MS21-000894

To: Minister for the Environment (For Decision)

Approval Decision Brief (recommendation report) – Russell Vale Colliery Revised Underground Expansion Project, Russell Vale, NSW (EPBC 2020/8702)

Timing: 31 August 2021 - Statutory timeframe for final decision

Recommendations:

1. That you consider the information provided in this brief and attachments including:
   a. the proposed decision briefing package at **Attachment A** to this brief, including the recommendation report and the final public environment report at Attachment A to that proposed decision brief., and
   b. information concerning the impacts of the proposed action on human safety and your duty to take reasonable care, in the exercise of your powers under ss 130 and 133 of the EPBC Act, to avoid causing personal injury or death to persons under 18 years of age and ordinarily resident in Australia, arising from emissions of carbon dioxide into the Earth's atmosphere at **Attachment F**.

   Considered / Please discuss

2. Consider the responses to the invitation for comment on the proposed decision at **Attachment B** and **Attachment C**.

   Considered / Please discuss

3. That you have considered the impacts of the proposed action on human safety and have given this consideration elevated weight in making the decision.

   Considered / Please discuss

4. That you agree that you have enough information to make the decision set out in the notice at **Attachment E**.

   Agreed / Not agreed

5. That you agree to approve, for the purposes of each controlling provision, the action as summarised in the table below.

   Agreed / Not agreed

6. That you agree to attach the conditions of approval as set out in **Attachment E**.

   Agreed / Not agreed

7. If you agree with recommendations 4, 5 and 6, that you accept the reasoning in the departmental briefing package as the reasons for your decision.

   Accepted / Not accepted

8. If you agree with recommendations 4, 5 and 6, that you sign the notice of your decision at **Attachment E**.

Signed / Not signed

9. If you agree with recommendations 4, 5 and 6, that you sign the letters at **Attachment G** advising the person proposing to take the action, relevant Commonwealth Ministers, and the NSW Government of your decision.

Signed / Not signed

Summary of recommendations on each controlling provision:

Controlling Provisions for the action	Recommendation	
	Approve	Refuse to Approve
Listed threatened species and communities (ss 18, 18A)	Approve	
A water resource, in relation to coal seam gas development and large coal mining development (ss 24D, 24E)	Approve	

The Hon Sussan Ley MP, Minister for the Environment Date: 31st August 2021

Comments:

Clearing Officer: Sent 30 / 08 / 2021	Melissa Brown	First Assistant Secretary, Environmental Approvals Division	Ph (02) 6272 4597 s. 22(1)(a)(ii)
Contact Officer:	Louise Vickery	Assistant Secretary, Environment Assessments (NSW, ACT) Branch	s. 22(1)(a)(ii)

Key Points:

1. The purpose of this brief is to seek your consideration of a final decision for the Russell Vale Colliery Revised Underground Expansion Project (the proposed action) under Part 9 of the *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**).

2. Wollongong Coal Limited (**WCL**) (the proponent and the person proposing to take the action) is proposing to extend underground mining operations at its existing Russell Vale Colliery in Russell Vale, approximately 8 km north of Wollongong, New South Wales (NSW).

proposed action is located within the Cataract Reservoir catchment which is a designated source of drinking water for Sydney. No mining is proposed underneath the full supply level of the Cataract Reservoir.

4. The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (**IESC**) has provided advice on the proposed action twice under the NSW assessment process (November 2019 and March 2020) (Attachment E2 and E3 of **Attachment A** to this brief).

5. In addition to this advice, independent technical reviews of the proposed action have been conducted under the NSW assessment process. The independent reviews agreed with the proponent's subsidence assessment.

6. On 8 December 2020, the NSW Independent Planning Commission approved the proposed action subject to conditions, in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (Attachment F of **Attachment A**). The NSW development consent conditions (conditions B12-B20, C1-C3, and C10-C11) require the approval holder to submit management plans that include mitigation measures, monitoring, thresholds, and a trigger action response plan should the project trigger a threshold.

7. The technical reviews and NSW development consent were provided as part of the documentation considered by the IESC in February 2021. The department has taken the IESC advice (Attachment E of **Attachment A**) into consideration in preparing the decision notice and attached conditions of approval (**Attachment E**).

8. Under section 130 of the EPBC Act, you are now required to decide whether or not to approve the proposed action and, if you decide to approve under section 133, what conditions you will attach to the approval under section 134 of the EPBC Act.

9. The mandatory considerations that you must have regard to when deciding whether or not to approve the proposed action, and the department's analysis of them, are in this brief, the Human Safety and Duty of Care Consideration Report at **Attachment F** and the Secretary's Recommendation Report at Attachment A to **Attachment A** to this brief.

Background

10. On 9 May 2021, your delegate proposed to approve the taking of the proposed action under the EPBC Act, subject to the proposed conditions of approval set out in the proposed approval decision notice (Attachment B of **Attachment A**).

11. Taking into consideration the Public Environment Report, IESC advice and the Secretary's Recommendation Report, your delegate considered the two most significant impacts of the action to be subsidence and adit water discharge:

    - the proposed action could result in subsidence. This has the potential to impact the endangered Coastal Upland Swamps ecological community (Coastal Upland Swamps) and associated EPBC-listed threatened species due to altered water flow regimes.

    - the discharge of adit water from the proposed action could have long-term impacts on groundwater levels and quality as well as long-term effects on Bellambi Gully Creek.

12. Impacts from the proposed action, and avoidance and mitigation measures, are discussed in more detail in the Secretary's Recommendation Report at Attachment A of **Attachment A** to this brief.

13. The relevant protected matters are water resources and listed threatened species and ecological communities.

- Coastal Upland Swamps in the Sydney Basin Bioregion – Endangered;
- Macquarie Perch (*Macquaria australasica*) – Endangered;
- Silver Perch (*Bidyanus bidyanus*) – Critically Endangered;
- Prickly Bush-pea (*Pultenaea aristata*) – Vulnerable;
- Giant Burrowing Frog (*Heleioporus australiacus*) – Vulnerable;
- Littlejohn's Tree Frog (*Litoria littlejohni*) – Vulnerable;
- Stuttering Frog (*Mixophyes balbus*) – Vulnerable;
- Broad-headed Snake (*Hoplocephalus bungaroides*) – Vulnerable; and
- Large-eared Pied Bat (*Chalinolobus dwyeri*) – Vulnerable

14. The delegate considered that the potential impacts to the relevant protected matters can be addressed through the recommended conditions of approval, and that the impacts are not considered to be unacceptable, provided the action is undertaken in accordance with the recommended conditions (Attachment B of **Attachment A** to this brief).

Consultation

15. As recommended in the proposed approval decision brief, your delegate wrote to the proponent, and relevant Commonwealth Ministers inviting comments on the proposed decision, as required under sections 131AA(1) and 131(1) of the EPBC Act.

16. Your delegate also decided to consult the NSW Minister for Planning and Public Spaces, the Hon Rob Stokes MP, regarding the proposed approval decision.

Comments from WCL

17. Following the proposed decision, the department invited WCL to provide comments on the proposed decision and conditions.

18. On 17 May 2021, WCL responded and raised concerns about several of the proposed conditions of approval, in particular the requirement for the groundwater limits and swamp specific water balances, clarity around the adit discharge water quality and the requirement for a subsidence limit of 100 mm (**Attachment B**).

19. WCL's suggested amendments have, where considered appropriate by the department, been incorporated into the final decision notice (**Attachment E**). The key changes include:

    a. Removing the requirement for groundwater level limits (former conditions 7b and 7c)[1] and, as a consequence, the references to groundwater level limits in the cease work provision (former conditions 9,10 and 11). WCL provided data (Attachment 1 to **Attachment B1**) indicating that the Coastal Upland Swamps experience frequent cycles of drying, and the swamps are sourced from perched aquifers that are disconnected from the underlying aquifers including the water table. This means that there is no causal pathway between groundwater drawdown limits and the impacts on the relevant Coastal Upland Swamps. Due to frequent cycles of drying observed in the monitoring bores/piezometers, it will be technically difficult to develop useful limits that are linked to the impact of the proposed action on the relevant Coastal Upland Swamps. Without

[1] See paragraphs 132 and 177 of the Recommendation Report for a discussion of former conditions 7b and 7c.

useful limits, it would not be possible to impose cease work conditions triggered by exceedance of groundwater limits. WCL noted that monitoring of the groundwater will be undertaken, and water level triggers will be established in accordance with the NSW development consent conditions.

a. The department agrees with this approach. However, noting that not all Coastal Upland Swamps have monitoring in place, the department recommends altering the condition to require monitoring of the groundwater in all potentially impacted swamps and publishing the data (new condition 7b).

b. Changing former conditions 7g-h relating to individual water balances for each swamp, otherwise known as swamp specific water balances (**SSWB**).[2] The proponent has requested these conditions be altered and that SSWB be used as a tool for investigating the cause of impacts (if any are identified) rather than as an indicator of impact. This is based on the high level of variability observed in key datasets such as groundwater levels and soil moisture which are used to calculate SSWB. The proponent has recently provided to the department data for some swamps to support this position (Attachment 1 to **Attachment B1**). The proponent has committed in the final Public Environment Report to collecting data that will enable the calculation of SSWB and the department recommends that the condition be changed to formalise that commitment with the inclusion of requirements for monitoring sites to be installed and the commencement of data collection at least 12 months prior to any impact (condition 7c and d). This will ensure that there is some pre-impact data available to enable SSWB to be used in the manner proposed by the proponent.

c. Separating former condition 8[3] into two conditions (new conditions 8 and 9) to reflect both operational and post mining (i.e., adit) water discharges. This will provide clarity around the timing of monitoring and reporting requirements which was requested by the proponent.

d. Inserting a new Attachment B. The proponent has requested that the conditions relate to those Coastal Upland Swamps that will be potentially impacted by the proposed action. The department agrees with this change and has replaced Attachment B with the new figure provided by the proponent.

20. The department also recommends a number of minor changes including timing of reporting to align with the impacts of the proposed action, and changes to definitions for clarity and consistency with the NSW development consent conditions. These changes are detailed in **Attachment D**.

21. In addition to the changes above, WCL also requested the subsidence limit of 100 mm across all Coastal Upland Swamps as proposed by the department be restricted to the four swamps previously impacted by historic mining. For all other swamps, the proponent has suggested a subsidence limit of 300 mm which is consistent with the NSW Independent Advisory Panel for Underground Mining's (IAPUM) advice.

22. The 100 mm subsidence limit is based on the vertical subsidence predictions provided in the proponent's Public Environment Report. The department notes that subsidence will be the key lead indicator in determining the impacts associated with the proposed action. The first observable indicator that unapproved impacts could be occurring to Coastal Upland Swamps will be subsidence. The conservative threshold of 100 mm provides an early

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2 See paragraph 177 of the Recommendation Report for a discussion of former conditions 7f-h.

3 See paragraph 133 of the Recommendation Report for a discussion of former condition 8.

mapping system and protection of the greatest number of Coastal Upland Swamps. The IESC also recommended that a conservative threshold of 100 mm be applied. For these reasons, the department does not recommend that the subsidence limit for Coastal Upland Swamps be changed from 100 mm to 300 mm, and that a 100 mm subsidence limit will be applied to all Coastal Upland Swamps.

23. A revised copy of the proposed final conditions was provided to WCL on 8 July 2021. WCL responded on the same day, noting that they had no further comments on the proposed decision (**Attachment B2**).

Comments from the Minister for Energy and Emissions Reduction

24. On 25 May 2021, the Department of Industry, Science, Energy and Resources replied on behalf of the Minister for Energy and Emissions Reduction stating a nil response (**Attachment C1**).

Comments from the Minister for Indigenous Australians

25. On 27 May 2021, the National Indigenous Australians Agency responded on behalf of the Minister for Indigenous Australians (**Attachment C2**), and raised the following concerns and recommendations:

    a. The proponent should engage with the South Coast People native title group and the Illawarra Local Aboriginal Land Council.

    b. The proponent should consider the engagement of Indigenous employees and businesses in this project.

    c. In addition to the statutory requirements, all parties should ensure the preservation of Aboriginal cultural heritage materials by applying the best practice standards embedded in the *Dhawura Ngilan: A Vision for Aboriginal and Torres Strait Islander Heritage in Australia and the Best Practice Standards in Indigenous Cultural Heritage Management and Legislation*.

    d. The project is located within the South Coast People native title determination area and a portion of the project covers crown land. The NSW Government may wish to seek legal advice as to whether the future acts regime of the Native Title Act 1993 applies to the crown land and what steps it may need to take to validly extinguish or suppress native title rights and interests through the regime.

26. The letter to the proponent includes this advice and encourages ongoing Indigenous stakeholder consultation.

Comments from the Minister for Resources, Water and Northern Australia

27. On 26 May 2021, the Department of Industry, Science, Energy and Resources replied on behalf of the Minister for Resources, Water and Northern Australia and provided comments from Geoscience Australia (**Attachment C3**).

28. Geoscience Australia stated that the proposed approval conditions are generally outcomes-focussed, well-conceived and clearly written.

29. The following key concerns were identified:

    a. Performance measures set by the NSW development consent may not be applicable to the protection of water resources under the EPBC Act. The department considers that the performance measures required under the NSW development consent are

appropriate in protecting EPBC protected matters and, where this is not evident, the department has recommended additional conditions.

b. The Water Management Plan does not require approval from the Commonwealth regulator and, as such, the conditions may not provide the Commonwealth regulator with a role in determining how potential impacts will be monitored or how limits will be derived. Conditions could be refined to provide a mechanism to allow the department to be involved in approving the monitoring system. To avoid duplication and unnecessary regulatory burden, the department has not required that management plans be approved by the department. The state development consent includes numerous conditions detailing specific monitoring and management requirements and the department considers that these are generally appropriate and will require approval by the NSW Planning Secretary. Where the department considers that a cease work provision is needed, the limits associated with these require approval by the Minister or are set within the conditions. The department considers that the provision of the plans and triggers, combined with cease works measures will ensure that protected matters are adequately monitored and protected.

c. The draft conditions required subsidence to be monitored and limits to be set but the Minister was not required to approve limits. Consideration could be given to providing the Commonwealth with a role in approving subsidence limits given the subsidence threat to the Coastal Upland Swamp community. The department has addressed this by recommending a subsidence limit of 100 mm in the conditions for the approval in accordance with the IESC advice (Attachment E1 of **Attachment A**).

Matters for consideration

30. You are now required under sections 130 and 133 of the EPBC Act to decide whether to approve the action and, if you decide to approve, what conditions you will attach to the approval under section 134 of the EPBC Act. The department considers that you have enough information to make an informed decision on whether or not to approve the action.

31. Except for the matters discussed in the brief, the matters for consideration and factors to be taken into account in making your decision are as set out in the proposed approval decision brief and its attachments (**Attachment A** and in **Attachment F** concerning human safety).

32. The department confirms that all relevant conservation advices, recovery plans and threat abatement plans are still current and have not changed from the date of the proposed approval decision (**Attachment A**).

Changes to conditions

33. In preparing this final decision brief, the department has had regard to comments from all parties consulted, both internal and external.

34. As a result, the recommended conditions of approval have changed from the proposed decision (at Attachment B of **Attachment A**). The rationales for these changes are set out in the discussion at paragraph 19 above, and in the table at **Attachment D**. The rationales for the conditions are otherwise set out in the proposed approval decision brief and its attachments (**Attachment A**).

35. While the objectives of the conditions remain the same, some conditions have been removed or amended to provide further clarity around their intent and to improve the enforceability of the conditions.

36. Accordingly, the department considers that the recommended conditions of approval are necessary or convenient to protect, or repair or mitigate damage to, the matters protected by a provision of Part 3 of the EPBC Act which would be apply to this approval.

37. Consistent with the requirements in subsection 134(4), in recommending the conditions of approval at **Attachment E**, the department has considered: relevant conditions that have been imposed under the NSW approval; the information provided by WCL; and the desirability of ensuring that the conditions are a cost effective means for the Commonwealth and WCL to achieve the object of the conditions.

Human safety and your duty of care

38. After the proposed decision was made, the Federal Court of Australia declared that you have a duty to take reasonable care, in the exercise of your powers under ss 130 and 133 of the EPBC Act in respect of the Vickery Extension Project (EPBC 2016/7649) (**Extension Project**), to avoid causing personal injury or death to persons under 18 years of age and ordinarily resident in Australia, arising from emissions of carbon dioxide into the Earth's atmosphere: *Sharma v Minister for Environment (No 2)* [2021] FCA 774). On 27 May 2021, the Court published its reasons for making that declaration: *Sharma v Minister for Environment* [2021] FCA 560. These decisions are collectively referred to as ***Sharma***.

39. The department considers that the reasoning in *Sharma* is relevant to your decision whether to approve the proposed action which involves the extraction of coal and consequential emission of carbon dioxide into the Earth's atmosphere.

40. In accordance with *Sharma,* in deciding whether or not to approve the taking of the proposed action, you must take into account human safety and you must take reasonable care to avoid causing death or personal injury to Australian children. Human safety should be given elevated weight in balancing the matters you must consider in exercising your discretion to approve or not approve the proposed action under ss 130 and 133 of the EPBC Act.

41. The department has considered matters pertaining to the risks to human safety posed by the proposed action and your duty to take reasonable care to avoid causing death or injury to Australian children in making your decision at **Attachment F** to this brief.

42. The department requested further information from WCL and Jindal Steel and Power Limited (parent company) regarding the company's management actions to reduce emissions for the Russell Vale Colliery Revised Underground Expansion Project and the steelmaking plant in India. Information provided by WCL, and Jindal Steel and Power Limited is at Attachments 3-7 and Attachment 12 of the discussion on the human safety considerations and your duty of care at **Attachment F** to this brief.

43. The department considers, based on advice from the Department of Industry, Science, Energy and Resources (DISER), that approval of the proposed action is not likely to cause harm to human safety because it is likely that, if the proposed action is not approved, a comparable amount of coal will be consumed, in substitution for the proposed action's coal thus involving materially the same amount of GHG emissions whether or not the proposed action is approved.

44. Out of the abundance of caution, the department has also considered the risk posed by the proposed action to human safety that could arise if this conclusion is incorrect. If the GHG emissions of the proposed action are 'additional', the proposed action may result in a very small increase in global GHG emissions and therefore cause a very small increase to global average surface temperatures. However, even if this is the case, the department continues

44. recommend the approval of the proposed action because of the low risk of harm to human safety resulting from these very small emissions, together with the human safety benefits of the approval, including those human safety benefits associated with steel production (as described in **Attachment F**) as well as the social and economic considerations as set out in Attachment A to **Attachment A** to this brief.

45. For the reasons outlined in the Recommendation Report and in **Attachment F**, the department recommends that you approve the proposed action, after giving elevated weight to human safety and your duty of care, while also having regard to all other mandatory considerations, including economic and social considerations as outlined in the Recommendation Report.

Line area consultation

46. The following line areas were consulted in the preparation of the final decision briefing package and conditions:

- Legal Division (and Australian Government Solicitor);
- Water Resources Regulatory Support;
- Office of Water Science;
- Post Approvals;
- Environmental Audit; and
- Climate Adaptation and Resilience Division.

Notification of decision

47. Under section 133(3) of the EPBC Act, you must give a copy of the approval to the person named in the approval. A letter to WCL is at **Attachment G1** for your signature.

48. The department also recommends that you write to relevant Commonwealth Ministers, and the NSW Department of Planning, Industry and Environment, notifying them of your decision. The letters are at **Attachment G2** for your signature.

ATTACHMENTS* (see Appendix for complete list)

A: Proposed decision briefing package (hard copies)

B: Proponents' responses to invitation for comment on proposed decision; and supporting information.

C: Ministers' response to invitation to comment on proposed decision

D: Changes to condition table and track changed version of the final conditions

E: Approval decision notice (**for signature)**

F: Consideration of human safety and duty of care

G: Letters notifying WCL, relevant Commonwealth Ministers and the NSW Government of the final approval decision (**for signature)**

Appendix - final decision attachment list

NO.	*Attachment*
A	Proposed decision briefing package
B1	Proponents' responses to invitation for comment on proposed decision; and supporting information.
B2	Proponents' response to final conditions
C1	Minister for Energy and Emissions Reduction response to invitation to comment on proposed decision.
C2	Minister for Indigenous Australians response to invitation to comment on proposed decision.
C3	Minister for Resources, Water and Northern Australia (including GeoScience Australia comments) response to invitation to comment on proposed decision
D1	Change to conditions tables
D2	Marked up version of final Conditions
E	Approval notice - FOR SIGNATURE
F	Consideration of human safety and duty of care
Attachments to F:	
1	Steffen Report (dated 6 July 2021)
2	Department of Industry, Science, Energy and Resources (DISER) advice.
3	WCL draft Air Quality and Greenhouse Gas Management Plan
4	WCL Letter dated 13 August 2021 and confirmation email
5	JSPL Response to RFI
6	WCL Sustainability and Emission Reduction Strategy
7	WCL Letter dated 5 July 2021

8	DISER Supplementary information – Russell Vale Underground Expansion Project
9	NSW Independent Planning Commission (IPC) Approval dated 8 December 2021
10	IPC Statement of Reasons dated 8 December 2021
11	NSW Department of Planning, Industry and Environment Assessment Report
12	WCL advice on sealing the pillars of coal dated 20 August 2021
G1	Letter notifying WCL - FOR SIGNATURE
G2	Letters notifying Ministers - FOR SIGNATURE

ATTACHMENT F

Mandatory consideration – duty of care and human safety

1. On 8 July 2021, the Federal Court of Australia declared that you have a duty to take reasonable care, in the exercise of your powers under ss 130 and 133 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (**EPBC Act**) in respect of the Vickery Extension Project (EPBC 2016/7649) (**Extension Project**), to avoid causing personal injury or death to persons under 18 years of age and ordinarily resident in Australia, arising from emissions of carbon dioxide into the Earth's atmosphere: *Sharma v Minister for Environment (No 2)* [2021] FCA 774 (***Sharma No 2***). On 27 May 2021, the Court published its reasons for making that declaration: *Sharma v Minister for Environment* [2021] FCA 560 (***Sharma No 1***). These decisions are collectively referred to as ***Sharma***.

