env Planning B Economics over 20 years of experience as social scientist in resource industry.
Josh Peters	Senior Env. Manager, Resource Strategies	B Env Sc, over 18 years of experience as an environmental consultant in resources industry.
Jamie Gleeson	Senior Ecologist, Resource Strategies	BSc (Hons), over 18 years of experience in environmental management and project approvals in the resource industry.
Mitch Kelly	Env. Project Manager, Resource Strategies	B Eng (Chemical), over 10 years of experience as an air quality consultant and environmental project management and approvals consultant in the resource industry.

Name	Position/Affiliation	Relevant Qualifications and Experience
Justin Hocking	Env. Project Manager, Resource Strategies	B Eng (Chemical and Environmental), 3 years of experience as an environmental project management and approvals consultant in the resource industry.
Peter Standish	Facilitator, OpRM	Formal qualifications (including a PhD in mine ventilation) in mining and over 30 years of industrial experience at a range of mining operations. Facilitating risk analyses for over 15 years.

3.3 RISK IDENTIFICATION

3.3.1 Modified HAZOP

The main tool applied with the PRA team was that of a modified HAZOP. In this process the aerial imagery and plans of the pipeline route and surrounding district were referred to along with a consideration of the phases of operation and the potential impacts that could arise.

The generic key words used in the HAZOP process representing environmental issue subject areas (generally based on the headings in the Terms of Reference for the Project) were:

- Surface Water.
- Flooding.
- Groundwater.
- Biodiversity.
- Non-Indigenous Cultural Heritage.
- Noise.
- Blasting.
- Air Quality.
- Road Transport.
- Rail Transport.
- Social/Economic.
- Land/Agriculture.
- Visual Landscape.
- Chemical Leaks and Spills.

Figure 2 shows the subject area considered in the HAZOP phase of the analysis.

The key issues identified in the PRA will be addressed in appropriately detailed assessments in the EIS and the specialist’s reports (where relevant) included as appendices to the EIS.

3.3.2 Referred Issues

Where issues raised during the PRA workshop brainstorming were: outside the scope of the PRA; outside of the Project scope; and/or beyond the control of Whitehaven, these referred issues were considered to warrant consideration in the development of the EIS.

The only referred issue identified by the PRA team, that would require further consideration by Whitehaven during the operation of the Project, was third party access to the quarry.

3.3.3 Assumptions and Constraints

The PRA team also needed to make some basic assumptions regarding the likely status of controls and the extent to which issues needed to be analysed in the session. The PRA team drew on the standard Whitehaven Risk Assessment assumptions, which are:

- Adherence with the Group Health, Safety, Environment and Community (HSEC) Policy, Group Health, Safety and Environment Standards and associated procedures.
- All workers are supplied with and utilise required personal protective equipment (PPE) for the tasks and conditions.
- Slips/trips/falls controlled through hazard identification, housekeeping, eyes on path and three points of contact.
- Personnel are inducted, trained competent and authorised in their relevant work areas.
- Positive communications in place.
- Eyes on tasks.
- Fitness for work requirements as part of the broader HSEC Policy.
- Pre-placement, periodic medicals and functional capacity evaluations (FCEs).
- Safe Work Method Statements/Safe Work Procedures/Job Hazard Analyses/Take 5s.
- Control for working conditions (e.g. cap lamps, LHD lights, seasonal appropriate clothing).
- Tagging and Inspection regime for lifting equipment and electrical equipment.
- Inspection of equipment.
- Fit for purpose equipment selection.

4 ANALYSE RISKS

4.1 PROBABILITY AND MAXIMUM REASONABLE CONSEQUENCE

Potential loss scenarios (primarily based on the identified key potential environmental issues) were ranked for risk by the PRA team. A tabular analysis was used for this risk ranking process, based on the probability and consequence of a loss scenario occurring as decided by the PRA team (Tables 2 to 4).

The following definition of risk was used:

- the maximum reasonable consequences (MRCs) should the event occur (Table 2); and
- the combination of the probability of an unwanted event occurring (Table 3).

The following tables (shown in a landscape format) present the bases on which these analyses were made.

4.2 RISK RANKING

Risk ranking was undertaken by the PRA team on the loss scenarios drawn from the key potential environmental issues, using the risk ranking matrix shown in Table 4. The key risks that were identified were ranked and are presented in Table 5. A consolidated list of risks that were identified during the PRA workshop is provided in Attachment B. The order of the consolidated list of risks (Attachment B) has been based on the rankings assigned to each risk during the PRA workshop.