2. The Court also found that human safety is a mandatory relevant consideration in relation to a controlled action that may endanger human safety, including through the emission of greenhouse gases (**GHG**). The Court said at [404] of *Sharma No 1*:

> 'In relation to a controlled action of that kind, the lives and safety of the Children are not optional considerations but have to be taken into account by the Minister when determining whether to approve or not approve the controlled action. That implication is found in the 'subject-matter, scope and purpose' of EPBC Act…'

3. The Court found that you owed the applicants and other Australian children a duty to take reasonable care to avoid causing them personal injury when deciding whether to approve the Extension Project. The relevant risk of personal injury was the real risk of harm to Australian children arising from heatwaves and bushfires, brought about by increases to global average surface temperatures: see *Sharma No 1* at [247]. The Court found that the Extension Project would lead to the emission of 100MT of CO_2, which the Court found would cause a small but measurable increase to global average temperatures and that the proposed action's emissions would increase the risk of harm to Australian children arising from climate change. While the Court accepted that the contribution of the Extension Project to the increase in global average surface temperature might be characterised as "tiny", there was a "real risk that even an infinitesimal increase in global average surface temperature may trigger a 4°C Future World" and, in that context, "the Minister's prospective contribution is not so insignificant as to deny a real risk of harm to the Children": *Sharma No 1* at [253].

4. Noting that you are currently appealing the Federal Court's judgment in *Sharma*, the Department has nonetheless applied the *Sharma* reasoning to this decision.

Application of Sharma reasoning to this decision

5. Although the duty specified in the declaration made in *Sharma No 2* was confined to the exercise of your power under ss 130 and 133 of the EPBC Act in respect of the Extension Project, the Court noted that the duty of care may extend to any decision

under ss 130 and s 133 of the EPBC Act approving the extraction of coal. At [94] of *Sharma No 1*, the Court observed:

> 'I will proceed on the basis that the duty of care asserted is not confined to the approval of the Extension Project but extends to an approval of the extraction of coal which foreseeably exposes the Children to harm. However, I can only conveniently assess whether such a duty exists by reference to the evidence and that evidence and, in particular, the evidence going to the reasonable foreseeability inquiry is specific to the Extension Project. I will therefore confine the findings I will make about the existence of a duty of care to the approval of the Extension Project.'

6. The department considers that the reasoning in *Sharma* as to the existence of a duty of care is relevant in the circumstances of the current proposed action which involves the extraction of coal and the consequential emission of carbon dioxide into the Earth's atmosphere. Human safety is a mandatory relevant consideration that you must take into account in accordance with the Court's reasoning in *Sharma*. The Court in *Sharma* stated at [407]:

> 'Faced with a controlled action which poses a real risk to the safety of members of the Australian community, the Minister may be expected to give at least elevated weight to the need to take reasonable care to avoid that risk of harm. To do so would be consonant with the policy of the EPBC Act. In such circumstances, the imposition of a duty of care which may, as a practical matter, impose a requirement upon the Minister to consider and give elevated weight to the need for reasonable care to be taken to avoid death or personal injury will not distort the Minister's discretion or skew the intended statutory balance.'

7. In deciding whether or not to approve the taking of the proposed action, you must take into account human safety and you must take reasonable care to avoid causing death or personal injury to Australian children. Human safety should be given 'elevated weight' in balancing the matters you must consider in exercising your discretion to approve or not approve the proposed action under ss 130 and 133 of the EPBC Act.

8. This part of the decision brief addresses the risks to human safety posed by the proposed action, your duty to take reasonable care to avoid causing death or injury to Australian children in making your decision and the department's recommendation, taking into account these matters and weighing them against other considerations including economic and social considerations. This section is structured as follows:

   a. Global coal markets and the likelihood of the proposed action's emissions increasing global GHG emissions;

   b. How GHG emissions are managed under international and national frameworks;

   c. Summary of GHG emissions for the proposed action, measures being undertaken by the company to manage the proposed action and Independent Planning Commission (**IPC**) Assessment;

   d. Risks to human safety of a warming climate;

e. Social and economic considerations;

f. Conclusion.

Global coal markets and the likelihood of the proposed action's emissions increasing global GHG emissions

9. To assist you in making your decision, the department has reviewed publications of the International Energy Agency that analyse trends in global markets including the 'World Energy Outlook 2020' (**WEO 2020**), 'Iron and Steel Roadmap 2020' (**2020 IEA Iron and Steel Roadmap**) and 'Net Zero by 2050'. The department has taken into account the report of Professor Will Steffen submitted by the EDO and dated 6 July 2021 (**Steffen Report**) (Attachment 1 – Steffen Report).

10. The department has also sought the advice of the Department of Industry, Science, Energy and Resources (**DISER**) in relation to the extent to which, if at all, the approval of certain coal projects would affect the global level of consumption of coal in possible future scenarios (Attachment 2) (**DISER Advice**).

11. The DISER Advice explains that the two primary uses of coal are for energy and steelmaking. Coal used for steelmaking is referred to as metallurgical or coking coal. Coke makers use multiple coals when formulating a coking coal blend in order to meet these specifications. Coal used for energy is referred to as thermal coal.

Global demand for steel

12. Steel is and will be critical for supplying the world with energy, as it is an integral ingredient for energy transition, with solar panels, wind turbines, dams and electric vehicles all depending on it to varying degrees. Steel is the main material used in onshore and offshore wind turbines. Almost every component of a wind turbine is made of steel. Steel provides the strength for taller, more efficient wind turbines. Each new MW of solar power requires between 35 to 45 tons of steel, and each new MW of wind power requires 120 to 180 tons of steel.

13. Transmission and distribution lines also require steel. As installations move further offshore more steel will be required. Demand is growing for electrical steels to serve this market.

14. Steel is also a fundamental building block for modern and developing economies. The construction of homes, schools, hospitals, bridges, cars and trucks rely heavily on steel for strength. The DISER Advice notes that steel demand is driven by construction and infrastructure development.

15. OECD modelling[1] predicts that global steel demand is not expected to peak until mid-century, with a growth rate for steel demand from about 1.4% per annum to 1.1%. Demand in mature economies will show zero to slightly negative growth rates over the period, while demand growth in emerging economies will be in the range 2.5% to 4%. Further, the modelling predicts that iron ore demand for steel making will peak in 2025-2030.

[1] https://www.oecd.org/industry/ind/Item_4b_Accenture_Timothy_van_Audenaerde.pdf

16. The steel sector is currently responsible for about 8% of global final energy demand and 7% of energy sector CO_2 emissions (including process emissions). However, through innovation, low-carbon technology deployment and resource efficiency, iron and steel producers have opportunities to reduce energy consumption and GHG emissions, develop more sustainable products and enhance their competitiveness.

Global demand for coal

17. The WEO 2020 identifies a number of scenarios for future global energy demand and supply to 2040. These scenarios include the:

- Sustainable Development Scenario (SDS): which assumes that global coal consumption will be constrained to a level consistent with the aims of the Paris Agreement and energy-related sustainable development goals (these are: affordable and clean energy (SDG 7), to reduce the severe health impacts of air pollution (part of SDG 3) and climate action (SDG 13)); and
- Stated Policies Scenarios (STEPS): which assumes that global coal consumption will not be constrained to a level consistent with the aims of the Paris Agreement or address sustainable development goals. This scenario takes into account the policies and implementing measures affecting energy markets that have been adopted as of mid-2020, together with relevant policy proposals which have not been fully implemented.

18. The DISER Advice notes that global demand for coal will gradually decrease to 2040 in either SDS or STEPS scenario. Global demand for coal is estimated to be 1850 Mtce in 2040 in the SDS scenario and 4735 Mtce in 2040 in the STEPS scenario. However, demand for coal varies by region.

19. Table 1 of the DISER Advice details predicted coal demand in the STEPS scenario and demonstrates that demand for coal in the Asia Pacific region (including India and China) will remain relatively steady up to 2040. The DISER Advice states:

> Coal consumption in India is expected to grow over the next 20 years by 182 Mtce. Coal consumption in South East Asia is also expected to grow rapidly over the same period, increasing by 157 Mtce. Coal use rebounds in China in the near term, peaking around 2025, before declining to 2040. Japan is expected to see the largest reduction in coal consumption over the period, declining by 55 Mtce. By 2040, the Asia Pacific region will account for 85 per cent of global coal consumption (Table 1).

20. Table 2 of the DISER Advice details predicted coal demand in the SDS scenario and demonstrates that demand for coal in India will decrease from 590 Mtce in 2019 to 516 Mtce in 2025, 454 Mtce in 2030 and 298 Mtce in 2040. In China, demand will decrease from 2864 Mtce in 2019 to 2539 Mtce in 2025, 1952 Mtce in 2030 and 1045 Mtce in 2040. Although in this scenario there is a decline in overall demand, this decline is much less significant for the life of the proposed action which is 5 years. The WEO 2020 also projects that countries exporting to emerging Asian markets with higher exposure to coking coal will be less affected by lowered demand. Australia is also projected to remain the largest exporter of metallurgical coal.

21. The DISER Advice notes that, in either the SDS or STEPS scenario, the global demand for coal up to 2040 can be met by alternative sources of coal. Alternative sources of coal include all currently approved Australian coal mines, as well as all known or likely coal mines and coal deposits outside Australia, but excludes the Russel Vale project and other unapproved Australian coal mining developments.

Iron and Steel Roadmap and Net Zero by 2050

22. China is the largest steel producer and India is the second-largest steel producing country in the world. Steel production is expected to continue to grow in India in coming years.

23. The proponent has advised that 84% of the coal is to be used for steelmaking in India, with rejects accounting for the remaining 16%. That is, that all the coal produced will be metallurgical coal for the purpose of steelmaking. As noted by the IPC in its statement of reasons, metallurgical coal is an essential input for current steel production.

24. The 2020 IEA Iron and Steel Roadmap developed in conjunction with industry indicated that opportunities to reduce emissions from the sector in the next 10 years will primarily rely on improvements in material efficiency (light weighting of steel requirements in buildings) greater recycling of steel and iron (electric arc furnace), energy efficiency and performance improvements. Additionally, alternatives to steel (such as carbon fibre, engineered timber) and new methods for making steel without metallurgical coal, using hydrogen or electrolysis (using electricity) are being developed and piloted globally. However, these methods are not currently projected to be operating at scale until the 2030s.

25. The DISER Advice also notes that Direct Reduction Iron (DRI) and electric arc (EAF) furnace technologies currently present technical and cost challenges and are not yet available at the scale needed to meet global demand for steel.

NSW Strategic Statement on Coal

26. The NSW Government has developed a Strategic Statement on Coal Exploration and Mining in NSW. The statement identifies that coal mining in NSW is anticipated to continue for the next few decades. Although recognising that emissions reduction measures will be required, the statement notes that ending or reducing NSW thermal coal exports while there is still strong global demand for coal is likely to have little to no impact on global carbon emissions. The use of coking coal is likely to be sustained longer than thermal coal, as there are currently limited practical substitutes available.

Alternative sources of coal and related GHG emissions

27. The DISER Advice differentiates between the global coal market for thermal coal and metallurgical coal. The long term demand for metallurgical coal depends primarily on its price and the demand for steel. The long term demand for thermal coal depends primarily on its price and demand for energy (including the cost of alternative energy products and consumer preferences for energy types). Supply of

both metallurgical and thermal coal depends on availability in nature, the technology used for extraction, the labour and capital costs associated with production, the cost of transporting the coal to the demand source (normally by rail and ship) and the regulatory costs associated with environmental protection and worker health and safety. However, the prices of metallurgical and thermal coal are linked because there is a degree to which the different coal types can be used in the alternative market. Steelmakers may substitute some metallurgical coal with high-end thermal coal.

28. Based on DISER's advice, the metallurgical coal from the proposed action is of high quality with a sulphur content of 0.42-0.45%, at the low end of the national range of 0.3–1.3% for Australian metallurgical coal. Sulphur is deleterious to the quality of steel and costly to remove during the steel making process.

29. The DISER Advice states that your decision to approve the proposed action does not affect any of the demand factors identified. The DISER Advice notes that recent trade disruptions have demonstrated the substitutability of coal, where coal destined for China has been resold or redirected to various countries and China has managed to source its coal needs in the absence of previously substantial Australian supply. The DISER Advice concludes:

> Regardless of any feasible scenario of future global demand, this small fraction of current global supply, combined with the relatively flat global seaborne metallurgical coal cost curve indicates that the Decision will not have any discernible impact on global coal prices. The alternative sources of coal identified in sub-question 1 are readily substitutable for any coal that might be produced by the Coal Mining Projects.

Impact of a decision to approve or refuse the proposed action on global GHG emissions and climate change

30. The department considers that the available evidence indicates that a decision to approve the proposed action would be unlikely to lead to an increase in global average surface temperatures. This is because the action consequent upon the approval of the project is not likely to cause more coal to be consumed globally (and therefore more GHG emissions) than if the proposed action was not approved.

31. The DISER Advice states that 'any decision of the Minister to approve one or more of the Coal Mining Projects (Decision) is not expected to materially impact on the total amount of coal consumed globally'. The department agrees with this conclusion. DISER notes that the approval or refusal of the proposed action will not affect global demand for coal (see DISER Advice Question 2) and there are sufficient alternative sources of coal to supply future demand for coal in projected future scenarios. In those circumstances, the rejection of the proposed action is unlikely to have an impact on total global coal consumption, or to impact the price of coal.

32. The department has also considered the Steffen Report in reaching the above conclusion. Professor Steffen acknowledges the argument that 'if a proposed new coal development is not allowed to proceed, another new coal resource, either in Australia or overseas, will be developed to take its place'. Professor Steffen states

that this argument is flawed because it presumes that there is and will continue to be a demand for new coal resources beyond those that already exist, whereas he is of the view that evidence demonstrates that coal production is in steady decline. The department notes that this is inconsistent with other available evidence which indicates that demand for coal is likely to continue to be significant in countries including India and China for the life of the proposed action (see paragraphs [17]-[21] above). Further, demand for metallurgical coal in particular is likely to remain in circumstances where alternative steelmaking methods are not available at scale, and are not anticipated to be available until the 2030s, and steel is required for the construction of safe buildings, infrastructure and energy in developing economies.

Conclusion on coal markets and substitution

33. As found by the Court in *Sharma*, an increase to total global GHG emissions poses a risk to human safety by increasing total global average surface temperatures. The relevant risk to human safety found to exist in *Sharma* was the risk of death or personal injury from heatwaves or bushfires.

34. The department considers that the approval of the proposed action is not likely to cause harm to human safety because, if the proposed action is not approved, it is likely that a comparable amount of coal will be consumed in substitution of the proposed action's coal. Therefore, the proposed action will not result in an increase to global GHG emissions.

How GHG Emissions are managed under international and national frameworks

35. Out of the abundance of caution, and in the event that (contrary to the above conclusion) the small amount of emissions from the proposed action are *additional* and are not substituted by emissions from other coal production, the department has considered the national and international frameworks within which those emissions will be managed and measures to mitigate their impacts. These matters further inform your consideration of your duty of care and your consideration of the impact of the proposed action on human safety.

International framework for climate change

36. The international climate treaties, the Paris Agreement, done at Paris on 12 December 2015, the Kyoto Protocol, done at Kyoto on 11 December 1997, and the United Nations Framework Convention on Climate Change (**UNFCCC**), done at New York on 9 May 1992, are the primary multilateral mechanisms governing the international response to climate change.

37. The Paris Agreement entered into force on 4 November 2016. 191 countries are Party to the Paris Agreement, including Australia.

38. The temperature goal of the Paris Agreement is to limit the increase in global average temperature to well below 2°Cand pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. All parties must prepare, communicate and maintain successive nationally determined contributions (**NDCs**) and pursue

domestic mitigation measures, with the aim of achieving the objectives of such contributions. In Australia, our emissions reduction targets and national climate mitigation policies are the responsibility of the Minister for Energy and Emissions Reduction, supported by DISER.

39. Projections in the IPCC Special Report, 'Global Warming of 1.5°C' (8 October 2018) indicate that, if NDCs in place in 2018 were implemented successfully, the world would reach 2.7-3.2 degrees Celsius above pre-industrial levels by 2100. Under the Paris Agreement successive NDCs are required to represent a progression beyond the current NDC and reflecting its highest possible ambition (Article 4.3).

40. Under Article 4 of the Paris Agreement, parties aim to reach global peaking of GHG emissions as soon as possible, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removal by sinks of GHG in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty. 137 governments around the world including Australia have announced intentions to reach net zero emissions which better align with the Paris Agreement temperature goal to limit the increase in global average temperature to well below 2°C and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

41. To respond to climate change, industry, legal and financial fiduciary bodies have also called on business to recognise, understand and respond appropriately to the risks and consequences posed by climate change, potentially independent of government policy. Many companies and businesses have also established net zero by 2030 – 2050 targets. Industry is increasingly acknowledging that effort across the whole supply chain is required to enable sectors to decarbonise.

Climate change framework in India

42. Metallurgical coal from the proposed action is intended to be used for steelmaking in India. India is a party to the Paris Agreement and has submitted its NDC, which includes commitments to:

- reducing the emissions intensity of its GDP by 33% to 35% by 2030 from 2005 levels;
- achieving about 40% cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030 with the help of transfer of technology and low cost international finance including from Green Climate Fund;
- creating an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030.

43. India's domestic climate change policy is centred around the National Environment Policy 2006 (**NEP**), and the National Action Plan on Climate Change (**NAPCC**). The NEP outlines 'intergenerational equity' as a priority, and the NAPCC highlights 8 national missions:

- Solar mission: aims to promote the development and use of solar energy for power generation, with key objective of making solar energy competitive with fossil fuel based energy options;
- Enhanced Energy Efficiency: mandating specific energy consumption decreases in large energy-consuming industries, with a system for companies to trade energy-saving certificates, financing for public–private partnerships to reduce energy consumption through demand-side management programs;
- Sustainable Habitat: The NAPCC also aims at promoting energy efficiency as a core component of urban planning by extending the existing Energy Conservation Building Code, strengthening the enforcement of automotive fuel economy standards, and using pricing measures to encourage the purchase of efficient vehicles and incentives for the use of public transportation;
- Water mission: sets a goal of a 20% improvement in water use efficiency through pricing and other measures to deal with water scarcity as a result of climate change;
- Himalayan Ecosystem: sets the goal to prevent melting of the Himalayan glaciers and to protect biodiversity in the Himalayan region;
- Green India: aims at afforestation of 6 million hectares of degraded forest lands and expanding forest cover from 23 to 33% of India's territory;
- Sustainable Agriculture: goal is to support climate adaptation in agriculture through the development of climate-resilient crops, expansion of weather insurance mechanisms, and agricultural practices;
- Strategic Knowledge for Climate Change: to gain a better understanding of climate science, impacts, and challenges, the plan envisions a new Climate Science Research Fund, improved climate modelling, and increased international collaboration. It also encourages private sector initiatives to develop adaptation and mitigation technologies through venture capital funds.

44. Each of the states in India also have their own State Action Plans for Climate Change (**SAPCCs**). Jindal Steel and Power Limited (**JSPL**) (the parent company of Wollongong Coal Limited (**WCL**)) is the anticipated end-user of the metallurgical coal produced by the proposed action. JSPL has operations in Orissa, India, (now known as Odisha). Odisha has a Renewable Energy Policy (current until 2022), that outlines a number of schemes to reduce carbon emissions.

45. Odisha has a Renewable Energy Policy (current until 2022) that outlines a number of schemes to reduce carbon emissions including:

- under the Odisha Electricity Regulatory Commission (Procurement of Energy from Renewable Sources and its Compliance) Regulations 2015 and Indian Cwlth Electricity Act 2003, anyone who produces or purchases power from a plant that has a capacity of 1MW or greater must source a certain percentage of their power purchases from renewable energy sources;

- this percentage was 11% of total energy in the 2019-2020 financial year (**FY**) . This obligation is increased incrementally each FY;
- implementing renewable goals for 2022, including 2200MW solar, 200MW wind, 150MW small hydro, 180MW biomass, 20MW WTE, for a total of 2750MW renewable energy by 2022;
- investment and incentives for solar, wind, small hydro, biomass, Waste-to-Energy;
- the establishment of three State Technical Committees (**STCs**) to investigate:
  - selection criteria for renewable projects and developers;
  - selecting project developers and projects;
  - approval of detailed project reports;
  - extending projects;
  - making recommendations to Odisha Renewable Energy Empowered Committee, who manage and implement the Renewable Energy Policy commitments and Odisha Renewable Energy Development Fund;
- under the Odisha Renewable Energy Development Fund (**OREDA**), energy sellers will contribute to the fund 5 paise (equivalent to about 0.0009 AUD) for every unit of renewable energy sold. This is on top of a 2.5 billion INR (about 46 million AUD) Odisha government investment in the fund, distributed over a period of 5 years. The fund will be used to develop renewable infrastructure, acquire and develop land, training, funding and loans to small businesses, development and testing of technology.

46. The state also has a number of incentives including setting aside land for renewable projects; tax concessions for renewable projects and developers, and exemptions from certain approvals, fees and licenses.

Domestic measures

47. Under the UNFCCC, Kyoto Protocol and Paris Agreement, the Australian Government has committed to reduce national GHG emissions, track progress towards those commitments, and report annually on Australia's GHG emissions.[2] Australia first communicated its NDC under the Paris Agreement in 2015, committing to an economy-wide target to reduce GHG emissions by 26 to 28% below 2005 levels by 2030.

48. In preparing this brief, the department consulted with DISER who advised:

> Australia has a strong record of overachieving on its emissions reduction targets – we overachieved on our two previous targets, under the Kyoto Protocol and UNFCCC.

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2 https://www.industry.gov.au/policies-and-initiatives/australias-climate-change-strategies/tracking-and-reporting-greenhouse-gas-emissions.

> Australia has in place a comprehensive suite of emissions reduction policies, which are working to reduce emissions in all sectors of the economy. Building on these policies, the government is currently focused on low emissions technologies globally scalable, commercial, and achievable.
>
> Australia's Technology Investment Roadmap will drive down the cost of low emissions technologies and accelerate their deployment, both in Australia and overseas. The Roadmap brings a strategic and system-wide view to future investments in low emissions technologies, in partnership with the private sector, states and territories, and key international partners.
>
> The Roadmap's first annual Low Emissions Technology Statement articulates five priority technologies (clean hydrogen, carbon capture and storage, low carbon materials like steel and aluminium, energy storage and soil carbon) and accompanying stretch goals – ambitious but realistic goals to bring priority low emissions technologies to economic parity with existing mature technologies.
>
> These technologies are expected to avoid in the order of 250 million tonnes of emission per year by 2040, through deployment in Australia and low emission exports. The Roadmap will guide the deployment of an estimated $20 billion of Government investment between now and 2030, including through the CEFC, ARENA, the Climate Solutions Fund, and the Clean Energy Regulator. The Government's investments through the Roadmap will help to secure around $80 billion in total investment from the private sector and governments over the next 10 years.

49. Commonwealth legislation relating to the Australian Government's policies and programs to reduce emissions and fulfil its emissions reporting and target tracking obligations are regulated by the Clean Energy Regulator (**CER**). The CER is responsible for administering the *National Greenhouse and Energy Reporting Act 2007* (**NGER Act**), the *Carbon Credits (Carbon Farming Initiative) Act 2011*, the *Greenhouse and Energy Minimum Standard Act 2012*, and the *Australian National Registry of Emission Units Act 2011.*

50. GHG emissions are categorised into three different types:

- scope 1: direct emissions from owned or controlled sources of an organisation/ development;
- scope 2: indirect emissions from the generation of purchased energy electricity, heat and steam used by an organisation/ development; and
- scope 3: all other upstream and downstream emissions related to an organisation/ development.

51. Australia's National Inventory System (**NIS**) estimates and reports Australia's GHG emissions in accordance with Intergovernmental Panel on Climate Change (**IPCC**) guidelines and rules adopted by the Parties to the Paris Agreement. The NIS comprises an independent national monitoring system to compile Australia's national GHG inventory. The scheme established under the NGER Act is a primary data collection tool for the NIS, with high quality facility level NGER data used where possible for the energy, industrial processes and waste sectors. The UN climate

treaties, including the Paris Agreement, specify that Parties are responsible for the emissions occurring within their jurisdictions.

52. This means that emissions across each jurisdiction, conceptually equivalent to scope 1 emissions, are aggregated to fulfil Paris Agreement emission reporting and target accounting obligations. Scope 2 and scope 3 emissions that occur within the same jurisdiction are not added to this calculation as it would result in double counting of emissions: one facility's scope 2 and 3 emissions are another facility's scope 1 emissions. Scope 3 emissions associated with Australian facilities that occur outside Australia's jurisdiction (eg emissions from the combustion of Australia's coal in an export destination) are accounted for in the countries where those emissions occur.

53. In January 2021, the Prime Minister announced that 'our goal is to reach net zero emissions as soon as possible, preferably by 2050'[3].

NSW

54. The NSW government has developed the NSW climate change policy framework (**CCPF**) and NSW Net Zero plan which provides guidance and measures to achieving net zero emissions in NSW by 2050.

55. The aim of the NSW Climate Change Policy Framework (**CCPF**) is to maximise the economic, social and environmental wellbeing of NSW in the context of changing national and international policy, with the aim to achieve net-zero emissions by 2050. The CCPF does not set prescriptive emission reduction targets, but sets policy directions for government action, for example, to improve opportunities for private sector investment in low emissions technology in the energy industry, which is needed for a transition to a net-zero emissions inventory.

56. The Net Zero Plan builds on the CCPF and sets out a number of initiatives to deliver a 35% cut in emissions by 2030, compared to 2005 levels.

57. In addition to the above policies, the NSW State Environmental Planning Policy (**SEPP**) for mining (**Mining SEPP**) requires the NSW consent authority to consider, in approving a development application:

- whether conditions should be attached to consents to ensure that the development is undertaken in an environmentally responsible manner, including conditions to ensure that GHG emissions are minimised to the greatest extent possible (clause 14(1) of the Mining SEPP); and
- an assessment of GHG emissions (including downstream emissions) from the development and must do so having regard to any applicable State or national policies, programs or guidelines concerning GHG emissions (clause 14(2) of the Mining SEPP).

3 https://www.pm.gov.au/media/address-national-press-club-barton-act.

58. As discussed above, the NSW IPC assessed the GHG emissions of the proposed action and imposed conditions relating to air quality and GHG regulation (B8, B9, B10 and B11), including that the approval holder must:

- not exceed GHG emission criteria (1,148,997 t CO_2-e of Scope 1 emission; 103,500 t CO_2-e of scope 2 emissions);
- take all reasonable steps to improve energy efficiency and reduce scope 1 and scope 2 GHG emissions;
- ensure that major mobile diesel mining equipment used in undertaking the development includes reasonable and feasible diesel emissions reduction technology; and
- prepare and implement an Air Quality and Greenhouse Gas Management Plan.

59. The IPC concluded that the GHG emissions of the proposed action were adequately considered and that the impacts associated with the GHG emissions of the proposed action were acceptable and in the public interest.

New technologies

60. Ventilation air methane (**VAM**) is a source of fugitive emissions. Methane poses a unique challenge in the coal industry as risks associated with it are not only a safety hazard, but a significant contributor of GHG into the atmosphere. Underground coal mines use large-scale ventilation systems to move fresh air into the mine and flush out methane and other gases. This dilutes methane released into the mine workings to enable safer working conditions. However, VAM is ultimately vented into the atmosphere, significantly adding fugitive GHG emissions.

61. Methane is the second most abundant GHG following carbon dioxide, and 28-times more potent than carbon dioxide per molecule in trapping heat in the atmosphere.

62. The CSIRO have been developing VAM technologies to mitigate methane emissions associated with underground mining by either destroying, enriching or capturing VAM.

63. The choice of VAM technology is dependent upon the methane concentration associated with the mine VAM process: The technology is composed of three models:

- VAMMIT – this process allows the methane to be destroyed;
- VAMCAP – the VAM is collected and separated from the ventilate air using carbon composites;
- VAMCAT – the methane is used to create electricity. This type of process can potentially reduce global warming potential from 28 x CO2 to 1 x C02 on a tonne for tonne basis.

64. The Australian Government's low emissions technology roadmap[4] will be looking further into how such technologies can be further supported and developed for commercial use, as fugitive methane from coal mines continues to be a significant contributor to our national GHG emissions representing 4.8% of emissions in 2019.

Summary of GHG emissions for the proposed action, measures to manage the proposed action, and IPC assessment

65. A full description of the proposed action is contained earlier in the Recommendation Report (Attachment A to the final decision brief). The proposed action is the extension of mining operations at the existing Russell Vale Colliery in Russell Vale, approximately 8 kilometres north of Wollongong, NSW, within the Wollongong and Wollondilly Local Government Areas. The proposed action will produce GHG emissions, as stated in the Public Environment Report (**PER**):

- 1,419,000 t CO_2-e of scope 1 emissions during its operational phase area;
- 104,000 t CO_2-e of scope 2 emissions, associated with the production of electricity used by the proposed action including underground mining equipment, conveyor belts, ancillary equipment, and administration facilities;
- 9,600,000 t CO_2-e of scope 3, which would be generated by third parties who transport and consume the extracted coal.

66. The proponent has submitted a draft Air Quality and Greenhouse Gas Management Plan prepared by EEM Consulting (**Management Plan**), which outlines how the proponent will manage and control project risks associated with air quality and GHGs. The preparation of a comprehensive Air Quality and Greenhouse Gas Management Plan is a condition of the development consent granted for the proposed action under the *Environmental Planning and Assessment Act 1979* (NSW) (**EP&A Act**) (Condition B9). Condition B10 requires the proponent to implement the Air Quality and Greenhouse Gas Management Plan as approved by the Planning Secretary.

67. The Management Plan (Attachment 3) identifies its main objectives as to:

- describe how WCL will manage and control project risks associated with air quality and GHGs;
- ensure the protection of nearby sensitive receptors when carrying out the proposed action activities;
- ensure that relevant stakeholders are involved in the formulation and implementation of this Management Plan; and
- address the requirements of applicable legislation, this approval, and statements of commitments.

[4] Technology Investment Roadmap: First Low Emissions Technology Statement 2020

Scope 1

68. Scope 1 emissions from the proposed action are expected to occur through the combustion of diesel (0.4%) and the release of fugitive emissions (99.6%). Some gas is also expected to be released fugitively post-mining from coal stored in the stockpile.

69. The expected emission from the use of diesel is approximately 6,097t CO_2-e over the five year life of the proposed action. The proponent has committed in the Management Plan to reduce the emissions associated with the combustion of diesel including through the following routine site management practices:

- regular maintenance of vehicles;
- use of low sulphur diesel and exhaust scrubbers for all underground equipment;
- pre-start inspections for each shift for all plant and vehicles; and
- tracking and reporting fuel usage.

70. The Management Plan states that the largest sources of scope 1 emissions are expected to be from the coal seam gas vented during the underground coal extraction. The Management Plan provided by the proponent states that the mine ventilation will return air with a methane content ranging from 0.1% to 0.15% based on previous mine ventilation emissions data from 2013 to 2016.

71. The Management Plan notes that Russell Vale does not feature drainage and capture of coal seam gas during mining operations, therefore reduction of fugitive emissions through flaring or electricity generation are not feasible options for the proposed action. The proponent has explored options to utilise VAM technology for electricity generation, however, given the small quantities and low densities of methane, they indicated it is not currently a feasible alternative. The department sought independent advice from the CSIRO who confirmed the proponent's conclusion that this technology is not feasible for the proposed action.

72. It is noted that there are currently no established practical methods for capturing fugitive emissions from stockpiled coal.

73. The proponent further advised on 20 August 2021 (Attachment 12) that they have investigated and are committed to sealing the pillars of coal which is estimated to reduce the proposed action's scope 1 methane emissions by 40%.

74. The proponent has committed to measures to monitor the Scope 1 emissions through scheduled monthly ventilation surveys and real time monitoring. The monitoring data will be used to:

- assess the ongoing impact of the mine on GHG emissions;
- investigate and implement reasonable measures for minimising GHG emissions; and
- quantify GHG emissions and data for reporting purposes.

75. The Management Plan also states that the proponent commits to contacting the CSIRO to discuss low methane technology currently in development to determine the viability for implementation, with findings to be reported in the next annual report.

76. The proponent has advised that the following strategies for Diesel Emission Reduction have been implemented to reduce diesel emissions (Attachment 4 – WCL letter dated 13 August 2021):

- Introduction of a hired diesel vehicle fleet, with machinery within a 2000-hour overhaul schedule. This will enable the retirement of the current fleet of diesel machinery that are reaching the end of their overhaul life;
- Proposed introduction of long-life particulate filters to assist further in the reduction of diesel particulate matter being released;
- Introduction of an underground gas testing station. This will enable more accurate monitoring for diesel emissions, and assist in specific component maintenance to reduce diesel emissions;
- Assistance from the original equipment manufacturer in the maintenance of the diesel fleet as product specialists, to minimize diesel emissions due to wear and tear of diesel vehicles on site;
- Optimisation of the diesel emissions maintenance system, through generated alerts, when diesel emissions testing is not within site specification. This will trigger an inspection of affected diesel systems to determine the cause and in turn minimise diesel emission generation;
- Investigations into establishing a low emission diesel fleet. This includes introducing proven machinery with the latest technologies in certified diesel engine systems with minimal diesel emissions. By 2030 there is to be a plan in place to implement battery powered man transports and load haul dump machinery at site with zero diesel emissions from the underground fleet.

Scope 2

77. Scope 2 emissions are those emissions associated with the production of electricity used by the proposed action. Electricity will be generated for onsite activities including underground mining equipment, conveyor belt motors, overhead cranes in the workshop, compressors, ancillary equipment, and administration facilities. The Management Plan states that the forecast for the proposed action is approximately 103,500t CO2-e of during the operation phase.

78. WCL's Sustainability and Emission Reduction Strategy (Attachment 6) notes that the proponent has proposed to reduce scope 2 emissions by 10,839 t CO_2/year through efficient and sustainable electricity use (Table 1), mostly due to:

- increased use of solar power;
- replacement of incandescent lights with LEDs;
- removal of several ventilation fans;

- solar panels and battery storage installed at No 4 ventilation shaft;
- solar panels and solar water heating to be implemented at bathhouse.

Table 1 showing energy savings and CO_2 reductions for existing and proposed projects as claimed by the proponent

Description	**Per Annum**		
	Energy Saving kWH	**CO2 Reduction (T)**	**SO2 (kg)**
Change from 2MTpa using LW to 1Mtpa using Continuous Miners	5,000,000	5376	714.3
Remove #5 Shaft Ventilation Fans	4,117,200	4427	588.2
Install Solar Panels on Workshop	505,141	543	72.2
Replace Surface Lighting to LED	413,187	444	59.0
Install Solar Panels on Main Bathhouse	38,857	42	5.6
Install Solar Panels at #4 Shaft	6,023	6	0.9
TOTAL	**10,080,408**	**10,839**	**1,440**

Scope 3

79. Scope 3 emissions associated with the proposed action will be generated by third parties who transport and consume coal products. Approximately 1,925,000 t CO_2-e per annum of scope 3 emissions is expected.

80. The Management Plan states that the distribution and transport of the coal product will be undertaken by companies who have committed to using fuel efficient vehicles and will be trialling electric vehicles.

81. The proponent advises that the majority of coal will be sent directly to India to the primary customer, JSPL. India is a signatory to the Paris Agreement and has committed to various measures as discussed at [42]-[46]. The proponent notes that the annual average scope 3 emissions from the combustion of product coal from the proposed action constitutes between 0.03% and 0.031% of India's NDC 2030 target.

82. JSPL have implemented the following GHG emissions reduction strategies[5]:

- implementation of ISO50001 energy management systems standardisation at 4 steel plants, and are in the process of implementing this across all remaining JSPL sites;
- alignment of JSPL operations with the Indian Government National Steel Policy 2012;
- installation of clean energy technology initiatives including solar power for several steel plants, waste heat utilisation, and efficient plants;

5 See JSPL, 'Business Sustainability Report FY 2018-19' and 'Business Sustainability Report FY 2019-2020'.

- distribution and planting of trees including:
  - development of nurseries within their plant premises, which employ professional horticulturalists, which grow locally adapted trees;
  - aiming to reafforest 33% of available space within their manufacturing areas;
  - organising mass plantation exercises in consultation with the Forestry Department;
  - distributing trees free of cost to local villagers;
  - JSPL indicate that they planted 5 million trees around the Jindal Steel and Power plants in India.

83. JSPL has also advised that they have reduced their emissions under India's industry efficiency program (the Perform Achieve and Trade (**PAT**) scheme). The PAT scheme is a measure under the energy efficiency mission under the National Action Plan on Climate Change (as discussed a [43]). Under this scheme, designated consumers must achieve an energy savings target and any savings beyond the target can be traded within the three year PAT cycle. Verification of energy savings is done by an accredited energy auditor at the end of the cycle. JSPL has advised that at its Raigarh steel plant (where coal from the proposed action is intended to be consumed) it has achieved emissions reductions of 578,857 tonnes of CO_2 under cycle I and 804,982 tonnes of CO_2 in cycle II of the PAT. At JSPL's Angul steel plant (another location where coal will be consumed) emissions reductions of 336,181 tonnes of CO_2 have been made in PAT cycle IV. The Angul plant is also subject to a state renewable energy policy requiring that 50MW of its energy consumption be met by its own cogeneration plants. The proponent advised that this has resulted in emissions reductions of 199,584 tonnes of CO_2 annually (Attachment 5).

84. The proponent has advised that the only confirmed customer of the coal is JSPL. As outlined in the Management Plan, other potential users of the product coal may include China and domestically within Australia, depending on future commercial agreements. As discussed at [22], China and India are the two largest steel producers. Both China and Australia are parties to the Paris Agreement and have communicated NDCs.

WCL commitments

85. WCL provided further information to the department about its intended GHG commitments on 13 August 2021 (See Attachment 4 – Letter from Proponent).

86. In addition to the GHG reduction measures identified specific to the GHG emissions above, WCL has committed to abating and or sequestering its scope 1 and 2 emissions by 4% per annum cumulative commencing in 2021 (a reduction of 20% over the 5 year life of the proposed action), with the intention of being carbon neutral by the year 2050 in accordance with the Paris Climate Accord (See Attachment 4 Proponent letter and RFI). The proponent explained that the commitment to net zero by 2050 involves a trajectory of abatement and sequestration of CO_2-e to 4%

cumulative per annum between 2022 and 2050. The proponent intends to hire a greenhouse and sustainability expert to develop a Sustainability and Net Zero by 2050 plan within six months of any EPBC Act approval. The proponent has stated that it will achieve these emissions reductions by purchasing and installing solar energy, improved energy efficiency of equipment and lighting needed to operate its mine, converting to electric trucks, capturing more of the methane from the underground, planting 1000 trees, purchasing Australian Carbon Credit Units and other nationally and internationally accredited carbon markets.

87. In its letter to the department dated 5 July 2021 (Attachment 7 – WCL Letter 5 July 2021), the proponent states it is evaluating a number of options for reducing emissions from the proposed action, including continuing to progress installation of solar power networks and the use of electric trucks for coal transportation. DISER advised (Attachment 8 – Supplementary Information on Russell Vale) that if implemented, these options have the potential to reduce the proposed action's scope 2 emissions, as well as minor sources of scope 1 emissions, which occur within Australia.

Department recommendation on proponent's voluntary commitments

88. The department has noted above a number of measures that the proponent has committed to undertake to achieve emissions reductions, in addition to those measures that will be required by the NSW conditions. However, the department cannot at this point in time assume, for the purposes of the recommendations in this attachment, that voluntary commitments will necessarily be undertaken. The department recommends that you note the proponent's voluntary commitments would be beneficial to reducing GHG emissions if they are carried out, but that, in deciding whether or not to approve the proposed action, you take into account that only those measures required by the NSW conditions are required by the NSW development consent.

State assessment

89. The Russell Vale Underground Expansion Project (09_0013), was assessed under Part 4 of the EP&A Act. The IPC was required to make the determination on the proposed action as more than 50 public submissions were received objecting to the proposal. The NSW Department of Planning, Industry and Environment (**DPIE**) provided an assessment report (**DPIE assessment report**) to the IPC on 5 September 2020. The IPC held a 12 week public hearing and approved the development application for the Russell Vale Underground Expansion Project on 8 December 2020 (Attachment 9). It published its reasons for the determination on 8 December 2020 (Attachment 10).

90. The DPIE assessment report (Attachment 11) considered the GHG and energy assessment (**GHGEA**) provided as part of the environmental impact assessment, noting the proposal is predicted to generate approximately 523,000t CO_2-e of scope 1 and 2 emissions primarily from the combustion of diesel, release of fugitive emissions and the use of electricity over the 5-year mine life. The proposed action is also forecast to be associated with approximately 9,624,000 t CO_2-e of scope 3

emissions, which would be generated by third parties who transport and consume the proposed action's coal products.

91. The GHGEA indicated that the forecast project-related emissions would contribute to 0.0005% of annual global GHG emission estimates. Based on this estimate, the proponent considered that the proposed action, in isolation, is unlikely to influence global emissions and climate change trajectories.

92. The GHGEA also noted that for Australia to achieve its commitment under the Paris Agreement, it would need to achieve a 28% (i.e. 762,000,000 t CO2-e) reduction in GHG emissions by 2030. The forecast project-related emissions would increase the required national mitigation effort by approximately 0.19%. The DPIE assessment report stated that the increase is unlikely to affect Australia achieving its national mitigation targets in any material way. DISER has advised in its supplementary information that the inclusion of the proposed action would increase Australia's projected emissions by less than 0.1% and would not impact on Australia to meet its 2030 Paris target of 26-28% reduction on 2005 levels.

93. The DPIE assessment report noted that coal produced from the proposal would most likely be used for steelmaking in India, which is a signatory of the Paris Agreement.

94. In accordance with the mining SEPP, DPIE considered that the coal resource associated with the proposal, is significant based on the high quality of the coal and the overall socioeconomic benefits of the proposed action. DPIE recommended that the proponent be required to prepare and implement an updated Air Quality and Greenhouse Gas Management Plan to detail measures to minimise GHG emissions during both the construction and operational phases of the proposed action.

95. The IPC (Attachment 10 – Statement of Reasons) agreed with the DPIE assessment and also noted:

- under the Paris Agreement, the Australian Government committed to a nationally determined contribution to reduce GHG emissions by 26% to 28% below 2005 levels by 2030. The IPC noted that scope 3 emissions occurring overseas become the consumer country's scope 1 and 2 emissions and would be accounted for under the Paris Agreement in their respective national inventories;
- the proposed action is not inconsistent with the CCPF, the net zero plan or Australia's obligations in respect to the nationally determined contributions;
- The proposed action includes appropriate measures for minimising and managing scope 1 and scope 2 emissions to the greatest extent practicable.

96. The IPC was of the view that, in the absence of a viable alternative to the use of metallurgical coal in steel making, on balance, the impacts associated with the emissions from the combustion of the proposed action's metallurgical coal are justified.

97. The IPC imposed conditions for air quality and GHG regulation (B8, B9, B10 and B11), including the approval holder must:

- not exceed GHG emission criteria (1,148,997 t CO2-e of scope 1 emission; 103,500 t CO2-e of scope 2 emissions);
- take all reasonable steps to improve energy efficiency and reduce scope 1 and scope 2 GHG emissions;
- ensure that major mobile diesel mining equipment used in undertaking the development includes reasonable and feasible diesel emissions reduction technology; and
- prepare and implement an Air Quality and Greenhouse Gas Management Plan (as discussed above).

Risks to human safety of a warming climate

98. The department sought internal advice from Climate Adaptation and Resilience Division regarding the current state of climate change and, in particular, the outcomes from the most recent IPCC Report 'Climate Change 2021: The Physical Science Basis' (**IPCC Report**). The Climate Adaptation and Resilience Division advised that the Government receives its primary advice on climate science from the Bureau of Meteorology (**BoM**) and the Commonwealth Scientific and Industrial Research Organisation (**CSIRO**). This advice aligns with information provided by the Intergovernmental Panel on Climate Change and other national and international organisations, such as the Australian Academy of Science, the World Meteorological Organization, the National Academy of Sciences and the National Aeronautics and Space Administration.

99. The IPCC Report provides an update on the latest climate science, including the rates, causes and likely future trajectories of global warming and other changes to the climate system.

100. The Climate Adaptation and Resilience Division advised that the key findings in IPCC Report are consistent with the findings of the *State of the Climate 2020* report, produced by BoM and the CSIRO.

101. The department accepts that increases to global GHG emissions may pose a risk to human safety by increasing total global average surface temperatures. Increases to global average surface temperatures may lead to the consequences described in the IPCC Report.

Contribution of the proposed action to climate change

102. It is acknowledged that the Court in *Sharma No 1* found that, even though the emissions of the Extension Project (100MT) were 'tiny' on a global scale, there was a real risk that even an infinitesimal increase in global average surface temperature may trigger a tipping point or a 4°C Future World: [253].

103. Thus, if, contrary to the DISER Advice, the proposed action were to cause additional coal to be consumed, the department considers that the proposed action risks a

very small increase in global GHG emissions (see below), which in turn leads to a commensurately small risk of increased global average surface temperatures.

104. This risk is particularly low given the total emissions from the proposed action are significantly less than those associated with the Extension Project. The total GHG emissions of the proposed action would be approximately 11.1MT of CO_2 equivalent (1,419,000 tonnes CO_2-e (scope 1), 104,000 tonnes CO_2-e (scope 2) and 9,600,000 tonnes CO_2-E (scope 3)). The emissions of the proposed action are discussed above at [65]-[84]. These GHG emissions are less than those associated with the Extension Project and are extremely small.