Table 2 – Consequence Rankings

Level	Descriptor	Safety	Health	Environment	Community	Economic
5	Catastrophic	Single or multiple fatalities	Exposure to health hazards (significantly exceeding the occupational exposure limit [OEL]) resulting in single or multiple fatalities	Unconfined detrimental impact requiring long term recovery leaving major residual damage (typically years)	Widespread mistrust / opposition among stakeholders setting the agenda for key decision makers	>\$50 million (M)
4	Major	Severe impairment or irreversible damage to one or more persons (typically a permanent disability injury)	Exposure to health hazards (significantly exceeding the OEL) resulting in irreversible impact on health with loss of quality of life (typically a permanent disability illness)	Unconfined detrimental impact requiring medium term recovery leaving residual damage (typically months)	Tangible mistrust / opposition among stakeholders with significant influence on key decision makers Irreparable damage to site or item of high cultural significance	\$10M - \$50M
3	Medium	Reversible injury or moderate irreversible damage or impairment to one or more persons (typically a restricted work day or lost time injury)	Exposure to health hazards (exceeding the OEL) resulting in reversible impact on health, or permanent change with no disability or loss of quality of life (typically a restricted work day or lost time illness)	Near source confined detrimental impact requiring medium term recovery (typically months) Unconfined detrimental impact requiring short term recovery (typically weeks)	Mistrust / opposition among some stakeholders with moderate influence on public opinion and decision makers Reparable damage to site or item of high cultural significance	\$2M - \$10M
2	Minor	Reversible injury requiring treatment but does not restrict duties (typically a medical treatment injury)	Exposure to health hazard resulting in symptoms requiring medical intervention and full recovery with no restrictions or lost time (typically a medical treatment illness)	Near source confined reversible impact requiring short term recovery (typically a week)	Tangible mistrust / opposition among a few stakeholders with some influence on public opinion and decision makers Irreparable damage to site or item of low cultural significance	\$100K - \$2M
1	Insignificant	Low level short-term inconvenience or symptoms (typically a first aid or no treatment injury)	Exposure to health hazard resulting in temporary and reversible discomfort (typically a first aid or no treatment illness)	Near source confined negligible or temporary impact (typically a shift)	Tangible mistrust / opposition among individual stakeholders with minimal influence on public opinion and decision makers Reparable damage to site or item of low cultural significance	<\$100K

Table 3 – Likelihood Rankings

Level	Descriptor	Description	Quantification
A	Almost Certain	The event is expected to occur in most circumstances	Typically occurs once per day to one week
B	Likely	The event will probably occur in most circumstances	Typically occurs once per week to one month
C	Occasional	The even should occur at some time	Typically occurs once per month to one year
D	Unlikely	The even could occur at some time	Typically occurs once in one to five years
E	Rare	The event may only occur in exceptional circumstances	Typically occurs once in five to ten years

Table 4 – Risk Ranking Matrix

		Consequence				
		Insignificant (1)	Minor (2)	Medium (3)	Major (4)	Catastrophic (5)
Likelihood	Almost Certain (A)	Moderate	High	High	Critical	Critical
	Likely (B)	Moderate	Moderate	High	High	Critical
	Occasional (C)	Low	Moderate	High	High	High
	Unlikely (D)	Low	Low	Moderate	Moderate	High
	Rare (E)	Low	Low	Moderate	Moderate	High

Risks Definition	
Critical	Risks that significantly exceed the risk acceptance threshold. Immediate attention needed, stop the job.
High	Risks that exceed the risk acceptance threshold. Additional risk control measures required. If further risk control measures are not practicable the responsible Manager must sign off.
Moderate	Risks acceptance threshold. Additional control measures could be implemented to control risks further. Active monitoring of risk control measures required.
Low	Risks that are below the risk acceptance threshold. No additional control measures required. Monitoring of risks may be needed.