Reasonable measures to mitigate climate change

105. As outlined above at [36]-[41], climate change is a global problem that the international community has responded to through the UNFCCC and now the Paris Agreement. Parties to the Paris Agreement have committed to prepare, communicate and maintain their NDCs that they aim to achieve, with the goal of limiting the increase in global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.

106. As outlined above, the proponent has advised that the only confirmed customer of the coal is JSPL and other potential users of the product coal may include China and domestically within Australia, depending on future commercial agreements. The department accepts that these are the likely consumers of the product coal. India, China and Australia are parties to the Paris Agreement and have communicated NDCs.

107. The department has received advice from DISER titled 'Supplementary information – Russell Vale Colliery Revised Underground Expansion Project' (Attachment 8). This advice states:

> CO_2 emissions associated with the Project that occur within Australia's jurisdiction over the period 2021-30 would be covered by the Australian Government's Paris Agreement Nationally Determined Contribution (NDC) for that period (2030 Paris target)

108. DISER advised that although the emissions from the proposed action were not included in Australia's Emissions Projections 2020, the inclusion of the GHG emissions of the proposed action (assuming these emissions are 'additional') would increase Australia's projected emissions by less than 0.1 per cent and would not change the conclusion from the report that Australia is on track to meet and beat its 2030 Paris target. The department accepts DISER's conclusions, noting that DISER is responsible for reporting nationally and internationally on Australia's emissions. The department considers that the approval of the proposed action is consistent with Australia's commitments under the Paris Agreement.

109. Further, scope 3 emissions occurring overseas will become the consumer country's scope 1 and 2 emissions and be accounted for under the Paris Agreement in their respective national inventories. The Paris Agreement does not require parties to take particular measures to achieve their NDCs; rather, parties may determine

which domestic mitigation measures to pursue, with the aim of achieving the objective of their NDC. India has made a number of commitments to reduce GHG emissions, as discussed at [42]-[46]. Countries where the coal will be consumed, including India, have a discretion to determine what climate change mitigation measures they will pursue in accordance with their national policies and pursuant to their NDCs.

110. The department has taken into account the report of Professor Will Steffen submitted by the EDO and dated 6 July 2021 (**Steffen Report**) (Attachment 1 – Steffen Report) in considering the impact of the proposed action on climate change. Professor Steffen uses a carbon budget approach to determine the limited cumulative amount of additional CO_2 emissions that can be emitted consistent with limiting global temperature rise to 2°C, consistent with the Paris Agreement.

111. The department disagrees with Professor Steffen's conclusion that, because the majority of the world's existing fossil fuel reserves cannot be burned in the 'carbon budget', this means that no new coal mines can be approved consistent with limiting warming to 2°C. The department notes the following:

a. First, consistent with the Paris Agreement, national governments have a discretion to determine what measures will be employed to reduce GHG emissions. There is no government policy requiring approval of coal mines to be refused in order to meet Australia's commitments under the Paris Agreement, or to prevent coal being available to other countries to reduce other countries' emissions.

b. Second, the scope 3 emissions from the burning of the coal are taken into account in the country where they are emitted, consistent with the Paris Agreement. The majority of the proposed action's emissions are scope 3 emissions, and the proposed consumers of the coal will be parties to the Paris Agreement.

c. Third, evidence as discussed above indicates that there is an ongoing demand for metallurgical coal, particularly for use in steelmaking. A decision to refuse the proposed action is likely to have no reduction of total GHG emissions.

d. Fourth, there are myriad sources of GHG emissions including from the burning of coal, but also many other sources. The department disagrees that the use of coal in particular cannot continue as a source of such emissions. The fact that *most* fossil fuels must remain unburned accepts that some fossil fuels can be exploited (see *Gloucester Resources v Minister for Planning* [2019] NSWLEC 9 at [551]), and does not take into account other measures that may be taken to reduce or offset emissions.

112. The department acknowledges that parties' current NDCs under the Paris Agreement are insufficient to limit global average temperatures to below 2°C. However, there are mechanisms under the UNFCCC and Paris Agreement (Article 4 to increase the commitments made for future NDCs) to achieve the Paris goal of well below 2 degrees.

Reasonable measures to mitigate human safety impacts posed by climate change

113. The NSW IPC has imposed a number of conditions directed at the reduction and mitigation of GHG emissions from the proposed action. Those measures are outlined above in [89]-[97].

114. The department has considered all completed assessments and NSW development consent conditions relating to GHG emissions. The IPC concluded that the proposed action included appropriate measures for minimising and managing the scope 1 and scope 2 emissions of the proposed action 'to the greatest extent possible'.

115. The department agrees that these conditions address the proposed action's GHG emissions and mitigate the risk to human safety caused by the proposed action to the greatest extent possible. The department also recommends that you take into account the social and economic benefits of the proposed action which are discussed further below.

Social and economic considerations

116. The department has outlined the relevant economic and social matters in the Recommendation Report (Attachment A to the final decision brief) at [284]-[311]. In summary, the department considers that the proposed action is estimated to result in an economic benefit to the NSW community. The refusal of the proposed action would prevent the opportunity for positive economic and social impacts.

117. The PER notes that the proposed action is expected to deliver 205 jobs and provide an estimated total net economic benefit for the NSW community of approximately $174.3 million in net present value (NVP). This includes $116.9 million in direct benefits to NSW through company tax payments, and royalties.

118. In addition, a further $57 million is expected from indirect benefits comprising $43.6 million of worker benefits and $13.8 million of supplier benefits.

119. According to the PER, a significant portion of workers are likely to reside in the local and regional areas contributing to an overall net benefit due to the potential for salaries to be reinvested and circulated in the Wollongong region. The PER notes that the proposed action is estimated to deliver a benefit of $14.3 million (NVP) to local suppliers and employees.

120. The PER notes that the economic benefits have been calculated using the worst case scenario which takes the most pessimistic assumptions around coal prices, capital expenditure, operational expenditure as well as worker and supplier benefits. Based on the best-case scenario the estimated benefit to NSW is predicted to be $220.1 million (NPV) and $17.4 million (NPV) to the local economy.

121. The department also considers that the proposed action would generate positive social and economic benefits from the steel production generated by the proposed action. Coking coal is considered an essential input to 90% of current primary production of steel and alternatives are not currently available at the scale needed to meet global demand for steel. As discussed at [12]-[16], steel is an essential material in the construction of safe buildings, infrastructure and renewable energy

and is of particular importance to developing countries. The department considers that the impacts associated with the combustion of the proposed action's coking coal are acceptable and justified in circumstances where there are no current viable alternatives to those emissions for the production of steel.

Conclusion on human safety risks

122. Even if, contrary to the DISER advice, the coal from the proposed action would *not* be substituted by other coal if the proposed action is not approved, the department still recommends approval, taking into account and balancing the other relevant considerations as detailed in the Recommendation Report (Attachment A to the final decision brief) and the matters considered throughout this attachment.

123. For the reasons identified throughout this attachment, the department recommends that you find, after giving elevated weight to human safety, that approval of the proposed action is not likely to cause harm to human safety and should be approved.

124. The department further considers that approval is appropriate having regard to the social and economic benefits of the proposed action, the global need for steel and the absence of any currently viable alternatives at scale to the use of metallurgical coal in steelmaking. The department has formed this view after taking into account the matters referred to in this attachment and, in particular, that any contribution of the proposed action to global GHG emissions will be extremely small.

Attachments

Attachments	
1	Steffen Report (dated 6 July 2021)
2	Department of Industry Science, Energy and Resources (DISER) advice.
3	WCL draft Air Quality and Greenhouse Gas Management Plan
4	WCL Letter dated 13 August 2021 and confirmation email
5	JSPL Response to RFI
6	WCL Sustainability and Emission Reduction Strategy
7	WCL Letter dated 5 July 2021
8	DISER Supplementary information – Russell Vale Underground Expansion Project
9	NSW Independent Planning Commission (IPC) Approval dated 8 December 2021
10	IPC Statement of Reasons date 8 December 2021

11	NSW Department of Planning, Industry and Environment Assessment Report
12	WCL advice on sealing the pillars of coal Dated 20 August 2021

s. 22(1)(a)(ii)

From: s. 11C(1)(a) @edo.org.au>
Sent: Tuesday, 6 July 2021 3:59 PM
To: Sussan.Ley.MP@aph.gov.au; Simon Fontana <Simon.Fontana@environment.gov.au>
Cc: s. 11C(1)(a) @edo.org.au>; s. 11C(1)(a) @edo.org.au>
Subject: RE: URGENT: Russell Vale Expansion (EPBC 2020/8702) - Implications of Sharma v Minister for the Environment [2021] FCA 650

Dear Minister

We confirm we act for Illawarra Residents for Responsible Mining Inc (**IRRM**) in respect of the proposed Russell Vale Expansion (EPBC 2020/8702) and we refer to our correspondence below.

We note that you are to make a decision whether or not to approve the controlled action the subject of EPBC 2020/8702 by 8 July 2021: http://epbcnotices.environment.gov.au/_entity/annotation/110b98bd-9cc9-eb11-80c8-00505684c563/a71d58ad-4cba-48b6-8dab-f3091fc31cd5?t=1625550604747.

We are instructed by IRRM to submit to you the **attached** independent expert report from Emeritus Professor Will Steffen (**Steffen Report**), who has been engaged by EDO on behalf of IRRM.

IRRM submits that the Steffen Report is relevant to your decision whether or not to approve the controlled action the subject of EPBC 2020/8702.

Please let us know whether you require any further information.

Kind regards

EDO_Full-Logo-Horizontal_Charcoal

s. 11C(1)(a)
@edo.org.au W: edo.org.au

I use he/him pronouns.

From: s. 11C(1)(a)
Sent: Tuesday, 8 June 2021 5:33 PM
To: Sussan.Ley.MP@aph.gov.au; Simon.Fontana@environment.gov.au
Cc: s. 11C(1)(a) @edo.org.au>; s. 11C(1)(a) @edo.org.au>
Subject: RE: URGENT: Russell Vale Expansion (EPBC 2020/8702) - Implications of Sharma v Minister for the Environment [2021] FCA 650

Dear Minister

Further to our correspondence below, we **attach** the International Energy Agency's Net Zero by 2050 Report, which provides *inter alia* on page 21:

> "Beyond projects already committed as of 2021, there are no new oil and gas fields approved for development in our pathway, and no new coal mines or mine extensions are required."

Kind regards

EDO_Full-Logo-Horizontal_Charcoal

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I use he/him pronouns.

DONATE – you can support EDO by making a tax-deductible donation today.

From: s. 11C(1)(a)
Sent: Tuesday, 8 June 2021 10:29 AM
To: Sussan.Ley.MP@aph.gov.au; Simon.Fontana@environment.gov.au
Cc: s. 11C(1)(a) @edo.org.au>; s. 11C(1)(a) @edo.org.au>
Subject: RE: URGENT: Russell Vale Expansion (EPBC 2020/8702) - Implications of Sharma v Minister for the Environment [2021] FCA 650

Dear Minister

We refer to the below and **attached** correspondence.

We respectfully request your response as soon as possible today.

Kind regards

EDO_Full-Logo-Horizontal_Charcoal

s. 11C(1)(a)
@edo.org.au W: edo.org.au

I use he/him pronouns.

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From: s. 11C(1)(a)
Sent: Friday, 4 June 2021 6:36 PM
To: Sussan.Ley.MP@aph.gov.au; s. 22(1)(a)(ii) @environment.gov.au
Cc: s. 11C(1)(a) @edo.org.au>; s. 11C(1)(a) @edo.org.au>
Subject: URGENT: Russell Vale Expansion (EPBC 2020/8702) - Implications of Sharma v Minister for the Environment [2021] FCA 650

Dear Minister

Please find **attached** correspondence of today's date.

Kind regards

s. 11C(1)(a)
@edo.org.au W: edo.org.au

EDO_Full-Logo-Horizontal_Charcoal

I use he/him pronouns.

DONATE – you can support EDO by making a tax-deductible donation today.

EDO recognises the traditional owners and custodians of the land, seas and rivers of Australia. We pay our respects to Aboriginal and Torres Strait Islander elders past and present, and aspire to learn from traditional knowledge and customs so that, together, we can protect our environment and cultural heritage through law.

Expert Report: Russell Vale Colliery Revised Underground Expansion
6 July 2021

Professor Will Steffen
Emeritus Professor, The Australian National University
Senior Fellow, Stockholm Resilience Centre

Executive Summary

1. Anthropogenic climate change is real and poses serious risks for the wellbeing of humans and our societies. These risks rise rapidly and nonlinearly with the rise in global average surface temperature.

2. Recognising that the risks to human wellbeing of unchecked climate change are too high to accept, governments around the world have agreed to limit warming to 1.5-2.0°C (the 2015 Paris accord).

3. The carbon budget approach is the most robust way to determine the rate of emissions reductions required to meet the goals of the Paris accord. This approach limits the cumulative amount of additional CO_2 emissions that can be allowed consistent with the Paris accord.

4. To meet a 2°C carbon budget, a very rapid phase-out of all fossil fuel usage by 2050 at the latest, or preferably earlier, is required. The 1.5°C carbon budget is smaller, requiring an even more rapid phase-out of fossil fuel usage.

5. This means that the majority of the world's existing fossil fuel reserves must be left in the ground, unburned. Furthermore, no new fossil fuel developments, or extensions to existing fossil fuel mines or wells, can be allowed. This analysis means the proposed Russell Vale Colliery Revised Underground Expansion cannot be allowed.

Introduction

6. I have prepared this report in response to an expert brief provided to me by the Environmental Defenders Office (**EDO**) acting on behalf of Illawara Residents for Responsible Mining Inc, dated 30 June 2021. I have reviewed Part 23 of the *Federal Court Rules 2011* and the Expert Evidence Practice Note and I have provided my advice in line with these requirements.

7. A copy of my curriculum vitae, including my relevant qualifications, is attached (**Appendix A**).

Anthropogenic climate change and its impacts

8. Anthropogenic (human-driven) climate change refers to the changes in the climate system caused by human activities, primarily the emission of greenhouse gases into the atmosphere. The most important of these gases is carbon dioxide (CO_2), with about 90% of CO_2 emissions arising from fossil fuel (coal, oil, gas) combustion and the remainder from land-use change (Le Quéré et al. 2017).

9. Greenhouse gases change the climate by trapping outgoing heat (long-wave radiation) from the Earth's surface and retaining it in the lower atmosphere and at the surface, thus increasing the energy of the climate system and raising its average temperature (Intergovernmental Panel on Climate Change (IPCC) 2013).

10. Currently global average surface temperature is about 1.2°C higher than pre-industrial levels (WMO 2021). Australia's climate has warmed by over 1°C since 1960, and by 1.44°C since records began in 1910. Australia's hottest year on record was 2019, and the seven years from 2013 to 2019 all rank in the nine warmest years. (Bureau of Meteorology (BoM) 2021).

11. The rate of climate change is alarming. The rise in atmospheric CO_2 concentration is up to 10 times faster than the most rapid changes in the geological record (Lüthi et al.

2008). Since 1970 global average surface temperature has been rising at a rate of 1.7°C per century, compared to a 7,000-year background rate of change of about 0.01°C per century (NOAA 2016; Marcott et al. 2013).

12. Many other features of the climate system, in addition to global average surface temperature, are changing as a result of anthropogenic greenhouse gas emissions (IPCC 2013). These include changes in the basic circulation patterns of the atmosphere and the ocean, increasing intensity and frequency of many extreme weather events, increasing acidity of the oceans, rising sea levels and consequent increases in coastal flooding, and intensification of the hydrological cycle.

13. The impacts of climate change are already being felt around the world. As reported by the IPCC (2013), the most authoritative assessment body on the science of climate change, some of the most important impacts are:
    a) Warmer and/or fewer cold days and nights over most land areas.
    b) Warmer and/or more frequent hot days and nights over most land areas.
    c) Increases in the frequency and/or duration of heat waves in many regions.
    d) Increase in the frequency, intensity and/or amount of heavy precipitation (more land areas with increases than with decreases).
    e) Increases in intensity and/or duration of drought in many regions since 1970.
    f) Increases in intense tropical cyclone activity in the North Atlantic since 1970.
    g) Increased incidence and/or magnitude of extreme high sea levels.

14. The impacts of climate change are also being felt in many ways across Australia, especially in the form of changes in extreme weather events (CSIRO and BoM 2015).

15. The evidence for the influence of climate change on worsening extreme weather include:
    a) The fact that all extreme weather events are now occurring in an atmosphere that is warmer and wetter than it was 70 years ago (Trenberth 2012);
    b) Long-term data records show observed changes in the nature of extreme weather; and
    c) Climate models run with and without the additional greenhouse gases in the atmosphere from human emissions show the increase in likelihood that a specific extreme weather event would have occurred because of climate change.

16. The most important of these climate-related impacts are (CSIRO and BoM 2015):
    a) Australia's average surface temperature has increased by 1.44°C from 1910 to 2020 (BoM 2021).
    b) Many heat-related records were broken in the summer of 2012-2013, and again in the two most recent summers. 2013 was Australia's hottest year on record up until then. Record-breaking heat continues. January 2019 was Australia's hottest January on record, with heatwaves unprecedented in their scale and duration (World Meteorological Organization (WMO) 2019). 2019 surpassed 2013 as Australia's hottest year on record (BoM 2021).
    c) Heat waves have increased in duration, frequency and intensity in many parts of the country.
    d) Cool-season rainfall has declined in southeast and southwest Australia and wet-season rainfall has increased in northern Australia.
    e) Heavy daily rainfall has accounted for an increased proportion of total annual rainfall over an increasing fraction of the Australian continent since the 1970s.
    f) Extreme fire weather days have increased at 24 out of 38 monitoring sites from 1973-2010 due to warmer and drier conditions.
    g) For 1966-2009 the average rate of relative sea-level rise along the Australian coast was approximately 1.4 millimetres per year.

17. The worsening risks and impacts of climate change have become even more evident over the past two years with the 2019-2020 bushfires in eastern Australia and the mass bleaching of the Great Barrier Reef.

18. The 2019-2020 bushfires were unprecedented in terms of the area burnt, the destruction of human infrastructure, the damage to wildlife, and the loss of human lives. About 21% of Australia's temperate broadleaf and eastern mixed forest were burnt, compared to a long-term average of 2-3% per season (Boer et al. 2020). About one billion animals were killed by the fires (University of Sydney 2020). Over 450 people were killed either directly by the fires or indirectly by the smoke from the fires (Arriagada et al. 2020).

19. There is strong evidence that climate change was the major driver of the massive bushfires. Extreme high temperatures reached a new record in 2019, eclipsing the previous record by more than 0.5°C (BoM 2020a). 2018-2019 was the driest two-year period in southeastern Australia on record (BoM 2020b), driven both by a long-term reduction in cool-season rainfall in southeastern Australian (BoM and CSIRO 2021) and a very strong positive Indian Ocean Dipole (IOD). The latter is a mode of natural variability that brings dry conditions to Australia, but recent evidence shows that an increase in frequency of strong IOD events coincides with the climate change-trend of increasing global temperature (Abram et al. 2020).

20. In early 2020 the Great Barrier Reef suffered its third mass bleaching event in the last five years. For the first time, the entire 2,300 km length of the reef suffered significant bleaching (ARC COE Coral Reef Studies 2020). Sea surface temperatures in the waters along the reef were the highest on record, a trend that is clearly driven by climate change (BoM 2020c).

21. There is increasingly strong evidence that climate change is driving changes in extreme weather events such as bushfires and coral bleaching (BoM and CSIRO 2021). Furthermore, there is a very large amount of evidence that the combustion of fossil fuels - coal, oil and gas - is the dominant driver of climate change (IPCC 2013; 2018).

22. Southeast Australia has experienced many of the impacts that have been observed around Australia as a whole (CSIRO and BoM 2015). In particular, these include:
    a) Changes in heatwaves, such as more frequent occurrence, increasing number of heatwave days and the hottest day of a heatwave becoming even hotter.
    b) Increases in the Forest Fire Danger Index have occurred mostly in the southeast region of the continent.
    c) Strong drying trends in cool-season rainfall since 1990.
    d) Three-fold increase in coastal flooding in the Sydney region through the 20th century.

Projections of future climate change

23. Future climate change will be driven in the near-term (several decades into the future) by the further amount of greenhouse gas emissions emitted by human activities, and in the longer term by both human emissions and feedbacks in the climate system (e.g., melting of permafrost, collapse of the Amazon rainforest) that could emit significant additional amounts of greenhouse gases to the atmosphere.

24. The projections for future changes in Australia's climate include (CSIRO and BoM 2016):
    a) Temperatures will continue to increase, with more hot days and fewer cool days.
    b) Oceans around Australia will warm further and acidification will continue.
    c) Tropical cyclones are projected to decrease in number but increase in intensity.
    d) Extreme rainfall events are likely to be more intense.
    e) Harsher fire weather is projected for southern and eastern Australia.
    f) Further decreases in winter rainfall for southern continental Australia, with an increase in droughts.

25. Projected changes in the climate of East Coast South region (sub-cluster) include (https://www.climatechangeinaustralia.gov.au/en/):
    a) Average temperatures will continue to increase in all seasons (*very high confidence*).
    b) More hot days and warm spells are projected with *very high confidence*. Fewer frosts are projected with *high confidence*.
    c) Decreases in winter rainfall are projected with *medium confidence*. Other changes are possible but unclear.
    d) Increased intensity of extreme rainfall events is projected, with *high confidence*.
    e) A harsher fire-weather climate in the future (*high confidence*).

26. Globally, climate change projections for the rest of the 21st century range from:
    a) A low emissions scenario (phasing out fossil fuels by the 2040-2050 period), which leads to a rise in global average surface temperature of 1.5-2.0°C above pre-industrial levels; to
    b) A high emissions scenario, which leads to a temperature rise of 4°C or greater by 2100 (Collins et al. 2013).

27. Current global emissions are now about 10.6 to 11.7 billion tonnes of carbon (emitted as CO_2) per annum, and have risen steadily since the mid-20th century, when emissions were about 3 Gt C (billion tonnes of carbon, emitted as CO_2) per year (Friedlingstein et al. 2019). If the trend of rising emissions is continued, it would put the world on an emissions pathway between the IPCC RCP6.0 and RCP8.5 scenarios[1] (Collins et al. 2013, based on extrapolation of observed emissions trend in Le Quéré C et al. (2017); consistent with analysis in Climate Action Tracker (2018)). Based on scenarios of changes in radiative forcing (i.e., the effect of (i) the atmospheric concentration of greenhouse gases and aerosols and (ii) the reflectivity of the Earth's surface on the Earth's surface energy balance – the difference between incoming solar energy and outgoing heat energy), climate models can simulate the resulting changes to the climate system.

28. Model-based projections of the level of climate change consistent with this emissions trajectory would lead to a global average surface temperature rise of 3-4°C by 2100. Thus, the world is currently on a pathway much closer to 26b) than to 26a) above. (Note that recent national pledges in 2021 of increased emission reduction rates have yet to be implemented.)

29. The IPCC has summarised the risks to humanity of various levels of climate change through the so-called 'burning embers' diagram (IPCC 2014), Figure 1 below:

[1] "RCP" is Representative Concentration Pathway, which is a scenario for the concentration of greenhouses in the atmosphere. The numbers refer to the 'radiative forcing' for each scenario, in watts per square metre.

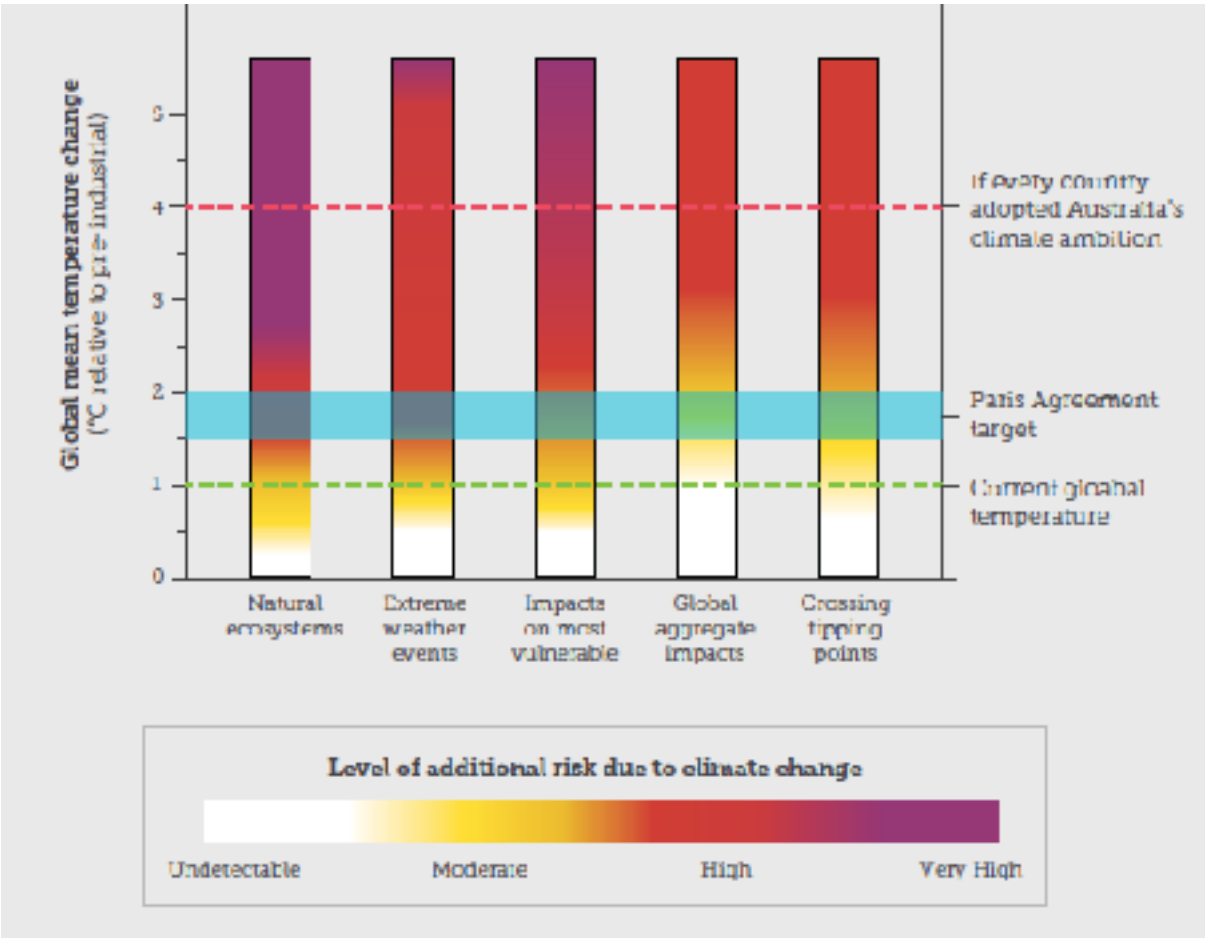

Figure 1: The IPCC 'burning embers' diagram – the reasons for concern about the impacts of climate change with increasing temperature. Adapted from IPCC (2014).

30. Figure 1 shows clearly that the impacts and risks of climate change increase nonlinearly with the increase in global average surface temperature, and connects these risks to levels of climate change using global average temperature as the indicator.

31. Figure 1 shows several levels of temperature (in 2014):
    a) The observed level, ca. 1°C above pre-industrial levels;
    b) The 1.5-2°C target range for the Paris accord; and
    c) The level of temperature increase by 2100 (ca. 3-4°C above pre-industrial) that would be reached if every country adopted Australia's level of ambition in terms of targets and policies (Climate Action Tracker (**CAT**) 2018[2]). In its country analysis dated 30 April 2018, CAT identifies that Australia's emissions are set to far exceed its Paris

[2] The Climate Action Tracker is an independent scientific analysis produced by three research organisations tracking climate action since 2009: www.climateactiontracker.org

accord Nationally Determined Contributions (**NDC**) target for 2030 (itself a target which, if followed by all other countries would lead to global warming of over 2°C and up to 3°C). Further, CAT assesses that, if all other countries were to follow Australia's current policy settings, warming could reach over 3°C and up to 4°C by 2100.

32. The synthesis of information represented by Figure 1 shows that:
    a) Australia is not doing nearly enough to meet its obligations under the Paris accord, which it signed; and
    b) That if every country followed Australia's level of action, the world would be on a trajectory to reach a 3-4°C temperature rise by 2100 and would thus face extremely damaging levels of climate change impacts (Figure 1).

33. At today's level of climate change – about 1.2°C above pre-industrial – many impacts are already occurring. For example, many natural ecosystems are already being severely damaged.

34. In Australia alone, the Great Barrier Reef suffered consecutive mass bleaching events in 2016, 2017 and 2020 driven by unusually high surface water temperatures as a result of climate change (Hughes et al. 2017; ARC COE Coral Reef Studies 2020).

35. The 2019-2020 eastern Australian bushfires were unprecedented in terms of the area burnt, the destruction of human infrastructure and wildlife, and the loss of human lives (Boer et al. 2020; University of Sydney 2020; Arriagada et al. 2020) – see points 18-19 above).

36. In 2016 a mass die-off of mangroves in the Gulf of Carpentaria was driven by exceptionally high sea temperatures (Duke et al. 2016).

37. Also at a 1.2°C temperature rise, extreme weather events are worsening in most parts of the world and severe impacts are already hitting the most vulnerable groups of people and countries (IPCC 2013; IPCC 2014).

38. The Paris accord range of 1.5-2.0°C is by no means 'safe'. As shown in Figure 1, at this level of climate change, the following risks/impacts would be expected:
    a) Risks to natural ecosystems would be high; this refers to a rapidly rising risk of extinction for vulnerable species as well as increasing damage to ecosystems, such as bleaching of coral reefs and damage to forests by fires and insect attacks.
    b) Extreme weather events would be far worse than today; for Australia this means far more severe heatwaves, more frequent and intense bushfires, an increase in extreme rainfall, and more frequent and damaging coastal flooding.
    c) The risk of widespread impacts on the most vulnerable would rise from moderate towards high; this includes the population of less developed countries who have low resilience and adaptive capacity as well as the most vulnerable people in wealthy countries – children, older people and disadvantaged people.
    d) The aggregated impacts of climate change around the world would increase political tensions and instabilities and take its toll on the global economy; as the most vulnerable countries and groups of people suffer increasing impacts, the risk of conflict and migration increases significantly, creating security threats in other parts of the world (UK MoD (Ministry of Defence) 2010; The White House 2015).
    e) Some important tipping points, such as the Greenland ice sheet, would be at risk of being crossed, driving an unstoppable rise in sea level of up to 7 metres (Kintisch 2017). The summertime Arctic sea ice would almost surely disappear, accelerating warming in the northern high latitudes and disrupting atmospheric circulation patterns (e.g., the jet stream) (Figure 1; Schellnhuber et al. 2016).

39. A 4°C temperature rise would likely lead to a world that would hardly be recognisable today (IPCC 2014; Figure 1). There is a high to very high risk that:
    a) Most of the world's ecosystems would be heavily damaged or destroyed;
    b) Extreme weather events would be far more severe and frequent than today;
    c) The most vulnerable people would increase greatly in number and, as large areas of the world become uninhabitable, migration and conflict would escalate;
    d) The aggregated impacts around the world would significantly damage the entire global economy; and

e) A cascade of intrinsic tipping points in the climate system could drive ongoing strong warming even as humanity finally took action to reduce its emissions (Figure 1; Steffen et al. 2018).

40. A ca. 3-4°C temperature rise would result by 2100 if all countries adopted Australia's current climate ambition and policy settings (CAT 2018).

Global and Australian targets for stabilising the climate system

41. In 2015, countries around the world carefully assessed the risks of allowing climate change to continue on a high emissions scenario (cf. Figure 1 and "Projections of future climate change" above) and agreed in the Paris accord on a new international framework for tackling climate change. The accord aims to "*...limit global average temperature rise to well below 2℃ and to pursue efforts to limit warming to 1.5℃*". The Paris accord is near-universal, with 197 countries signing the agreement.

42. Australia is a signatory to the Paris accord and so has committed to do its part in keeping the global average temperature rise to the 1.5-2.0°C range. Yet Australia's national greenhouse gas emission reduction target of a 26-28% reduction by 2030 compared to a 2005 baseline (United Nations Framework Convention on Climate Change (UNFCCC) 2015) is, based on an expert analysis by Australia's Climate Change Authority (CCA 2015), inadequate to meet Australia's Paris accord obligations.

43. The Climate Change Authority calculated that the appropriate target for Australia, consistent with its Paris accord obligations, would be a 45-65% reduction in emissions by 2030 from 2005 levels (CCA 2015).

44. Australia is not on track to meet its 2030 target, based on a linear emission reduction pathway between 2018 and 2030. Australia's emissions have actually risen over the 2016-2018 period so Australia is trending in the wrong direction (Australian Government 2018), much less reducing emissions in order to meet the rate required. In fact, if the rest of the world adopted Australia's targets and policy settings, global average temperature

would be headed for up to 4°C by the end of the century (CAT 2018), with all of the high-risk consequences outlined above.[3]

45. This leads to the question of how does one scientifically determine what is an adequate rate of emission reductions to meet the Paris accord targets. A commonly used approach based on the well-proven relationship between the cumulative anthropogenic emissions of greenhouse gases and the increase in global average surface temperature (Collins et al. 2013) – the one adopted by the Climate Change Authority in 2015 (CCA 2015) – is the carbon budget approach.

The global carbon budget approach to climate stabilisation

46. The 'carbon budget' approach is a conceptually simple, yet scientifically robust, approach to estimating the level of greenhouse gas emission reductions required to meet a desired temperature target, for example, the Paris accord 1.5°C or 2°C targets (Collins et al. 2013).

47. The approach is based on the approximately linear relationship between:
    a) The cumulative amount of carbon dioxide (CO_2) emitted from all human sources since the beginning of industrialisation (often taken as 1870); and
    b) The increase in global average surface temperature (Figure 2; IPCC 2013).

48. Once the carbon budget has been 'spent' (emitted), then emissions need to be net zero[4] to avoid exceeding the temperature target.

[3] Note that Australia's emissions dropped in 2020 due to the COVID-19 pandemic but are projected to return in 2021 to its long-term trajectory (data from DISER, Australia's Emission Projections 2020).
[4] "Net zero emissions" means the magnitude of carbon dioxide emissions to the atmosphere is matched by the magnitude of carbon dioxide removal from the atmosphere by, for example, "carbon capture and storage – CCS" technologies, sometimes called "Negative Emission Technologies". At present these technologies are in the early development stage, and none are technologically or commercially viable yet.

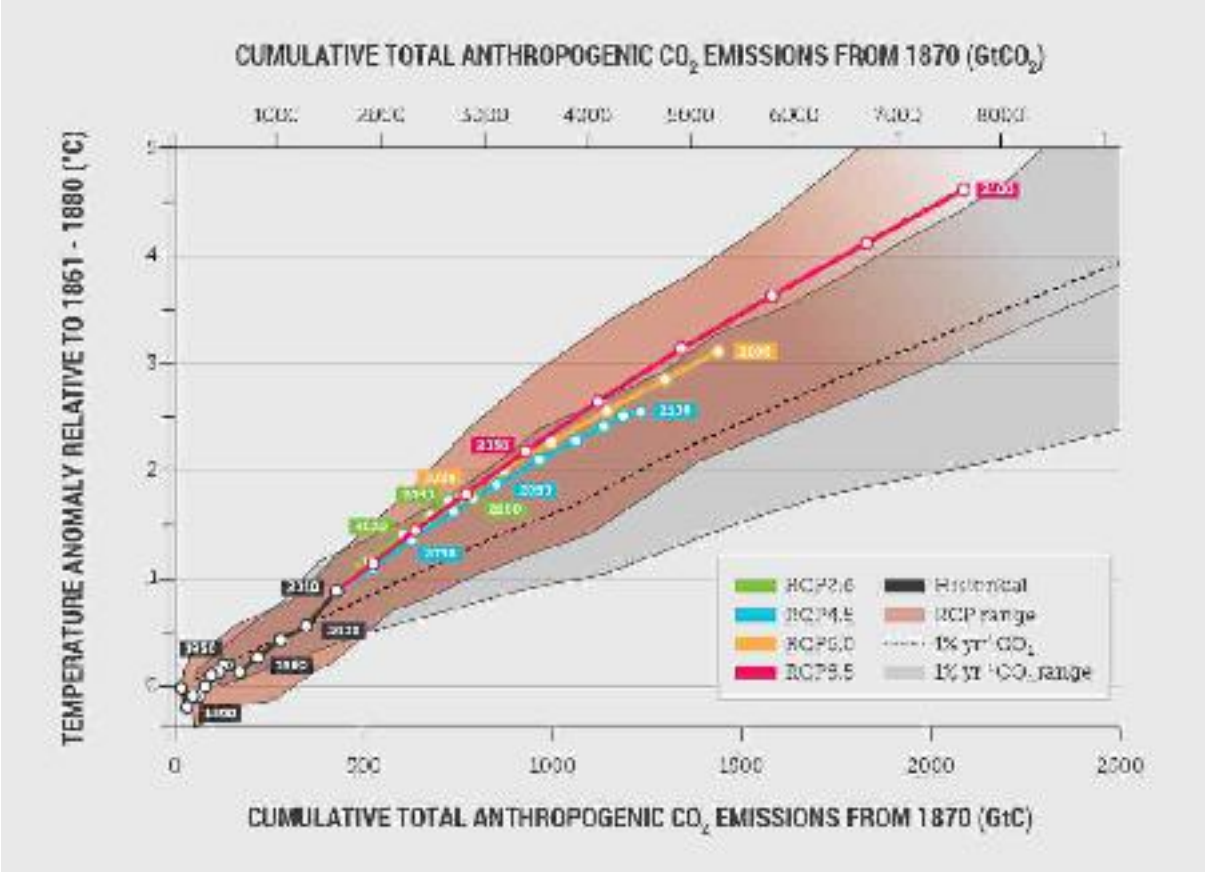

Figure 2: Global mean surface temperature increase as a function of cumulative global CO_2 emissions. The black line is global historical emissions and the coloured lines are climate model projections for various levels of human emissions. The coloured plume represents the spread of results across the models. From IPCC (2013).

49. There are several key areas of uncertainty that influence the carbon budget required to meet a temperature target:

    a) **<u>Probability of meeting the target</u>**. Higher probabilities of meeting a given temperature target (e.g., 2°C) require a more stringent carbon budget. Thus, there is a critical trade-off: relaxing the carbon budget to make it more feasible to meet means that there is a lower probability of achieving the desired temperature target.

    b) **<u>Accounting for other greenhouse gases</u>**. Non-CO_2 gases (e.g., methane (CH_4) and nitrous oxide (N_2O)), which are important contributors to warming, are assumed to be reduced to zero at the same rate as CO_2 is reduced to zero. If non-CO_2 gases are not reduced, or reduced more slowly than CO_2, then the CO_2 budget is reduced accordingly. Most of the CH_4 and N_2O emissions arise from the agricultural sector, where emission reductions are generally considered to be more difficult and expensive to achieve than for the electricity generation sector. Thus, carbon budgets

are often configured on the basis that reduction of CO_2 emissions from the electricity and transport sectors is more technologically feasible and less expensive than for the non-CO_2 gases, and therefore CO_2 emissions should be reduced even further to compensate for the continued emission of non-CO_2 gases.

c) **Accounting for feedbacks in the climate system**. Some carbon cycle feedbacks, such as permafrost melting or abrupt shift of the Amazon rainforest to a savanna, are not accounted for in the carbon budget approach. Including estimates for these would reduce the budget further (Ciais et al. 2013; Steffen et al. 2018). These are likely to be very significant. Quantitative estimates suggest that at a 2°C temperature rise (the upper Paris accord target), about 110 Gt C (billion tonnes of carbon, emitted as CO_2) of additional emissions to the atmosphere (about 11 years worth of human emissions at current rates) would be emitted (Steffen et al. 2018). These estimated feedbacks would significantly reduce the remaining carbon budget.

50. Applying the carbon budget for a 2°C target demonstrates how it can be used. The IPCC estimates that for a greater than 66% probability of limiting global average temperature rise to no more than 2°C, cumulative human emissions since 1870 must be less than 1,000 Gt C (emitted as CO_2) (IPCC 2013). If non-CO_2 greenhouse gases are not reduced at the same rate, the carbon budget must be reduced by up to a further 210 Gt C to 790 Gt C (see 49b) above). From 1870 through 2020 cumulative human emissions have been about 607 Gt C (Collins et al. 2013; Le Quéré C et al.2018; Friedlingstein et al. 2020). The remaining budget then becomes 183 Gt C.

51. The current rate of human emissions of CO_2 is about 10 Gt C per year (Le Quéré et al. 2018; Friedlingstein et al. 2020), so at these present rates of emissions, the carbon budget would be consumed in less than two decades (at about 2038).

52. I summarise this analysis in tabular form below:

Table 1: Carbon budget for a 66% probability of restricting temperature rise to no more than 2℃

Budget Item/Process	**Gt C**
Base budget based on IPCC (2013)	1,000
Accounting for non-CO_2 greenhouse gases	-210
Historical emissions through 2020	-607
Remaining budget to net zero emissions	**183**

53. The conclusion is that the world has about 18 years of emissions (at current rates) remaining before the world's economy must reach net zero emissions (183 Gt C divided by 10 Gt C per year = 18.3 years).

54. Applying this budget to emission reduction trajectories emphasises the need to peak emissions by 2020 at the latest, followed by a steep reduction curve thereafter (the area under the curves created by emission reduction trajectories is equal to the cumulative emissions of CO_2, which can then be directly compared to a remaining carbon budget – see Figure 3 below).

55. The recent IPCC Special Report on the 1.5°C Paris target (IPCC 2018) has estimated carbon budgets required to meet that more stringent target. The remaining budget from 2018 for a 66% probability of meeting the 1.5°C target is 155 Gt C, or about 15 years of emissions at current rates. Reducing the budget to allow for carbon feedbacks reduces the budget to about 8-9 years at present emission rates (Steffen et al. 2018).

Implication of carbon budget approach for the rate of emission reductions

56. The carbon budget approach has strong implications for the trajectory of emission reductions towards their eventual phasing out. Figure 3 shows the importance for the rate of emissions reductions of the peaking year (the year in which global emissions peak before starting their downward trajectory). The area under all of the curves on the graph are the same; they are equivalent to the cumulative carbon budget estimated by Figueres

et al. 2017 (cf. Figure 3), either 600 Gt CO_2 or 800 Gt CO_2.[5] To allow comparison to the carbon budget above, expressed as Gt C, these CO_2 budgets become 144 and 198 Gt C (or, 101 and 155 Gt C, taking 2018-2020 emissions into account), the more generous budget being somewhat lower than the budget estimated above (183 Gt C, Table 1), and the smaller budget generally comparable to the remaining 1.5°C carbon budget.

57. Figure 3 demonstrates the absolute importance of peaking global emissions as soon as possible, and then reducing emissions strongly thereafter. Although global CO_2 emissions flat-lined for the 2014-2016 period, they rose again in 2017 and rose even more strongly in 2018 and 2019 (Le Quéré et al. 2018; Friedlingstein et al. 2019). Due to the COVID-19 pandemic, global emissions dropped in 2020 (Le Quéré et al. 2020). However, if emissions return to their pre-COVID trajectory, as they appear to be already with the economic recovery now underway, just five further years of emissions at their pre-COVID rate would create a subsequent emission reduction trajectory that would be impossible to follow economically or technologically (Figueres et al. 2017).

58. The clear message from any carbon budget analysis, under any reasonable set of assumptions regarding probabilities of actually meeting the budget and the sensitivity of the climate system to the level of greenhouse gases in the atmosphere, is that fossil fuel combustion must be phased out quickly, at the rate of the curves shown in Figure 3.

59. Most of the world's existing fossil fuel reserves[6] – coal, oil and gas – must be left in the ground, unburned, if the Paris accord climate targets are to be met. I say that because the exploitation, and burning, of fossil fuel reserves leads to an increase in CO_2 emissions when meeting the Paris accord climate targets requires a rapid and deep decrease in CO_2 emissions.

[5] The 600 Gt CO_2 budget is the midpoint of a wider range of budgets that represents different ways of calculating the budget for the Paris target range (1.5-2.0°C). The 800 Gt CO_2 budget reduces the probability of meeting the 600 Gt CO_2 budget (Figueres et al. 2017).

[6] "Reserves" are defined by McGlade & Ekins (see below) as a subset of "resources" that are recoverable under current economic conditions and have specific probability of being produced. "Resources" are the remaining ultimately recoverable deposits of fossil fuels that are recoverable over all time with both current and future technologies, irrespective of economic conditions. Thus, "resources are all of the fossil fuels that are known to exist, and "reserves" are the subset of resources that are economically and technologically viable to exploit now.

60. An obvious conclusion that follows from this fact is that: No **new** fossil fuel development is consistent with meeting the Paris accord climate targets. That is, paragraphs 56-59 above demonstrate clearly that to meet the Paris accord, emissions must be reduced rapidly and deeply (cf Figure 3 below), and to do this requires the rapid phase-out of existing fossil fuel mines/wells. It is an obvious conclusion that no new fossil fuel developments, including extensions to existing mines or wells, can therefore be allowed.