Table 5 – Risk Ranking Results

Ref	Item/Aspect	Scenario	Existing and Proposed Preventative and Mitigating Measures	Ranking Basis	P	C	R
R001	Surface Water	Release of mine affected water from the Project leads to impacts on downstream surface water users	A Surface Water Management Plan, including a Surface Water Monitoring Program and Erosion and Sediment Control Plan, would be prepared for the Project with the requirements for water management during operations, aligned with model mine conditions regarding how waters can be released. Monitoring of upstream and downstream water qualities. A Receiving Environment Monitoring Plan (REMP) would also be prepared for the Project.	With all existing and proposed controls followed then the consequence would be insignificant with an occasional probability, as may occur releases occur during flow scenarios (e.g. annual occurrence).	C	1	Low
R002	Surface Water	Overtopping of dams	A Surface Water Management Plan, including a Surface Water Monitoring Program and Erosion and Sediment Control Plan, would be prepared for the Project with requirements for water management during operations, operational rules, emergency water management, Trigger Action Response Plans (TARPs) (ability of storages of last resort [mine workings]) and consequence category assessment on which storage are controlled to higher levels.	With the existing and proposed controls followed it is unlikely that a release would occur, however the consequence would be medium due to the short-term impact to the environment.	D	3	Moderate
R003	Surface Water	An unexpected flooding event impacts the Project	A Surface Water Management Plan would be prepared for the Project. The construction and maintenance of temporary levees (design and inspections by a suitable quality person) input consequence category assessment, regulator inspections, designed to suit flooding events. Contingency plans, insurance and implementation of the health, safety, environment and community management system for managing any required activities.	Ranked on the basis of a rare event leading to a major impact. Operational impacts could lead to economic, health and safety impacts. If an unexpected flood event occurs there would be negligible harm off-site due to dilution of water. Off-site releases may be required after flood event. Risk is considered ALARP.	E	4	Moderate

Ref	Item/Aspect	Scenario	Existing and Proposed Preventative and Mitigating Measures	Ranking Basis	P	C	R
R004	Groundwater	Release of mine affected water from the Project leads to impacts on downstream groundwater users	A Water Management Plan, including a Groundwater Monitoring Program would be prepared for the Project. The design of the final landform would also meet the requirements of a Progressive Rehabilitation and Closure Plan. Selective handling and placement of waste materials.	With all existing and proposed controls followed, the probability is unlikely and the consequence would be minor.	D	2	Low
R005	Groundwater	Project impacts the availability of water resources for private bores and the environment	A Water Management Plan, including a Groundwater Monitoring Program would be prepared for the Project. The design of the final landform would also meet the requirements of a Progressive Rehabilitation and Closure Plan (PRCP). Make good provisions would be required for privately-owned bores that may be impacted. Environmental users have no current planned mitigation measures. Ecological management plans may be required if risks to groundwater dependent ecosystems (GDEs) are identified.	With all existing and proposed controls followed, the probability is unlikely and the consequence would be minor.	D	2	Low
R006	Biodiversity	Loss of habitat value and flora/fauna species due to clearance associated with the Project	Mapping and ground-truthing of vegetation/habitat and development of an acceptable offset strategy. Consideration of mapped vegetation/habitat during the development of the mine plan (avoidance of impacts to biodiversity values where possible). Ground Disturbance Permit (GDP) process.	With all existing and proposed controls followed, the probability is unlikely and the consequence would be minor.	D	2	Low
R007	Non-Indigenous Cultural Heritage	Loss of unknown non-Indigenous cultural heritage values	Mapping of historic heritage items - and no items identified. Protocols in place for identification and response to heritage items (included in site inductions and GDP process).	With the absence of known heritage items, the probability is unlikely and the consequence would be insignificant.	D	1	Low