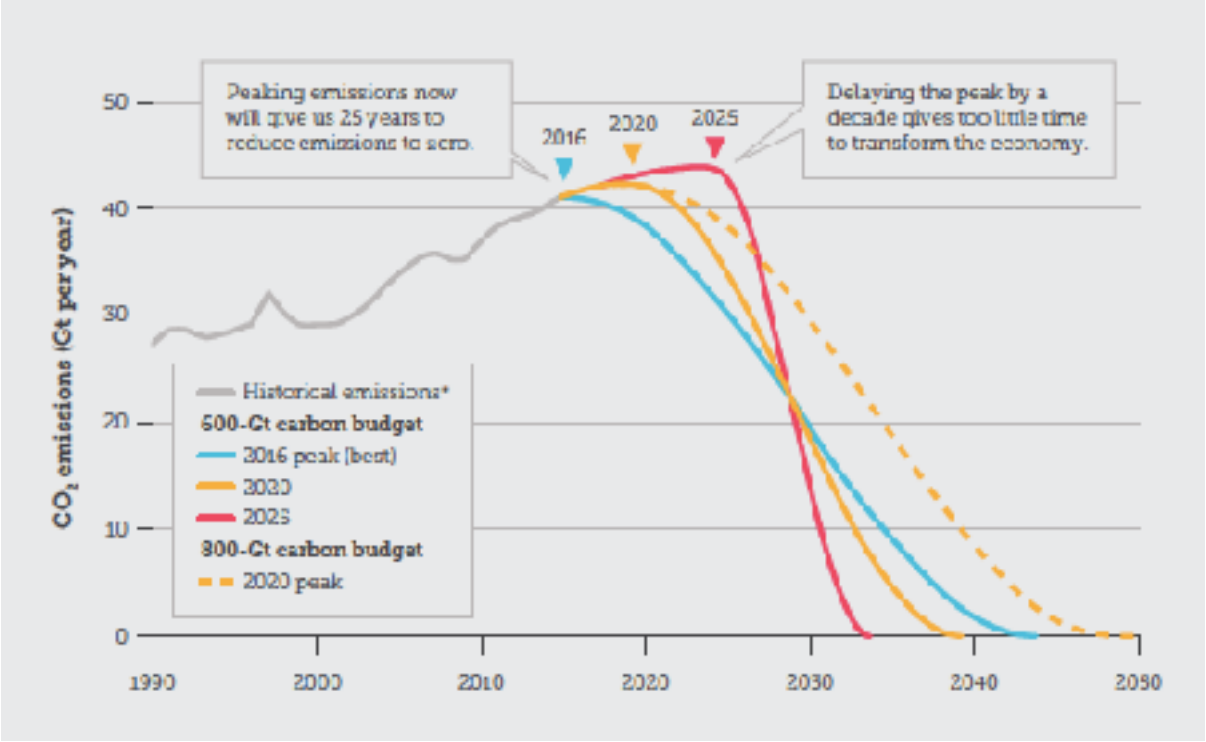

Figure 3. Emission reduction trajectories for meeting the Paris accord target(s). Delaying peak emissions to 2025 is too late for any achievable emission reduction trajectory. Note that the budgets in Gt CO_2; converting them to Gt C would give budgets of 164 Gt C and 218 Gt C, respectively. Budgets are from 2016; converting them to budgets from the end of 2020 would yield 109 Gt C and 163 Gt C, respectively. Source: Figueres et al. 2017

Applying the carbon budget approach to Australia and the Russell Vale Colliery Revised Underground Expansion

61. An economic analysis of a generous global carbon budget highlights the implications of meeting the Paris accord climate targets for the Australian fossil fuel sector (McGlade and Ekins 2015). Based on a 50% probability of meeting the 2°C temperature target, the

global budget for the 2011-2050 period was estimated by the authors at 300 Gt C, considerably higher than the budget in Table 1. The study showed that if all of the world's existing fossil fuel reserves were burned, about 780 Gt C would be emitted as CO_2, about 2.5 times greater than the allowable budget. Globally, 62% of the world's existing fossil fuel reserves need to be left in the ground, unburned, to remain within the carbon budget.

62. Meeting the carbon budget consistent with the Paris accord climate targets therefore means that not only must currently operating mines and gas wells be closed before their economic lifetime is completed (obvious from point 61 above – 780 is much larger than the assumed budget of 300), but also that (i) no existing fossil fuel extraction facilities can be expanded, (ii) no approved (but not yet operating) fossil fuel projects can proceed, and (iii) no proposed fossil fuel projects, based on existing reserves, can be implemented. This analysis applies to the Russell Vale Colliery Revised Underground Expansion.

63. McGlade and Ekins (2015) then applied an economic analysis to the three types of fossil fuels – coal, oil and gas – and to the various regions of the world that are major producers of fossil fuels. Based on their analysis, 88% of global coal reserves are unburnable for any purpose (it is the CO_2 emissions that matter for the carbon budget approach, not the purpose for which the fossil fuel is burnt). The regional analysis yielded even more stringent conditions for Australia's fossil fuel industry (Australia is the only major fossil fuel producer in the OECD Pacific region; other countries in the region are only minor producers of fossil fuels). Over 90% of Australia's existing coal reserves cannot be burned to be consistent with the Paris accord 2°C target, and none can be burned to be consistent with the more stringent Paris accord 1.5°C target.

64. The conclusions from this – or any other analysis based on a carbon budget – are:

- **Australia's existing fossil fuel industries must be phased out as quickly as possible, with most of the Australian fossil fuel reserves (and nearly all of Australia's coal reserves) left in the ground.**

- **Development of new fossil fuel reserves, or extensions of existing fossil fuel facilities, no matter how small, are incompatible with any carbon budget assuming a 50% or better chance of the budget meeting the temperature target and with Australia's commitments to the Paris accord.**

- **Based on this analysis, approval of the Russell Vale Colliery Revised Underground Expansion is inconsistent with the carbon budget approach to climate stabilisation.**

The fallacy of the "my emissions are too small to matter" or "some other coal resource will be developed if this one isn't" arguments

65. A common argument made for proceeding with new fossil fuel developments is that the resulting emissions are so small compared to the total global emissions (currently about 10 billion tonnes of carbon per annum) that they do not matter. The argument is made at the national level in terms of Australia's national emissions being such a small fraction (ca. 1.2%) of the global total that they don't matter (i.e., "even if we reduce our emissions, it won't have a major effect on the climate").

66. A second common argument is that if a proposed new coal development is not allowed to proceed, another new coal resource, either in Australia or overseas, will be developed to take its place. A supporting argument is that the development of new coal resources is required to meet society's basic energy needs (i.e., electricity).

67. These arguments are, in my opinion, fundamentally flawed. The first argument (paragraph 65) is flawed because it ignores the fact that global greenhouse gas emissions are made up of millions, and probably hundreds of millions, of individual emissions around the globe. All emissions are important because cumulatively they constitute the global total of greenhouse gas emissions, which are destabilising the global climate system at a rapid rate. Just as many emitters are contributing to the problem, so many emission reduction activities are required to solve the problem.

68. A useful analogy for this first argument is the total tax revenue that a government agency collects each year to support the activities of the government. While there are certainly some large taxpayers (just as there are some large carbon emitters), there are also millions of Australians who pay a small amount of tax each year, compared to the total revenue. Each of these taxpayers could make the argument to the government agency that their amount of tax compared to the total revenue collected is so small that it does not matter. The government agency would very likely not accept that argument, and nor should decision makers, in my view, accept the argument that some activity's greenhouse gas emissions are so small that they do not matter.

69. The second argument (paragraph 66) is flawed because it assumes that there is now, and will continue to be, a demand for new coal resources beyond those that already exist. Observations of global coal production show that this assumption is not valid. Global coal production peaked in 2013/2014 and has been in a steady decline since then (Our World in Data 2018). In fact, coal production is dropping in all regions of the world – North America, Europe & Eurasia, Africa, South & Central America, the Middle East and Asia-Pacific (which includes Australia). The trend towards decreasing coal production is very likely to continue, or even accelerate, as the world experiences more severe impacts of climate change over the coming decades and the economic and social advantages of renewable energy technologies become even more apparent than they are today.

70. The judgment in Gloucester Resources Limited v Minister for Planning on the Rocky Hill coal mine recognised the flaws in the arguments in paragraphs 65 and 66 above.

s. 11C(1)(a)

Professor Will Steffen

6 July 2021

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Coal Mining Projects – Technical Analysis

Introduction

The following coal mining projects (hereinafter collectively referred to as **the Coal Mining Projects**) are currently pending possible approval from the Minister under the *Environmental Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act):

- (EPBC 2020/8702) Russell Vale Colliery in NSW (Wollongong Coal Limited);
- (EPBC 2016/7649) Vickery Coal Mine Extension Project in NSW (Whitehaven Coal limited);
- (EPBC 2017/8084) Tahmoor South Project in NSW (Tahmoor Coal Pty Ltd);
- (EPBC 2018/8280) Mangoola Coal Continued Operations Project in NSW (Mangoola Coal Operations Pty Ltd).

(See attached for further information on each of these coal projects)

The Department of Agriculture, Water and the Environment (DAWE) is considering the extent to which, if at all, the approval of the Coal Mining Projects would affect the global level of consumption of coal in certain possible future scenarios, with particular attention being paid to the contribution of coal mining and coal consumption to the generation of greenhouse gases.

This analysis is based on the following scenarios

- the **sustainable development scenario (SDS)**, based on the International Energy Agency's Sustainable Development Scenario, assumes that global coal consumption will be constrained so that the energy-related United Nations Sustainable Development Goals are achieved: universal access to affordable, reliable and modern energy services by 2030; a substantial reduction in air pollution, and effective action to combat climate change[1]
- the **stated policies scenario (STEPS)**, based on the International Energy Agency's Stated Policies Scenario, assumes that global coal consumption is determined by the IEA's assessment of stated policy ambitions, including the energy components of announced economic stimulus or recovery packages (as of mid-2020) and the Nationally Determined Contributions under the Paris Agreement .[2]

[1] In the SDS, annual energy sector and industrial process CO_2 emissions fall continuously over the period to 2050 from around 33 gigatonnes (Gt) in 2020 to 26.7 Gt in 2030 and 10 Gt in 2050, on course towards global net-zero CO_2 emissions by 2070. If emissions were to remain at zero from this date, the SDS would provide a 50% probability of limiting the temperature rise to less than 1.65 °C, in line with the Paris Agreement to limit global warming to well below 2 °C, preferably 1.5°C, compared to pre-industrial levels. (If negative emissions technologies are deployed after 2070 in the SDS, the temperature rise in 2100 could be limited to 1.5 °C with a 50% probability.)

[2] In the STEPS, broad energy and environmental objectives (including country net-zero targets) are not automatically assumed to be met. They are implemented in this scenario to the extent that they are backed up by specific policies, funding and measures. The STEPS also reflects progress with the implementation of corporate sustainability commitments. In the STEPS, emissions from new and existing energy infrastructure lead to a long-term temperature rise of around 2.7 °C in 2100.

Having regard to:

- the known and likely coal resources in the world (including those currently being mined and those available for development) but excluding the Coal Mining Projects (and also excluding any other unapproved Australian coal mining developments), and

- the current and reasonably anticipated coal demand arising in the two scenarios outlined above, and

- the nature and manner of operation of the global market for coal,

DAWE is considering the prospects that the approval of one or more of the Coal Mining Projects would affect the total amount of coal consumed globally or affect the amount of greenhouse gas emissions generated in the process of mining and conveying coal from mine to consumer prior to the year 2100, or, if not possible to answer this question up to the year 2100 using the available modelling, by reference to the point in time to which reasonable inferences can be drawn on the available modelling.

In answering this question, consideration is being given to:

- whether there are sufficient known alternative sources of coal, Australian or otherwise, (alternative coal sources) that could supply the global demand for coal in either or both of the scenarios outlined above (alternative coal sources should include all currently approved Australian coal mines, as well as all known or likely coal mines and coal deposits outside Australia, and should exclude the Coal Mining Projects and any other unapproved Australian coal mining developments);

- whether the level of global coal consumption would be unaffected by the approval or commencement of supply associated with the Coal Mining Projects, recognising that the approval might affect the composition of global coal consumption;

- whether the amount of CO2 emissions likely to be generated by the coal extracted from the Coal Mining Projects would be greater or less than, or the same as, the amount of CO2 emissions likely to be generated from alternative coal sources that would be likely to be exploited if the Coal Mining Projects were not approved (this might, for example, be the case if the quality or characteristics of alternative coals sources were materially different from coal available from the Coal Mining Projects in generating the same power or in achieving the same production objects of coal use);

- whether the amount of CO2 emissions likely to be associated with the mining undertaken at the Coal Mining Projects and the amount of CO2 emissions likely to be associated with transporting the coal from the Coal Mining Projects to coal consumers is likely to be materially different than the amount of CO2 emissions likely to be associated with the mining and transport of coal to the same consumers from alternative coal sources (insofar as the alternative sources would replace the supply that might have been met by the Coal Mining Projects);

- whether, apart from CO2 emissions, the consumption of coal from alternative coal sources would be likely to create dangers to human safety that are different to any such dangers that would be likely to be associated with the consumption of the coal from the Coal Mining Projects (for example, because of the different grades of coal that might be used in substitution).

[Note that references to “approved” means approved under the EPBC Act.]

The Department of Industry, Science, Energy and Resources (DISER) provides the following report to aid DAWE in consideration of this question.

Primary question:

Having regard to the known and likely coal resources in the world (including those currently being mined and those available for development) but excluding the Coal Mining Projects (and also excluding any other unapproved Australian coal mining developments), and

- *the current and reasonably anticipated coal demand arising in the two scenarios outlined above, and*

- *the nature and manner of operation of the global market for coal,*

the Department of Agriculture, Water and the Environment (DAWE) is considering the prospects that the approval of one or more of the Coal Mining Projects would affect the total amount of coal consumed globally or affect the amount of greenhouse gas emissions generated in the process of mining and conveying coal from mine to consumer prior to the year 2100, or, if not possible to answer this question up to the year 2100 using the available modelling, by reference to the point in time to which reasonable inferences can be drawn on the available modelling.

Response

DISER notes that this response is provided in conjunction with the advice and limitations identified in the responses to the sub-questions that follow this response.

For the reasons explained below, any decision of the Minister to approve one or more of the Coal Mining Projects (Decision) is not expected to materially impact on the total amount of coal consumed globally.

Demand for metallurgical coal is determined primarily by the demand for steel. Steel demand is driven by construction and infrastructure development, which is dependent on population and economic growth as well as government policies that support these industries. The demand for thermal coal is determined primarily by its price, and the demand for energy, which again, depends in part on population and economic growth, the cost of alternative energy products, such as oil, gas and renewables, as well as consumer preferences for different types of energy. The Decision affects none of these factors.

There are many alternative sources of coal both within Australia and overseas - both metallurgical and thermal. There is enough known coal reserves to last for 200 years at current production levels (see sub-question 1).

These sources of supply are varied. No one country or company dominates the market for seaborne coal supply. The speed at which trade has recently realigned in response to trade disruptions shows that regional coal markets are highly integrated. Over the last 10 years, competition has increased in the seaborne market for both thermal and metallurgical coal, as lower-cost supply has entered the market and production costs at existing mines have declined.

Regardless of any feasible scenario of future global demand, the small fraction of global supply that the annual output the Coal Mining Projects represent, combined with the competitiveness of global coal markets, indicate that alternative sources of coal are readily substitutable for any coal that might be produced by the Coal Mining Projects (see sub-question 2).

It is not possible to identify specific mine sources that would be the alternative sources of coal in the event the Coal Mining Projects were not approved. This makes it not possible to conclude that any Decision to approve the Coal Mining Project will necessarily increase greenhouse gas emissions associated with coal consumption.

s. 47(1) / s. 47G(1) the coal from the Coal Mining Projects is of relatively high calorific value. Other things being equal, where coal from these projects is replaced by coal of lower calorific value, emissions from consumption of this alternative source of coal will tend to be higher (see sub-question 3).

Emissions from mining and transport of coal depend on a large range of factors including mining method, transportation method and distance, making it not possible to conclude that the Coal Mining Projects will necessarily increase emissions. As a proportion of total emissions associated with the projects, transport emissions are significantly less than from the combustion of the coal (see sub-question 4).

Sulphur dioxide emissions are another potential danger to human health from the consumption of coal, contributing to acid rain and respiratory illnesses.[3] These emissions depend on the sulphur content of the coal and any sulphur emission controls used in conjunction with the coal consumption. The lack of information on the sulphur characteristics of the alternative coal and the use of any sulphur emission controls means that it is not possible assess the impacts of the Decision on this danger.

[3] https://www.eia.gov/energyexplained/coal/coal-and-the-environment.php

Sub-question 1

*Whether there are sufficient known alternative sources of coal, Australian or otherwise, (**alternative coal sources**) that could supply the global demand for coal in either or both of the scenarios outlined above (**alternative coal sources** should include all currently approved Australian coal mines, as well as all known or likely coal mines and coal deposits outside Australia, and should exclude the Coal Mining Projects and any other unapproved Australian coal mining developments);*

Under the IEA scenario of greatest coal demand (STEPS), there are sufficient known alternative coal sources to supply global demand for coal beyond 2040. It logically follows that there are also sufficient known alternative coal sources to supply global demand in any scenario in which demand is expected to be lower than in STEPS.

In the IEA's STEPS, it is estimated that aggregate annual global coal consumption gradually declines to 2040, reaching 4,735 million tonnes of coal equivalent (Mtce) with an associated 12.4 gigatonnes (Gt) of CO2 emissions. In the Asia-Pacific, annual coal consumption is also expected to experience a small decline of 101 Mtce by 2040.

This conceals stark regional variations in the outlook for coal. Coal consumption in India is expected to grow over the next 20 years by 182 Mtce. Coal consumption in South East Asia is also expected to grow rapidly over the same period, increasing by 157 Mtce. Coal use rebounds in China in the near term, peaking around 2025, before declining to 2040. Japan is expected to see the largest reduction in coal consumption over the period, declining by 55 Mtce. By 2040, the Asia Pacific region will account for 85 per cent of global coal consumption (Table 1).

Under the IEA's Sustainable Development Scenario, the world is projected to consume 1,850 Mtce in 2040 (Table 2) with an associated 3.3 Gt of CO2 emissions. Aggregate global consumption falls more rapidly and more consistently across different regions. All of Australia's major coal export destinations experience substantial falls in coal consumption: China by 340 Mtce; India by 292 Mtce; Japan by 116 Mtce; and Southeast Asia by 167 Mtce.

It is not possible to explicitly identify from these projections the individual demands for thermal and metallurgical coal. The IEA does distinguish between power use of coal and industrial use of coal (see the last two rows of Tables 1 and 2). The coal used in power generation is thermal coal. However, industrial use of coal includes both thermal coal used to generate energy and metallurgical coal used for steel making. As noted by the IEA, steel and cement production accounted for around 70 per cent of industrial coal end use in 2019 (IEA World Energy Outlook 2020, page 196). However, DISER has no additional information as to how this demand is split between steel and cement uses or how this proportion is projected to evolve over the next twenty years.

Coal reserves are generally taken to be those quantities that geological and engineering information indicates with reasonable certainty can be recovered in the future from known reservoirs under existing economic and operating conditions. Publically available coal reserves with global geographic coverage normally classify coal by its level of coalification – anthracite, bituminous, sub-bituminous and lignite - rather than its anticipated end-use.

As shown in Table 3, in 2020, there were 923,881 million tonnes of proved coal reserves in known alternative coal sources outside of Australia. These reserves are 113 times greater than global coal production in 2019[4]. There were also substantial proved coal reserves within Australia (Table 4), although the share of these reserves that would require additional approvals by the Minister under the EPBC Act has not been identified.

The share of anthracite and bituminous coal is approximately three quarters of total coal reserves. Given this abundance of coal and the projected gradual decline in coal demand in all of the IEA's scenarios, it is highly unlikely that coal used for the production of steel or energy might be in short supply over the coming decades, even excluding the approval of the Coal Mining Projects.

Coal exploration and development is likely to add to these reserves over time. Exploration and development gives a more complete picture of a particular coal resource, and often results in sufficient confidence that a coal resource is economically mineable, i.e., a resource becomes a reserve. For example, in 2019, total coal reserves were 1,054,782 million tonnes. In 2020, despite approximately 7,741 million tonnes of production, coal reserves grew to 1,074,108 million tonnes (BP Statistical Review of World Energy 2021).

[4] While coal is stored at various times and places, these stocks are not large and the difference between global consumption and production of coal in any one year is normally a few percentage points.

Table 1 – IEA Stated Policy Scenario coal demand

	Stated Policies Scenario						Shares (%)			CAAGR (%)	
	2010	2018	2019	2025	2030	2040	2019	2030	2040	2019-30	2019-40
Coal demand (Mtce)											
North America	770	497	431	266	204	125	8	4	3	-6.6	-5.7
United States	718	458	393	247	188	113	7	4	2	-6.5	-5.8
Central and South America	35	43	43	38	38	42	1	1	1	-1.1	-0.1
Brazil	19	21	22	21	22	24	0	0	1	0.1	0.4
Europe	538	450	387	250	202	163	7	4	3	-5.7	-4.0
European Union	360	309	251	155	106	60	5	2	1	-7.5	-6.6
Africa	155	142	167	165	164	161	3	3	3	-0.1	-0.2
South Africa	144	120	142	134	121	96	3	2	2	-1.5	-1.9
Middle East	3	5	5	8	9	12	0	0	0	5.0	3.8
Eurasia	197	231	225	208	206	198	4	4	4	-0.8	-0.6
Russia	145	171	164	147	141	132	3	3	3	-1.4	-1.0
Asia Pacific	3 512	4 092	4 135	4 176	4 182	4 034	77	84	85	0.1	-0.1
China	2 567	2 837	2 864	2 877	2 779	2 524	53	56	53	-0.3	-0.6
India	399	592	590	631	712	772	11	14	16	1.7	1.3
Japan	165	163	157	139	119	102	3	2	2	-2.5	-2.0
Southeast Asia	122	220	246	273	314	383	5	6	8	2.2	2.1
OECD	1 559	1 219	1 079	733	602	445	20	12	9	-5.2	-4.1
Non-OECD	3 652	4 241	4 313	4 379	4 403	4 290	80	88	91	0.2	-0.0
Advanced economies	1 580	1 235	1 094	746	609	450	20	12	10	-5.2	-4.1
Emerging market & developing economies	3 631	4 225	4 299	4 366	4 395	4 285	80	88	90	0.2	-0.0
World	**5 211**	**5 460**	**5 392**	**5 112**	**5 004**	**4 735**	**100**	**100**	**100**	**-0.7**	**-0.6**
Power	3 099	3 509	3 449	3 218	3 148	2 974	64	63	63	-0.8	-0.7
Industrial use	1 239	1 138	1 151	1 135	1 128	1 107	21	23	23	-0.2	-0.2

Source: IEA World Energy Outlook 2020, all rights reserved.