Ref	Item/Aspect	Scenario	Existing and Proposed Preventative and Mitigating Measures	Ranking Basis	P	C	R
R008	Noise	Noise generated by the Project impacts neighbouring sensitive receivers	A Noise Management Plan would be prepared for the Project. Standard noise management and mitigation processes, including the consideration of sound power levels (SWLs) in selection of fixed plant and mobile equipment.	With all existing and proposed controls followed, the probability is unlikely and the consequence would be minor.	D	2	Low
R009	Blasting	Potential blasting impacts on rail infrastructure (i.e. damage from fly-rock)	A Blast Management Plan, including a Blast Monitoring Program would be prepared for the Project. Minimising the maximum instantaneous charge (MIC) of blasts where practicable and consultation/agreement with Aurizon regarding potential interactions with the railway.	With all existing and proposed controls followed, the probability is unlikely and the consequence would be medium, due to the potential risk to safety and infrastructure.	D	3	Moderate
R010	Air Quality	Project contributes to air quality impacts in the community leading to perceived health impacts and reduced amenity	An Air Quality Management Plan would be prepared for the Project, which would detail air quality monitoring processes for the Project, general dust controls, TARPs for high dust conditions.	With the existing and proposed controls followed, the probability would be occasional but minor in consequence, which is considered ALARP.	C	2	Moderate
R011	Road Transport	Increased traffic movement associated with the Project leads to a deterioration in road safety for users	A Road Use Management Plan would be prepared for the Project. The Road Transport Assessment for the EIS has included cumulative forecasting of traffic movements and assesses potential impacts on the existing road network. Where potential road transport risks are identified, potential intersection upgrades and maintenance may be implemented. Optional transport of workforce via buses to reduce potential impacts on existing road network. Development of a Fatigue Management Plan.	With all existing and proposed controls followed, the probability is unlikely and the consequence would be medium, due to the potential risk to safety, health, community and infrastructure. With the controls the risk is considered ALARP.	D	3	Moderate
R012	Rail Transport	Potential impacts on the rail corridor and interaction of Aurizon workforce	Health and Safety Management System (HSMS) for workforce, agreement with Aurizon for works within the railway corridor, permits to work in railway corridors.	With all existing and proposed controls followed, the probability is rare and the consequence is medium, due to the potential risk to safety, health and community.	E	3	Moderate

Ref	Item/Aspect	Scenario	Existing and Proposed Preventative and Mitigating Measures	Ranking Basis	P	C	R
R013	Social/Economic	Workforce places pressure on housing and social infrastructure	<p>A Social Impact Management Plan would be prepared for the Project, including:</p> <ul style="list-style-type: none"> • Workforce Management Plan. • Workforce Housing and Accommodation Plan. • Local Business and Industry Procurement Plan. • Health and Community Wellbeing Plan. • Community and Stakeholder Engagement Plan. <p>Ongoing consultation with relevant stakeholders.</p>	With the existing and proposed controls followed, the probability would be occasional but minor in consequence. There is potential for perceived impacts to the community from the Project, but these would also be minor in consequence.	C	2	Moderate
R014	Land/Agriculture	Loss of grazing land	<p>A PRCP would be prepared for the Project, which would outline the processes to return the land to prior grazing use or other authorised land use.</p> <p>Ongoing consultation with relevant stakeholders.</p>	This represents a tolerable level of concern and is covered as part of general approval conditions, so ranking was not required.	-	-	N/A
R015	Visual Landscape	Change from agricultural to mining landscape	<p>Assessment and management of visual amenity. It should be noted that the sensitivity of receptors is low due to the existing environment.</p>	This represents a tolerable level of concern and is covered as part of general approval conditions, so ranking was not required.	-	-	N/A
R016	Chemical Leaks and Spills	Release of hydrocarbons or other contaminant from the MIA	<p>A Surface Water Management Plan and Emergency Response Procedure would be prepared for the Project. Hazardous substances management, bunding of all chemical storage and use areas and emergency response capacity on-site. ChemAlert (or similar) utilised to provide guidance to site management and emergency responders (e.g. Safety Data Sheets, etc.). Fuelling facilities designed to prevent releases to the environment.</p>	With the existing and proposed controls followed it is expected to be rare that an impact off-site could occur and this impact would be minor in consequence.	E	1	Low

P = Probability, C = Consequence, R = Rank.

5 MONITOR AND REVIEW

5.1 NOMINATED CO-ORDINATOR

The nominated client review facilitator is Brendan Dillon – Approvals Manager, Whitehaven.

It is understood the nominee will co-ordinate the inclusion of the key potential environmental issues into the various studies undertaken as part of the EIS and the overall Whitehaven management systems.

5.2 COMMUNICATION AND CONSULTATION

Consultation, involvement of personnel (Whitehaven and attending specialists) and communication of the process and outcomes of the PRA workshop are intended to be achieved by the inclusion of this PRA and the relevant specialist assessments addressing the key potential issues in the EIS, and consideration of the report's outcomes in the overall Whitehaven management systems to be implemented for the Project.

5.3 CONCLUDING REMARKS

The risk assessment process conducted by the PRA team was aligned with AS/NZS ISO 31000:2018, QLD DNRME's Recognised Standard 02 and MDG1010 *Minerals Industry Safety and Health Risk Management Guideline* (NSW Department of Trade and Investment, 2011), with the intention of identifying the key potential environmental issues for the Project.

Risk Mentor would like to thank all of the personnel who contributed to the risk assessment in particular those personnel from Whitehaven and Resource Strategies who prepared source material for the PRA workshop.

Peter Standish, May 2020

6 DEFINITIONS AND TERMS

The following key terms are used consistently through this report.

Table 6 – Abbreviations and Terms

Abbreviation/Term/Phrase	Description and Definition
ALARP	“As Low As Reasonably Practicable”. The level of risk between tolerable and intolerable levels that can be achieved without expenditure of a disproportionate cost in relation to the benefit gained.
AS/NZS ISO 31000:2018	Australian Standard/New Zealand Standard on Risk Management.
CHPP	Coal Handling and Preparation Plant
Control	An intervention by the proponent intended to either Prevent a Cause from becoming an incident or to reduce the outcome should an incident occur.
EIS	Environmental Impact Statement
ETL	Electricity Transmission Line
FCEs	Functional Capacity Evaluations
Hazard	The source of potential harm or a situation with a potential to cause injury or illness to a person or harm to the environment.
HSEC	Health, Safety, Environment and Community
HSMS	Health and Safety Management System
MDG1010	Department of Primary Industries guideline on risk management
MIA	Mine Infrastructure Area
MRCs	Maximum Reasonable Consequence
Mtpa	Million tonnes per annum
Outcome	The end result following the occurrence of an incident. Outcomes are analogous to impacts and have a risk ranking attached to them.
PPE	Personal Protective Equipment
Practicable	The extent to which actions are technically feasible, in view of cost, current knowledge and best practices in existence and under operating circumstances of the time.
Review	An examination of the effectiveness, suitability and efficiency of a system and its components.
Risk	The combination of the potential consequences arising from a specified hazard together with the likelihood of the hazard actually resulting in an unwanted event.
RM	Risk Mentor
ROM coal	Run-of-Mine coal
PRA	Preliminary Risk Assessment

7 REFERENCES

Department of Natural Resources, Mine and Energy (2018) *Recognised Standard 02 – Control of Risk Management Practices*.

Department of State Development, Manufacturing, Infrastructure and Planning (2019) *Terms of reference for an environmental impact statement - Winchester South Project*.

Department of Trade and Investment (2011) *MDG1010 Minerals Industry Safety and Health Risk Management Guideline*.

Standards Australia (2012) *Handbook 203:2012 Environmental Risk Management – Principles and Process*.

ATTACHMENT A – IDENTIFIED CONTROLS / CONTROL STRATEGIES FOR THE PROJECT

Table A1 indicates the controls identified in the risk analysis and which are intended to be applied to the Project when executed, which Whitehaven WS confirmed are agreed as intended.

Table A1 – Identified Controls / Control Strategies for the Project

Nominated Control
Air Quality Management processes (e.g. Air Quality Management Plan), monitoring, general dust controls, Trigger Action Response Plans for high dust make conditions.
Assessment and management of visual amenity - and receptor sensitivity is low.
Aurizon work agreement – addressing work in corridor conditions, permits to work in corridors, etc.
Blasting Management processes (e.g. Blast Management Plan) - requiring control of maximum charge per delay, agreement with Aurizon (blast interaction plan signed off).
Constraints plan as part of mine planning processes to provide a consideration of mapped aspects with mine planning (avoidance where possible).
Contingency plans and appropriate insurance to support mitigation/recovery efforts.
Ecological management plans (including identifying and protecting groundwater dependent ecosystems)
Final landform meeting regulatory requirements (i.e. PRCP guidelines).
Fuelling facilities designed to prevent major releases to the environment.
Ground Disturbance Permitting process.
Groundwater management process (e.g. Water Management Plan including a groundwater monitoring program).
Hazardous substances management plan which includes: bunding of all chemical storage and use areas; emergency response capacity on site; provision and use of ChemAlert to provide guidance to site management and emergency responders (e.g. Safety Data Sheets, etc.).
Heritage management process - mapping of potential items of interest and standard protocols in place for identification and response to heritage items (included in site inductions and GDP process).
Health and Safety Management System (HSMS) for managing any required activities including any works in rail corridors.
Identification of make good requirements for private bore users potentially impacted by the Project.
Noise management processes (e.g. consideration of sound power levels in selection of plant and equipment).
Offset management plan (e.g. mapping of vegetation and habitat and development of an acceptable offset proposal).
Receiving Environment Monitoring Plan.
Rehabilitation management processes (e.g. PRCP) including, selective handling and placement of materials, returning the land to prior land use where possible, or other agreed land use.
Road transport management process (e.g. Road Use Management Plan), including consideration of cumulative forecasting of traffic movements to assess potential impacts, intersection design and maintenance.