Table 2 – IEA Sustainable Development Scenario coal demand

	Sustainable Development Scenario						Shares (%)			CAAGR (%)	
	2010	2018	2019	2025	2030	2040	2019	2030	2040	2019-30	2019-40
Coal demand (Mtce)											
North America	770	497	431	101	59	42	8	2	2	-16.5	-10.5
United States	718	458	393	84	48	32	7	2	2	-17.3	-11.3
Central and South America	35	43	43	28	22	18	1	1	1	-6.1	-4.0
Brazil	19	21	22	16	14	12	0	0	1	-4.2	-2.8
Europe	538	450	387	180	116	73	7	4	4	-10.3	-7.6
European Union	360	309	251	104	60	39	5	2	2	-12.1	-8.5
Africa	155	142	167	137	115	80	3	4	4	-3.3	-3.5
South Africa	144	120	142	117	94	51	3	3	3	-3.7	-4.8
Middle East	3	5	5	7	6	5	0	0	0	1.3	-0.5
Eurasia	197	231	225	165	124	68	4	4	4	-5.3	-5.5
Russia	145	171	164	120	90	55	3	3	3	-5.3	-5.1
Asia Pacific	3 512	4 092	4 135	3 581	2 762	1 564	77	86	85	-3.6	-4.5
China	2 567	2 837	2 864	2 539	1 952	1 045	53	61	57	-3.4	-4.7
India	399	592	590	516	454	298	11	14	16	-2.4	-3.2
Japan	165	163	157	104	57	41	3	2	2	-8.8	-6.2
Southeast Asia	122	220	246	234	170	79	5	5	4	-3.3	-5.3
OECD	1 559	1 219	1 079	432	240	165	20	7	9	-12.8	-8.5
Non-OECD	3 652	4 241	4 313	3 767	2 965	1 685	80	93	91	-3.4	-4.4
Advanced economies	1 580	1 235	1 094	439	242	166	20	8	9	-12.8	-8.6
Emerging market & developing economies	3 631	4 225	4 299	3 760	2 962	1 684	80	92	91	-3.3	-4.4
World	**5 211**	**5 460**	**5 392**	**4 199**	**3 204**	**1 850**	**100**	**100**	**100**	**-4.6**	**-5.0**
Power	3 099	3 509	3 449	2 448	1 686	706	64	53	38	-6.3	-7.3
Industrial use	1 239	1 138	1 151	1 035	903	697	21	28	38	-2.2	-2.4

Source: IEA World Energy Outlook 2020, all rights reserved.

Table 3 - Key 2020 coal statistics (physical units)

		Australia	OECD	World
Resources				
Proved reserves (at end of year)	Mt	150,227[b]	508,433	1,074,108
of which: Black coal (anthracite and bituminous)	Mt	73,719[b]	331,303	753,639
of which: Brown coal (sub-bituminous[a] and lignite)	Mt	76,508[b]	177,130	320,469
Share of world coal reserves	%	14.0[b]	47.3[b]	100
World ranking	no.	3[b]	na	na
Production				
Annual production	Mt	477	1,422	7,742
Share of world annual production	%	6.2	18.4	100
CAGR from 2009-2019	%	1.8	-2.1	1.4
World ranking	no.	5	na	na

Notes:
a Sub-bituminous coal has properties that range from those of brown coal to those of black coal—there is therefore some variation in this terminology across countries.
OECD - Organisation for Economic Co-operation and Development countries; CAGR - compound annual growth rate; Mt - million tonnes; na - not applicable.

Source: BP Statistical Review of World Energy 2021.

Table 4 - Australia's coal reserves at operating mines in 2019

No. of operating mines[a]	Ore Reserves[b] (Mt)	Measured and Indicated Mineral Resources[c,e] (Mt)	Inferred Mineral Resources[d,e] (Mt)	Mine Production[f] (Mt)	Reserve Life[g] (years)	Reserve Life 1[h] (years)	Reserve Life 2[i] (years)
96	11,670	30,586	14,227	588	20	52	76

Notes:
a The number of operating mines counts individual mines that operated during 2019 and thus contributed to production. Some of these mines may belong to larger, multi-mine operations and some may have closed during or since 2019.
b The majority of Australian Ore Reserves and Mineral Resources are reported in compliance with the JORC Code, however there are a number of companies that report to foreign stock exchanges using other reporting codes, which are largely equivalent. In addition, Geoscience Australia may hold confidential information for some commodities. Not all operating mines report Ore Reserves. Ore Reserves are as at 31 December 2019.
c Measured and Indicated Mineral Resources are inclusive of the Ore Reserves. Not all operating mines report Mineral Resources. Mineral Resources are as at 31 December 2019.
d Inferred Mineral Resources are as
e Measured, Indicated and Inferred Mineral Resources for black coal are presented on a recoverable basis (these are Geoscience Australia estimates unless provided by the company).
at 31 December 2019. Not all operating mines report Mineral Resources.
f Mine production refers to raw coal.
g Reserve Life = Ore Reserves ÷ Production.
h Resource Life 1 = Measured and Indicated Resources ÷ Production.
i Resource Life 2 = Measured, Indicated and Inferred Resources ÷ Production.
Source: a-d - Geoscience Australia; e - Resources and Energy Quarterly, September 2020, Department of Industry, Science, Energy and Resources.

Sub-question 2

Whether the level of global coal consumption would be unaffected by the approval or commencement of supply associated with the Coal Mining Projects, recognising that the approval might affect the composition of global coal consumption;

As established in sub-question 1, there are many alternative sources of coal outside of Australia - both metallurgical and thermal. There are enough coal reserves to last for approximately 200 years at current production levels (see sub-question 1). This is in addition to any coal reserves in Australia that do not require approval by the Minister under the EPBC Act to mine.

As already noted above, coal is primarily used in two ways; for producing steel and for producing energy. Coal used in the production of steel is referred to as metallurgical (or coking) coal. Coal used for producing energy is referred to as thermal (or steaming) coal.

The long-term demand for metallurgical coal depends primarily on its price, and the demand for steel, which in turn depends on demand for steel uses, including construction and infrastructure, which, in part, depends on population and economic growth as well as government policies that support these industries.

The long-term demand for thermal coal depends primarily on its price, the demand for energy, which, again, depends in part on population and economic growth, the cost of alternative energy products, such as oil, gas and renewables, as well as consumer preferences for different types of energy.

In additional to its price, the long-term supply of metallurgical and thermal coal depend on the availability of the resource in nature, the technology used for extraction (the two main methods are open-cut or underground), the labour and capital costs associated with production, the cost of transporting the coal to the demand source (normally by rail and ship) and the regulatory costs associated with environmental protection and worker health and safety.

The characteristics required for coal to be suitable for steel making means that metallurgical coals are rarer in nature, which makes metallurgical coal more expensive than thermal coal. In the last ten years, the average price of exported Australian metallurgical coal was approximately double the average price of exported Australian thermal coal (IHS Markit, 2021).

However, the prices of metallurgical and thermal coal are linked because there is a degree to which the different coal types can be used in the alternative market. When the price differential is small, the cost of beneficiation of low-grade bituminous coal that makes the coal suitable for steel-making is less than the return from beneficiation. When the price differential is large, steel-makers will find it profitable to substitute some metallurgical coal with high-end thermal coal, where the reduction in blast efficiency is more than offset by the reduced input cost.

Putting aside prices of metallurgical and thermal coal, the decision by the Minister under the EPBC Act to approve one or more of the Coal Mining Projects effects none of the demand factors listed above.

In consideration of price, the feasibility of alternative sources of coal substituting for coal supplied by the Coal Mining Projects as a result of a decision by the Minister under the EPBC Act must be considered. Limiting supply of a product will, in standard markets, lead to higher prices and lower demand if there are no readily available substitutes to replace this supply. If on the other hand, there are readily available substitutes to replace that supply, i.e. if markets are competitive, then there is not expected to be any meaningful impact of reduced supply on price or demand. The coal markets, both metallurgical and thermal are highly competitive global markets.

The coal that is expected to be produced by the Coal Mining Projects is a mix of thermal and metallurgical coal primarily for sale into the seaborne coal trade. The supply of each of these coal types will now be considered separately.

China dominates the global production of metallurgical coal, accounting for over half of all production in 2020. Despite this, China's demand for coal makes it a net importer (its imports of metallurgical coal, exceeds its exports). Imports accounted for approximately 10 per cent of metallurgical coal consumption in China in 2020 (Table 5).

Australia dominates the global supply of seaborne metallurgical coal. Australia accounted for over half of all seaborne coal trade in 2020. Other major suppliers include United States, Canada, Russia and Mongolia.

Table 5 – Production and Export of metallurgical coal in 2020, million tonnes

Region	**Production**		**Region**	**Exports**
Asia Pacific	**812**		Australia	167
China	605		United States	38
India	6		Canada	33
Australia	170		Russia	30
Indonesia	6		Mongolia	26
North America	**88**		Mozambique	4
United States	51		Rest of world	13
Central and South America	**4**		**World**	**309**
Europe	**12**			
European Union	11			
Middle East	**1**			
Eurasia	**105**			
Russia	98			
World	**1029**			

Source: IEA Coal 2020 Report

China also dominates the global production of thermal coal and lignite, accounting for almost half of all production in 2020. Also similar to the seaborne metallurgical coal market, China is a net importer of thermal coal (it imports more than it exports). Imports accounted for almost 10 per cent of thermal coal consumption in China in 2020 (Table 6).

The supply of seaborne thermal coal is less concentrated than for seaborne metallurgical coal. No individual country dominates supply. Indonesia is the largest supplier of seaborne thermal coal and lignite, accounting for 31 per cent of global supply in 2020. Australia and Russia are other important suppliers, accounting for 29 per cent and 16 per cent of global supply, respectively.

Table 6 – Production and Export of thermal coal in 2020, million tonnes

Region	Production		Region/country	Exports
Asia Pacific	**4780**		Australia	366
China	3086		Canada	36
India	737		Colombia	58
Australia	290		Indonesia	404
Indonesia	523		Russia	207
North America	**469**		South Africa	75
United States	439		United States	59
Central and South America	**61**		Rest of world	88
Europe	**439**		**World**	**1292**
European Union	286			
Middle East	**0**			
Eurasia	**419**			
Russia	297			
Africa	**241**			
World	**6409**			

Source: IEA Coal 2020 Report

Substitutability of coal

The recent experience of trade disruptions associated with COVID-19 and China's informal trade restrictions in the metallurgical and thermal coal markets has shown that geography is not a key consideration for coal end-users. Coal that was destined for China has been resold or redirected to an array of countries. These countries include Japan, South Korea and India. Similarly, China has managed to source its coal needs from other countries, including United States, Canada and Russia in the absence of previously substantial Australian supply. That is to say, companies that supply seaborne metallurgical and thermal coal compete in the one marketplace.

Over the last 10 years competition has increased in the seaborne market for coal, as lower-cost supply has entered the market and production costs at existing mines have declined (Figure 1). Reflecting this, globally over the past decade, unit production costs have become more uniform over a wider range of production levels; any increase in coal price is expected to be met with a greater increase in supply.

Table 7 shows the anticipated volume of metallurgical and thermal coal that each of the Coal Mining Projects will produce and how much that represents as a share of global production and exports. The Vickery Coal project's annual metallurgical coal production represents 0.4 per cent of global metallurgical coal production and 1.3 percent of global metallurgical coal exports in 2020. The share of global coal represented by the annual coal production of the other projects are all smaller than that of the Vickery Coal project.

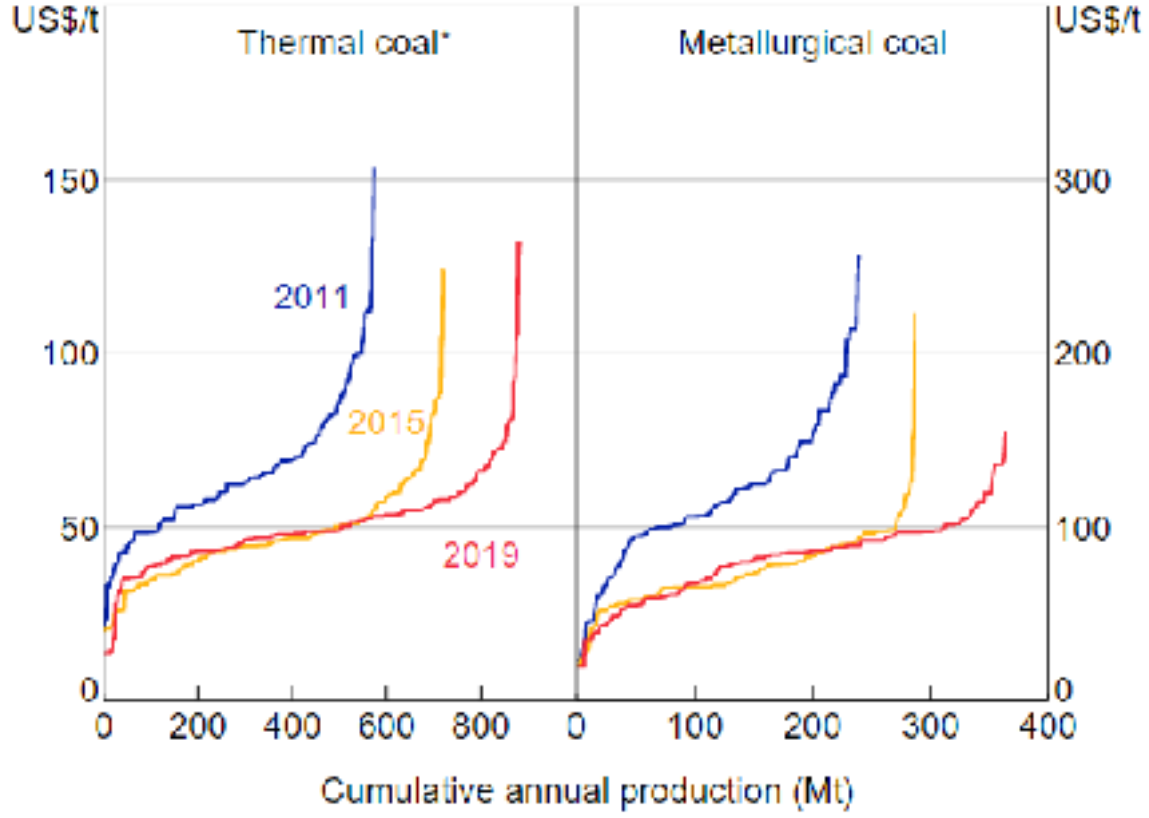
Table 7 – Coal Mining Project production as a share of global coal production and exports in 2020

	Units	Russell Vale	Tahmoor South	Mangoola	Vickery
Total volume	Mt	3.7	33	52	168
Duration of project	Years	5	10	8	25
Project share of metallurgical coal	%	100	90-95	0	60
Project's annual metallurgical production	Mt	0.74	2.97-3.14	0	4.03
Share of global metallurgical coal production	%	0.07	0.29-0.3	-	0.39
Share of metallurgical coal exports	%	0.24	0.96-1.01	0	1.30
Project share of thermal coal	%	0	5-10	100	40
Project's annual thermal coal production	Mt		0.17-0.33	s. 47(1) / s. 47G(1)	2.69
Share of global thermal coal production	%	0	0.003-0.005	0.10	0.04
Share of thermal coal exports	%	0	0.017-0.034	0.66	0.27

Source: DAWE and IEA Coal 2020 Report

Regardless of any feasible scenario of future global demand, the small fraction of current global coal supply that these projects represent, combined with the relatively flat global seaborne coal cost curves indicates that the Decision will not have any discernible impact on global coal prices. The alternative sources of coal identified in sub-question 1 are readily substitutable for any coal that might be produced by the Coal Mining Projects.

Figure 1: Seaborne Coal Production Costs (FOB basis)



*Notes: * Costs are quality adjusted*

Sources: AME Research; Reserve Bank of Australia

Sub-question 3

Whether the amount of CO_2 emissions likely to be generated by the coal extracted from the Coal Mining Projects would be greater or less than, or the same as, the amount of CO_2 emissions likely to be generated from alternative coal sources that would be likely to be exploited if the Coal Mining Projects were not approved (this might, for example, be the case if the quality or characteristics of alternative coals sources were materially different from coal available from the Coal Mining Projects in generating the same power or in achieving the same production objects of coal use);

Mine development decisions by both governments and industry are generally linked to broader considerations, including future global coal demand, the coal mine construction pipeline, capital availability and social licence. It is not possible to identify specific mine sources that would be the alternative sources of coal in the event the Coal Mining Projects were not approved.

Industry estimates that if Australian coking coals were not available and had to be replaced by coking coal from alternative sources, which would be of inferior quality, it is estimated that the amount of CO2 produced from blast furnaces that currently use the Australian products may increase by 7-25 million tonnes per annum or 0.8-2.8 per cent.[5]

While technically possible to replace coking coal in the steel making process through the combination of a Direct-Reduced Iron (DRI) facility and an Electric Arc Furnace (EAF) using either zero-emission electricity or green hydrogen, such a process currently presents technical challenges, and is not yet available at the scale needed to meet global demand for steel particularly in developing economies.

The CO2 emissions intensity of electricity generated from coal is dependent on a number of factors including the energy, moisture, ash content and sulphur content of the coal, how the coal is stored and treated, and the technology and operation of the coal generation unit. One of the most important factors for emissions intensity is the energy content or calorific value, which represents the energy contained in the coal. High energy content coal can be combusted more efficiently resulting in less emissions per unit of electricity generated (i.e., improved thermal efficiency). Table 8 shows that, based on industry estimates, Australia's exported thermal coal has a high calorific value compared with other major coal exporters (noting the United States is on par with Australia).

In particular, Australian coal has a much higher calorific value than Indonesia, which would tend to result in slightly lower emissions per unit of electricity generated from the use of Australian coal compared to Indonesian coal, based on the data in Table 8. As a consequence, it could be concluded that consumption of thermal coal from Indonesia rather than thermal coal from the Coal Mining Projects, s. 47(1) / s. 47G(1) could be expected to result in slightly more CO2 emissions, based on DAWE estimates of calorific value contained in Table 10.

[5] Minerals Council of Australia, 2020. *Best In Class: Australia's Bulk Commodity Giants. Australian Metallurgical Coal: Quality Sought Around the World.*

Sub-question 4

Whether the amount of CO_2 emissions likely to be associated with the mining undertaken at the Coal Mining Projects and the amount of CO_2 emissions likely to be associated with transporting the coal from the Coal Mining Projects to coal consumers is likely to be materially different than the amount of CO_2 emissions likely to be associated with the mining and transport of coal to the same consumers from alternative coal sources (insofar as the alternative sources would replace the supply that might have been met by the Coal Mining Projects);

It is not possible to readily determine whether CO2 emissions from the Coal Mining Projects' extraction and transport activities would be materially different to emissions from such activities undertaken by alternative overseas coal sources. It can be stated however that, transport emissions associated with any coal mining project would represent a relatively small percentage of emissions from the combustion of the final product (ie coal). To illustrate using the data provided by the Coal Mining Projects with the highest (Russel Vale) s. 47(1) / s. 47G(1) calorific value coal: estimated transport emissions would represent approximately 4-5 per cent of estimated emissions from the combustion of coal (source: *Russell Vale Colliery Air Quality and Greenhouse Gas Management Plan*, table 7.3; *EIS Appendix 22 – Greenhouse Gas and Energy Assessment Appendix B*, page 2).

International coal supply chains normally involve some combination of conveyor, truck, rail, cargo vessel to transport coal. The inability to identify specific mine sources that would be the alternative sources of coal in the event the Coal Mining Projects were not approved in addition to the varied mining environments, transportation choices and distances make any estimation of the impact of the Decision on mining and transportation emissions infeasible.

Such a comparison would require, for example, a level of detail in emissions data reporting by Australia's developing country competitors which is not currently available. Difficulties in attributing transport sector emissions to specific coal mines presents a further obstacle to preparing a reliable comparison. As a consequence, it is not possible to determine whether global CO2 emissions from the extraction and transport of coal to consumers would increase or decrease if the coal mining projects were not approved.

It is noted, however, that the calorific value of coal has implications for related transport emissions. That is, the lower the calorific value (energy content) of coal, the greater mass of coal required to produce a given level of electricity. It follows that – for a given electricity requirement – supplying coal with lower thermal efficiency would result in higher transport related emissions per kilometre travelled compared to supplying coal with higher thermal efficiency (such as coal from the Coal Mining Projects, s. 47(1) / s. 47G(1) due to the greater mass of coal to be transported.

Sub-question 5

Whether, apart from CO2 emissions, the consumption of coal from alternative coal sources would be likely to create dangers to human safety that are different to any such dangers that would be likely to be associated with the consumption of the coal from the Coal Mining Projects (for example, because of the different grades of coal that might be used in substitution).

Apart from CO2 emissions, consumption of coal from alternative coal sources may create dangers to human safety that are different from the dangers associated with the consumption of coal from the Coal Mining Projects. For example, combustion of coal from alternative sources may result in greater sulphur dioxide emissions, a contributor to acid rain and respiratory illnesses.[6]

Australian export coals have comparable levels of sulphur to our major export competitors (see Tables 7 and 8).

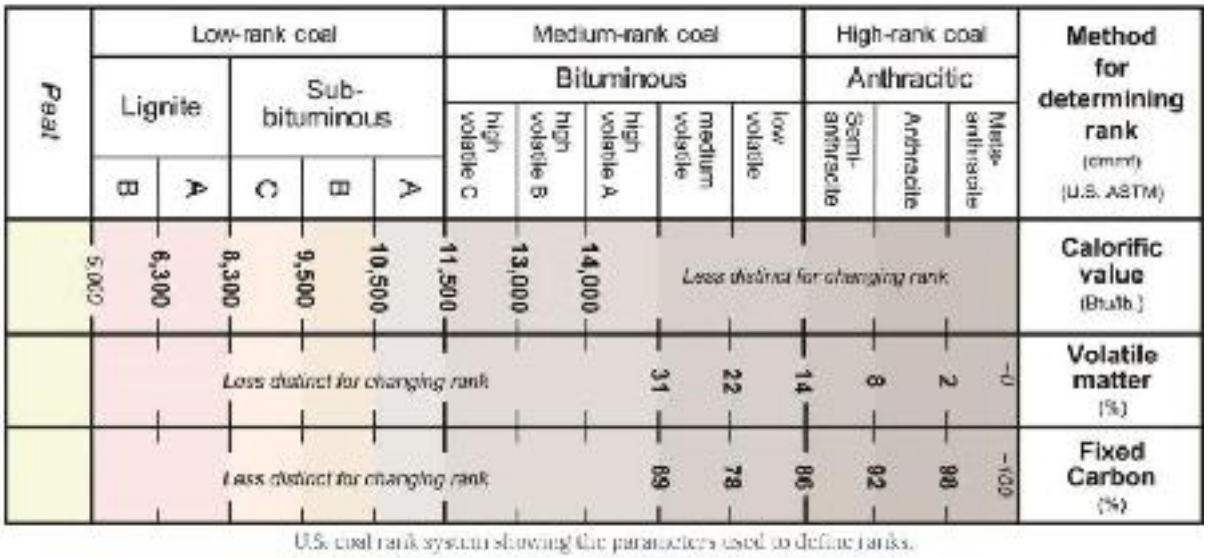
It is not possible to readily determine whether sulphur dioxide emissions from the consumption of coal from alternative sources would be materially different to sulphur dioxide emissions from the consumption of coal from the Coal Mining Projects as it is not possible to identify specific mine sources that would be the alternative sources of coal in the event the Coal Mining Projects were not approved. This determination would also be informed by any sulphur emission controls used in conjunction with the coal consumption such as the flue-gas desulphurization technologies that can be used to remove sulphur dioxide from exhaust flue gases of fossil-fuel power plants.