Nominated Control
<p>Social impact management process (e.g. Social Impact Management Plan), including;</p> <ul style="list-style-type: none"> • workforce management plan; • community and stakeholder engagement plan; • workforce housing and accommodation plan; • local business and industry procurement plan; • health and community wellbeing plan; and • fatigue management plan.
<p>Surface water management process (e.g. Water Management Plan including a surface water monitoring program and an erosion and sediment control plan), covering:</p> <ul style="list-style-type: none"> • monitoring of upstream and downstream water qualities; • requirements for water management during operations, operational rules, emergency water management, TARPs (ability of storages of last resort (mine workings)) and consequence category assessment on which storage are controlled to higher levels; • levee construction and maintenance (design and inspection); • RPEQ input to designs and consequence category assessment; • regulator inspections; and • facilities designed to suit flooding event(s).

ATTACHMENT B – CONSOLIDATED LIST OF IDENTIFIED RISKS

Table B1 – Consolidated Identified Risks

Ref	Issue	Priority	Issue Assessment Approach
IS041	Levees overtopping or failure and subsequent impact on downstream users/features and the Project (floodwater ingress)	1050	Addressed in the Surface Water and Flooding Assessment. Review designs of the temporary levee and construction limits is assumed. Location of the Project indicates a low potential for over-topping.
IS026	Risk associated with final landform options, recent changes to rehabilitation requirements and impacts post-mining commitments	1020	Addressed in the Main Text of the EIS. Highlighted as relates to mining companies - needing to cost the varying alternatives. Economic Assessment and multiple landform designs to be developed.
IS016	Range of cumulative social impacts related the Project, including impacts to housing demand, employment, services and the community	1000	Addressed in the Social Impact Assessment and associated Social Impact Management Plan. Isaac Regional Council - has lent weight to the review process. Social Impact Management Plan acceptable to council and the State government (Office of the Coordinator-General) - will require appropriate consultation to reach a practicable solution. The cumulative element will be harder to resolve - as this is going to be harder to resolve.
IS003	Post-mining, poor quality water is discharged from the final voids and impacts the groundwater system and reduces water available for existing users	650	Addressed in the Surface Water and Flooding Assessment, Groundwater Assessment and Geochemistry Assessment. Normally only consider salinity other CSE's not considered. Rehabilitation section of EIS addressing post mining land use effects
IS051	Noise from the mine infrastructure area impacting on near neighbours - with potential for sleep disturbance - also includes cumulative impacts from surrounding mining operations	600	Addressed in the Noise and Vibration Assessment.
IS022	Maintaining the biodiversity values of final landform	555	Addressed in the Main Text of the EIS and Terrestrial Ecology Assessment. Targeted vegetation. Confirming grazing and light woodland can be achieved.
IS001	Groundwater drawdown reduces water available for existing bore water users	510	Addressed in the Groundwater Assessment. Modelling study on privately held bores (and make good provisions). Groundwater management plan. (Addressing Chapter 3 of the Water Act - including a Bore Census).

Ref	Issue	Priority	Issue Assessment Approach
IS015	Cumulative impact of the Project for water resources (i.e. groundwater and surface water impacts)	230	Addressed in the Surface Water and Flooding Assessment. Analysis of water impacts and changing in catchment and flooding characteristics. Similar to above. Challenges of cumulative impact assessment - data limitations. Groundwater Assessment cumulatively assesses impacts from adjacent and other operations in the area.
IS042	Potential impacts on wetlands due to catchment excision of the Project	150	Addressed in the Terrestrial Ecology Assessment and Aquatic Ecology and Stygofauna Assessment. Input from surface water modelling (dominantly through consideration of loss of catchment).
IS012	Connectivity of the Isaac River alluvium with flood waters and seepage from waste rock emplacements	150	Addressed in the Groundwater Assessment. Particularly for overburden and mine pit seepage. Saturation of Isaac River alluvium from flooding - and subsequent connection to the workings - enhanced recharge during flood events - and subsequent impact on pit inflows.
IS020	Potential impacts of automation (if utilised) and the level of social acceptance	135	Addressed in the Social Impact Assessment and Economic Assessment. Community engagement process (e.g. Whitehaven investment in STEM at the local schools) to support this aspect of the project.
IS002	Groundwater drawdown reduces water available for groundwater dependent ecosystems (GDEs) along the Isaac River	105	Addressed in the Groundwater Assessment, Terrestrial Ecology Assessment and Aquatic Ecology and Stygofauna Assessment. Loss of water at identified locations to state the impact of water loss. Will also need a cumulative impact analysis piece as well.
IS009	Risk or perceived risk to health due to increase in dust (particularly contribution to cumulative dust effects in Moranbah)	100	Addressed in the Air Quality and Greenhouse Gas Assessment and Social Impact Assessment. Key social issue in Moranbah. Concerns around this to address in Social Impact Assessment. Noted that there are high levels of background dust - that may make it hard to achieve guideline levels.
IS044	Loss of unknown GDEs, including potential risk of insufficient data to identify GDEs	100	Addressed in the Groundwater Assessment, Terrestrial Ecology Assessment and Aquatic Ecology and Stygofauna Assessment. Stakeholder comments to include in helping to identify GDE locations for the Ecological Studies. Note that specifically groundwater information in other's EIS's/reports to regulators will be used to inform the studies.

Ref	Issue	Priority	Issue Assessment Approach
IS023	Risk around understanding of the Project's offset liability and pathways to address these - taking into consideration requirement of state and federal regulators	70	Addressed in the Terrestrial Ecology Assessment and Aquatic Ecology and Stygofauna Assessment. Understanding of project offset liability - and understand how the project is going to address the various pathways for these liabilities. Consultation with relevant government agencies/regulators.
IS029	Blasting impacts on rail line and other neighbouring features	55	Addressed in the Noise and Vibration Assessment. Outcomes to inform operational management plans for blasting and consultation required.
IS006	Proposed flood levees results in impact on flood levels at surrounding properties.	50	Addressed in the Surface Water and Flooding Assessment.
IS011	Mental health of the workforce	50	Addressed in the Social Impact Assessment. Implementation of Whitehaven's Health Management programs.
IS057	Inability of third parties to access quarry.	50	Referred issue - negotiations and continued engagement with owner of the quarry and interactions with the Project.
IS013	Unauthorised clearing during construction & operations	30	Addressed in the Terrestrial Ecology Assessment and Aquatic Ecology and Stygofauna Assessment (GDP requirements).
IS021	Unable to return disturbance areas to suitable post mining land use (agriculture etc.)	30	Addressed in the Main Text of EIS and Terrestrial Ecology Assessment.
IS059	Ability to demonstrate a final void land use (e.g. for fauna)	30	Addressed in the Main Text of EIS, Terrestrial Ecology Assessment, Aquatic Ecology and Stygofauna Assessment, Groundwater Assessment and Surface Water and Flooding Assessment.
IS008	Risk to road/public safety due to increase in vehicle movements.	20	Addressed in the Road Transport Assessment.
IS031	Landform stability	20	Addressed in the Main Text of the EIS and Geomorphology Assessment. Reference intended preparation of geotechnical management processes of the operations.
IS039	Climate change and greenhouse gas emissions	20	Addressed in the Main Text of EIS, Surface Water and Flooding Assessment (climate change as an input) and Air Quality and Greenhouse Gas Assessment.
IS043	General impact on threatened species and communities as a result of clearing	15	Addressed in the Terrestrial Ecology Assessment and Aquatic Ecology and Stygofauna Assessment.
IS014	Public's acceptance of social commitments	10	Addressed in the Social Impact Assessment and associated Social Impact Management Plan. Community engagement activities

Ref	Issue	Priority	Issue Assessment Approach
IS019	Malfunction of automated (if utilised) fleet leads to collision with personnel or infrastructure.	10	Addressed in the Preliminary Risk Assessment. Internal project execution processes and health and safety management systems.
IS024	Black lung impacts on site workers	10	Addressed in the Social Impact Assessment and Air Quality and Greenhouse Gas Assessment.
IS037	Encountering unexpected geochemistry	10	Addressed in the Geochemistry Assessment. Commitment for ongoing analysis throughout the life of mine.
IS032	Land contamination	5	Addressed in the Main Text of EIS. Pathways for land contamination described and potential remediation/rehabilitation activities to return land to pre-mining conditions.
IS040	Unauthorised protest groups on-site / security impacts	5	Addressed in the Social Impact Assessment and Preliminary Risk Assessment.
IS050	Interaction with existing quarry (at MIA) - B-Doubles on access road	5	Addressed in the Road Transport Assessment.
IS004	Significant inundation of pit from rainfall runoff, leading to environmental releases and impact on downstream users.	-	Addressed in the Surface Water and Flooding Assessment.
IS005	Catchment excision of Isaac River due to Project reduces availability of water for downstream users.	-	Addressed in the Surface Water and Flooding Assessment.
IS007	Reliance on external water supplies results in reduced piped water availability for other users.	-	Addressed in the Main Text of EIS, Surface Water and Flooding Assessment and Economic Assessment.
IS010	Risk of damage to unknown sites or items of heritage significance.	-	Addressed in the Non-Indigenous Cultural Heritage Assessment.
IS017	Management of hazardous material - chemical, hydro carbons, explosives, wastes, radiation sources, etc.	-	Addressed in the Main Text of EIS.
IS018	Interaction between flooding and rail loop and infrastructure corridor	-	Addressed in the Surface Water and Flooding Assessment.
IS025	Drought impacts on the rehabilitation and operations (e.g. insufficient water for dust suppression)	-	Addressed in the Main Text of EIS.

Ref	Issue	Priority	Issue Assessment Approach
IS027	Rail line through mine potentially affecting high wall/low wall stability	-	Addressed in the Main Text of EIS. Operational geotechnical management processes and geotechnical studies.
IS028	Subsidence event takes out the rail line	-	Addressed in the Main Text of EIS. Geotechnical management processes.
IS030	Bush fires - exacerbated by the project	-	Addressed in the Main Text of the EIS, Terrestrial Ecology Assessment and Aquatic Ecology and Stygofauna Assessment. Bushfire Management protocols.
IS033	Stockpile management - safety, spontaneous combustion and other impacts on site and the wider environment	-	Addressed in the Surface Water and Flooding Assessment Air Quality and Greenhouse Gas Assessment.
IS034	Surface water flow diversions - during operations and post closure	-	Addressed in the Surface Water and Flooding Assessment.
IS035	Coal rejects run off leads to significant impact to downstream surface/ground water users	-	Addressed in the Groundwater Assessment, Surface Water and Flooding Assessment and Geochemistry Assessment.
IS036	Fatigued workers - on public roads and site road networks	-	Addressed in the Main Text of EIS, Social Impact Assessment, Social Impact Management Plan and Road Transport Assessment. Fatigue management policy - rosters, journey management, maximum hours worked interventions.
IS038	Noise and vibration impacts on mine workers	-	Addressed in the Noise and Vibration Assessment.
IS045	Cumulative impact on threatened species	-	Addressed in the Terrestrial Ecology Assessment and Aquatic Ecology and Stygofauna Assessment.
IS046	Spread of disease - transmissible disease from site activities/personal health etc. - including on site camp(s) during construction	-	Addressed in the Main Text of EIS and Social Impact Assessment.
IS047	Extending accommodation/camps in Moranbah during ongoing operations - and subsequent impacts	-	Addressed in the Social Impact Assessment
IS048	Spills of chemicals in MIA - and leads to contamination of surface waters	-	Addressed in the Surface Water and Flooding Assessment. Operational hazardous materials management protocols.

Ref	Issue	Priority	Issue Assessment Approach
IS049	Catchment management within MIA - including dirty water separation	-	Addressed in the Surface Water and Flooding Assessment.
IS052	Noise and vibration impacts on flora/fauna	-	Addressed in the Terrestrial Ecology Assessment, informed by Noise and Vibration Assessment.
IS053	Construction workforce interactions with rail line - particularly related to construction of over-pass of railway line	-	Addressed in the Main Text of EIS. Internal project execution processes and health and safety management systems.
IS054	Management of sediment laden water (e.g. disturbance from construction, overburden dumps, etc.)	-	Addressed in the Surface Water and Flooding Assessment. Operational sediment management controls.
IS055	Interaction with Aurizon and mining activities	-	Addressed in the Main Text of EIS. Internal project execution processes and health and safety management systems.
IS056	FIFO workers - and their impacts on a local community	-	Addressed in the Social Impact Assessment.
IS058	Geotechnical impacts associated with operating on the Yarrabee Tuff	-	Addressed in the Main Text of EIS. Operational strata/excavation stability management processes and geotechnical studies.
IS060	Eagle Downs causes unexpected subsidence impacting on the infrastructure corridor	-	Addressed in the Main Text of EIS.

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