[6] https://www.eia.gov/energyexplained/coal/coal-and-the-environment.php

Annex A: Background

Coal is formed from the physical and chemical alteration of peat. Peat is composed of plant materials that accumulate in wetlands. When peats are buried, the weight of the overlying sediments squeezes out much of the water from the peat and reduces its volume (called compaction). Continued burial deeper into the earth also exposes the material to higher temperatures. Heating, and to a lesser extent, time and pressure act on the buried peat to change it into coal. The stages of coalification proceed through different ranks of coal (lignite, sub-bituminous coal, bituminous coal, anthracite coal). The more advanced the stage of coalification, the higher the calorific value (energy content) of the coal, the lower the volatile matter (the amount of non-water gases formed from a coal sample during heating) and the higher the fixed carbon (the amount of non-volatile carbon remaining in a coal sample) (Figure 2).

Figure 2: US coal rank system



U.S. coal rank system showing the parameters used to define ranks.

Source: University of Kentucky, https://www.uky.edu/KGS/coal/coal-rank.php

The production and consumption of coal, like most commodities is determined by the interactions between numerous producers and consumers trading a relatively homogeneous good.

Demand factors for coal depend on the value of the end use of the product – this varies from producing steam to drive turbines to produce electricity, to producing gaseous and liquid fuels, through coal gasification and liquefaction, to using coal as a chemical source from which numerous synthetic compounds (e.g., dyes, oils, waxes, pharmaceuticals, and pesticides) can be derived, or in the production of coke for metallurgical processes.

The two primary uses of coal (energy and steel making) have led to the development of two major coal markets, reflecting the specific characteristic requirements associated with these uses.

Coal used for steel making is referred to as metallurgical (or coking) coal. It is used as a fuel and reductant (in the form of coke) in a blast furnace to produce iron. Blast furnace operators greatly value consistent coal quality as variable quality can create furnace instability. It is rare for coke makers to charge a single coal into a blast furnace as a single coal will not possess all of the properties required to produce coke suitable to meet blast furnace specifications for ash, sulphur, phosphorus, size and coke strength. Coke makers use multiple coals when formulating a coking coal blend in order to meet these specifications.

Metallurgical Coal

Metallurgical coals are primarily bituminous coals. As shown in figure 2, these coals are categorised primarily by their volatile matter rather than their calorific content. This feature of metallurgical coal markets is also demonstrated by metallurgical coal indexes such as those constructed by S&P Global Platts[7], which include coke strength reaction, volatile matter, total moisture, ash and sulphur as measures of quality. While all metallurgical coals have relatively high calorific value, this is not one of the measures that determines metallurgical coal value.

Table / outlines the important commercial properties of coking coal and compares Australian coking coal to international alternatives.

Table 8: Properties of Australian Coking Coals and Comparison to International Alternatives

COKING COAL PROPERTY	SIGNIFICANCE	TYPICAL AUSTRALIAN QUALITY	COMPARISON TO INTERNATIONAL ALTERNATIVES
Ash	Increases slag volume in the blast furnace and reduces blast furnace productivity. Lower ash is preferred.	6.0–10.5 per cent (air-dried basis)	Comparable
Sulphur (S)	S is deleterious to steel quality and costly to remove in the steelmaking process. Lower S is	0.3–1.3 per cent (air-dried basis)	Comparable
Phosphorus (P)	P is deleterious to steel quality and costly to remove in the steelmaking process. Lower P is	0.01–0.12 per cent (air-dried basis)	Comparable
Alkalis (K_2O + Na_2O)	Alkalis condense in the blast furnace shaft and build-up or form accretions on the furnace wall which can detach suddenly causing operational problems. Lower alkali content is preferred.	1.5 per cent in ash (dry basis)	Comparable
Rheology	Fluidity – viscosity of plastic phase during heating. Dilatation – expansion and contraction during heating. Both assist coke makers in formulating coal blends that produce strong	Broad range	US coals superior but Australian comparable to others
Coke cold strength	Abrasion and breakage resistance for optimisation of blast furnace permeability.	Broad range	Superior
Coke hot strength (Coke Strength after Reaction -	Hot strength for optimization of BF permeability. Preferred coke CSR for large BF 65-70 per cent.	55-74 per cent	Superior

Source: Adapted from MCA Best in Class: Australia's Bulk Commodity Giants – Metallurgical Coal

Thermal Coal

[7] https://www.spglobal.com/platts/plattscontent/_assets/_files/en/our-methodology/methodology-specifications/metcoalmethod.pdf

Coal used to produce steam to run turbines to generate electricity is referred to as thermal (or steaming) coal. Thermal coal (like metallurgical coal) is mainly composed of carbon, hydrogen and oxygen, however it also contains variable quantities of other elements that can impact the value of the coal as a fuel source. Important elements that can impact this value are the moisture content, sulphur content, ash content and other pollutants, as well as the coal's calorific value.

Thermal coals are primarily sub-bituminous coals. These coals are characterised primarily by their calorific value (or energy density). The calorific value of coal is also the most important determinant of a coal's ability to create steam and generate power, representing the amount of energy produced from burning a given quantity. A greater quantity of low calorific value coals are needed in order to produce the same amount of electricity that can be obtained from higher calorific value coals.

Thermal coal also contains variable quantities of other elements that can impact the quality and efficiency of the coal as a fuel source. In addition to calorific value, important elements that can impact the quality and emissions from coal are the moisture content, sulphur content and ash content.

Total moisture is the total amount of water in the coal including inherent and surface moisture. Moisture is measured as a percentage of the "air dried" coal (that is, the moisture in the coal after achieving equilibrium with the atmosphere around it). As the moisture uses heat to be evaporated on combustion, the lower the level the better. Higher moisture coals have lower boiler efficiencies.

Ash remains after the complete combustion of all organic matter and the oxidation of the mineral matter present in the coal – it is therefore the incombustible material present in the coal. Ash in coal acts as a diluent, which needs to be disposed of after combustion as fly ash or bottom ash. Lower levels are therefore preferred.

Volatile matter in coal is the proportion of the air-dried coal released as gas or vapour during a standardised heating test. Higher volatile matter content indicates coal that is easier to ignite and which will burn with a large, steady flame However, if volatile content is too high (exceeding 30 per cent of the air dried coal), it increases the potential risk of spontaneous combustion.

Table 9 outlines the important properties of thermal coal and compares Australian export thermal coal to international alternatives.

Table 9: International Comparison of Export Thermal Coal Quality

Country	Australia	Indonesia	Russia	Colombia	South Africa	USA
Total Moisture (per cent ar)	10.6	24.9	10.2	11.8	8.3	11.7
Ash (per cent ad)	13.7	5.5	12.2	7.1	13.8	7.9
Volatile Matter (per cent ad)	31.2	38.9	30.8	35.9	25.8	37.5
Calorific value (Kcal/Kg nar)	5980	4640	5590	5860	5780	5980
Sulphur (per cent ad)	0.57	0.49	0.40	0.62	0.80	1.40

Notes: ar – as received; ad – air dried; nar – kilocalories per kilogram net as received
Source: Adapted from MCA Best in Class: Australia's Bulk Commodity Giants – Thermal Coal

Table 10 outlines the coal characteristics of the Coal Mining Projects from two sources: DAWE and AME Research.

Table 10 – Coal characteristics of the Coal Mining Projects

Project	Source	Ash (% adb)	Total Sulphur (% adb)	Calorific Value NAR (kcal/kg)
Russell Vale Colliery Revised Underground Expansion Project (2020/8702)	AME Research	13	0.39	7,025[a]
	DAWE	26-32	0.42-0.45	6,300-7,400
Tahmoor South Coal Project (2017/8084)	AME Research	13	0.4	6,640
	DAWE	12	0.3	6,300
Mangoola Continued Coal Operations Project (2018/8280)	AME Research	15-27	0.35-0.40	5,014
	DAWE	Na	Na	4775-5800
Vickery Extension Project (EPBC 2016/7649)	AME Research	10	0.55	6,521
	DAWE	8	0.4	6,420

Notes: adb – air-dried basis; NAR – net as received;
a Russell Vale coal is not expected to produce thermal coal.
b – gross as received

Source: AME Research (April 2021) and DAWE

Lignite is also used to produce energy. However, because of its low energy density and typically high moisture content, lignite is inefficient to transport and is not traded extensively on the world market compared with higher coal grades. As a result it is not a focus of this report.

Coal Mine Investment Factors

Coal supply is associated with capital intensive investments and long lead times. In the short-term, the response of an operating coal mine to changes in market prices will be small. The operational costs of a coal mine represent a relatively small portion of the mines costs, making production at capacity most profitable over a wide range of prices. Even at price extremes, there is a limit to any potential supply response related to price changes. Putting a mine into care and maintenance is a costly exercise as many costs associated with mining are incurred regardless of the sale of coal. Similarly, there are production capacity constraints above which mines cannot operate regardless of prices. Of course, coal supply may fluctuate in the short-term as a result of unanticipated events such as weather disruptions or mining accidents.

Longer-term, these features mean that the decision to invest in additional coal mine capacity, either as a greenfield site, as an expansion to an existing operation or as a replacement for an expiring mine is taken with a long-term view of coal markets and coal prices. Time horizons can differ depending on the resource being considered for development, but investment horizons normally range from 5 to 25 years. While time horizons can extend beyond this point, the net present value of revenue streams thirty or more years into the future are insignificant at standard rates of return. That is to say, projections of future coal supply and coal demand more than 30 years into the future are irrelevant for most economic decision making purposes, and, as such, are not readily available publicly or privately.

The absence of economic modelling of coal markets beyond 30 years limits the ability of DISER to inform DAWE as to the operation of coal markets out to 2100. The most comprehensive long-term modelling of global energy systems that can inform the questions under consideration by DAWE is the International Energy Agency's (IEA's) annual World Energy Outlook report as the basis for drawing inferences on future global energy demand and supply.

The IEA's World Energy Outlook publications assess medium to long-term energy projections using the IEA's World Energy Model (WEM). The WEM is a large-scale simulation model designed to replicate how energy markets function and is the principal tool used to generate detailed sector-by-sector and region-by-region projections for the WEO scenarios. Updated every year, outputs from the model include energy flows by fuel, investment needs and costs, CO2 emissions and end-user prices.

The World Energy Outlook makes use of a scenario approach to examine future energy trends relying on the WEM. For the World Energy Outlook 2020, detailed projections for scenarios out to 2040 were modelled and presented.

At one end of the spectrum, the IEA's Sustainable Development Scenario (SDS) assumes that global coal consumption will be constrained to a level consistent with the aims of the Paris Agreement and the sustainable development goals (SDG 3, 7 and 13).

At the other end of the spectrum, the IEA's Stated Policies Scenario (STEPS) assumes that global coal consumption will not be constrained to a level consistent with the aims of the Paris Agreement or address the sustainable development goals (SDG 3, 7 and 13). The STEPS takes into account the policies and implementing measures affecting energy markets that had been adopted as of mid-2020, together with relevant policy proposals, even though specific measures needed to put them into effect have yet to be fully developed.

In addition to the above scenarios, projections for a Net Zero Emissions by 2050 Scenario (NZE) are also presented at a more aggregated regional level out to 2030. The NZE shows what is needed for the global energy sector to achieve net-zero CO2 emissions by 2050. Alongside corresponding reductions in GHG emissions from outside the energy sector, this is consistent with limiting the global temperature rise to 1.5 °C without a temperature overshoot (with a 50 per cent probability).

Projections for the STEPS and NZE scenarios are also presented at this more aggregated level, over a longer time frame in its *Net Zero by 2050* report. However, the level of regional aggregation associated with the scenario projections that are reported out to 2050 gives insufficient information to inform the questions posed by DAWE.

Annex C: Technical Expertise

The above advice was developed by Officers within areas of DISER:

- The Onshore Minerals and Energy Branch within the Resources Division utilised publicly available information including market intelligence subscription services, publicly available reports and documentation provided by the Coal Mining Projects. The analysis was compiled by employees with technical qualifications in geology, economics and law. The analysis was also reviewed by the Resources and Energy Insights Branch within DISER's Analysis and Insights Division.

- The National Inventory Systems and International Reporting Branch of the Climate Change Division. The Branch comprises employees with technical qualifications including science, engineering, economics and law, who are responsible for fulfilling the Australian Government's international emissions reporting obligations under the UN climate treaties, including the Paris Agreement. The advice provided in this response relating to emissions was prepared by, and in consultation with, employees with international accreditation in the review of countries' greenhouse gas inventories for consistency and compliance with UN climate treaty rules and guidance for the estimation and reporting of greenhouse gas emissions.

Annex D: Glossary

Tonnes of coal equivalent - one tonne of coal equivalent is the energy content of 1 tonne of 7,000 kilocalories per kilogram coal. One tonne of coal equivalent is equal to 29.3076 gigajoules (GJ). As reported under The National Greenhouse and Energy Reporting (Measurement) Determination 2008, Australian bituminous coal has an energy content of 27.0 GJ/tonne and Australian sub-bituminous coal has an energy content of 21.0 GJ/tonne.

Alternative coal sources - known and likely coal resources in the world (including those currently being mined and those available for development) but excluding the Coal Mining Projects (and also excluding any other unapproved Australian coal mining developments).

Mineral Resource - a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade (or quality), and quantity that there are reasonable prospects for eventual economic extraction. Mineral Resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories.

Inferred Mineral Resource - that part of a Mineral Resource for which quantity and quality are estimated on the basis of limited geological evidence and sampling. Geological evidence is sufficient to imply but not verify geological and quality continuity. Geological evidence is based on exploration, sampling and testing information. It is reasonably expected that the majority of Inferred Mineral Resources could be upgraded to Indicated Mineral Resources with continued exploration.

Indicated Mineral Resource - that part of a Mineral Resource for which quantity, quality, densities, shape and physical characteristics are estimated with sufficient confidence to support mine planning and evaluation of the economic viability of the deposit. Geological evidence is derived from adequately detailed and reliable exploration, sampling and testing, and is sufficient to assume geological and quality continuity between points of observation where data and samples are gathered.

Measured Mineral Resource - that part of a Mineral Resource for which quantity, quality, densities, shape, and physical characteristics are estimated with confidence sufficient to support detailed mine planning and final evaluation of the economic viability of the deposit. Geological evidence is derived from detailed and reliable exploration, sampling and testing, and is sufficient to confirm geological and quality continuity between points of observation where data and samples are gathered.

Proved Reserve - the economically mineable part of a Measured Mineral Resource. A Proved Ore Reserve implies a high degree of certainty in the factors that influence the economic viability of the resource.

Stated Policy Scenario (STEPS) – an IEA World Energy Outlook scenario in which broad energy and environmental objectives (including country net-zero targets) are not automatically assumed to be met. They are implemented in this scenario to the extent that they are backed up by specific policies, funding and measures. The STEPS also reflects progress with the implementation of corporate sustainability commitments. In the STEPS, emissions from new and existing energy infrastructure lead to a long-term temperature rise of around 2.7 °C in 2100.

Sustainable Policy Scenario (SDS) - an IEA World Energy Outlook scenario in which energy sector and industrial process CO_2 emissions fall continuously over the period to 2050 from around 33 gigatonnes (Gt) in 2020 to 26.7 Gt in 2030 and 10 Gt in 2050, on course towards global net-zero CO_2 emissions by 2070. If emissions were to remain at zero from this date, the SDS would provide a 50% probability of limiting the temperature rise to less than 1.65 °C, in line with the Paris Agreement to limit global warming to well below 2 °C, preferably 1.5°C, compared to pre-industrial levels.

Coal types - coal is classified into four main types, or ranks: anthracite, bituminous, sub-bituminous, and lignite. The ranking depends on the types and amounts of carbon the coal contains and on the amount of heat energy the coal can produce. The rank of a coal deposit is determined by the amount of pressure and heat that acted on the plants over time.

Anthracite - contains 86%–97% carbon and generally has the highest heating value of all ranks of coal. Anthracite accounted for less than 1% of the coal mined in Australia in 2019.

Bituminous - contains 45%–86% carbon. Bituminous coal is the most abundant rank of coal found in Australia, and it accounted for about 86% of total Australian coal production in 2019. Bituminous coal is used to generate electricity and is an important fuel and raw material for use in the iron and steel industry.

Sub-bituminous - typically contains 35%–45% carbon, and it has a lower heating value than bituminous coal. About 5% of total Australian coal production in 2019 was sub-bituminous. Sub-bituminous coal is mostly used to generate electricity.

Lignite - contains 25%–35% carbon and has the lowest energy content of all coal ranks. Lignite is crumbly and has high moisture content, which contributes to its low heating value. Lignite accounted for 9% of total Australian coal production in 2019. Lignite is mostly used to generate electricity.

Annex E: Details of proposed NSW Coal Mining Projects – under EPBC Act consideration as at 8 July 2021

Project Name and (EPBC Reference)	Russell Vale Colliery Revised Underground Expansion Project (2020/8702)	Tahmoor South Coal Project (2017/8084)	Mangoola Continued Coal Operations Project (2018/8280)	Vickery Extension Project (EPBC 2016/7649)
1. Company	Wollongong Coal Limited/Jindal steel	SIMEC	Mangoola Coal Operations Pty Ltd (MCOPL), a subsidiary of Glencore Coal Pty Ltd	Vickery Coal Pty Ltd, a subsidiary Whitehaven
2. Project description	Proposed expansion of existing underground operations. Proposal will extract 3.7 Mt of ROM coal over 5 years Mining at a rate of no more than 1.2Mt of ROM per annum The ROM coal meets specification for unwashed coking coal	Proposed underground mine expansion will produce an additional 33 Mt of ROM coal over 10 years. Mining at a rate of up to 4 million tonnes (Mt) per annum of ROM coal.	Extension project which will provide access to 52 Mt of ROM coal over 8 years s. 47G(1)	Extension Project will account for an additional 33 Mt of ROM coal over 25 years. Approved Mine 168 Mt of ROM coal Total Production of 150 Mt of saleable coal all to be exported- 40% Thermal 60% semi soft

Project Name and (EPBC Reference)	Russell Vale Colliery Revised Underground Expansion Project (2020/8702)	Tahmoor South Coal Project (2017/8084)	Mangoola Continued Coal Operations Project (2018/8280)	Vickery Extension Project (EPBC 2016/7649)
	that would be exported as a lower ash, single product coal for use in iron and steel making. The mine has been in care and maintenance since December 2015.			coking coal (SSCC is also classified as metallurgical coal). (SSCC can also be used as premium quality thermal coal)
3. Metallurgical Coal %	84 % coking coal (16% coal rejects when washed – washing will be done by the end user in India)	90-95% coking coal	N/A	60% coking coal
4. Metallurgical coal classification **a. Hard coking Coal (mt)** **b. Soft coking coal (mt)**	100% hard coking coal Gross calorific value: 6300-7400 kcal/kg raw coal ash: 26 – 32%	100% hard coking coal Hard coking coal is expected to account for 22.6 Mt of the saleable coal output.	N/A	The Extension Project will account for an additional 33 Mt of ROM coal. There will be a reduction of approx. 10% of the Total ROM to saleable

Project Name and (EPBC Reference)	Russell Vale Colliery Revised Underground Expansion Project (2020/8702)	Tahmoor South Coal Project (2017/8084)	Mangoola Continued Coal Operations Project (2018/8280)	Vickery Extension Project (EPBC 2016/7649)
c. PCI (mt)	total sulphur: 0.42 – 0.45 ROM moisture:9-12%			coal leaving 29.7 MT of saleable coal. Using the 60/40 ratio of Metallurgical Coal Versus Thermal Coal the Estimate for coal production for the Extension Project would be Approx. 17.82 Mt of saleable semi-soft coking coal Vickery Extension ash content is lower than average ash content of Aus SSCC and all other major seabourne SSCC suppliers apart from Canada. Sulphur content at 0.4% is at lower end globally,

Project Name and (EPBC Reference)	Russell Vale Colliery Revised Underground Expansion Project (2020/8702)	Tahmoor South Coal Project (2017/8084)	Mangoola Continued Coal Operations Project (2018/8280)	Vickery Extension Project (EPBC 2016/7649)
				Indonesia and Columbia have lower ash content. Vickery Extension coal has a low sulphur content only Russia has a lower sulphur content of thermal coal globally.
5. Thermal Coal %	N/A	5-10% thermal	100% low and high ash thermal	40% (used for power generation)
6. Thermal coal quality properties: **a. Ash Content (%)** **b. Volatile Matter (%)** **c. Total Sulphur (%)**	N/A	a. Ash Content: 23% b. Volatile Matter: 25% c. Total Sulphur: 0.3% d. Calorific Value NAR: 6300(kcal/Kg)	Mangoola markets primarily two thermal coal types, a relatively low ash thermal rated at about 5,800 kcal (per kilogram) and a high ash thermal with 4,775 kcal. [Economic impact assessment page 4]	a. Ash content: 7.6% b. Volatile matter: unknown c. Sulphur: 0.4% d. Calorific Value: 6420 Kcal/kg

Project Name and (EPBC Reference)	Russell Vale Colliery Revised Underground Expansion Project (2020/8702)	Tahmoor South Coal Project (2017/8084)	Mangoola Continued Coal Operations Project (2018/8280)	Vickery Extension Project (EPBC 2016/7649)
d. Calorific Value NAR (kcal/Kg)			Low Ash: 24.8 High Ash: 16.3 Total: 41.1 ROM: 52.3 [Economic impact assessment Table 30: page 56] Yearly break down also provided in table 30	Vickery Extension thermal coal is of higher quality in terms of calorific value than country weighted averages of all other coal exporters including within Australia. (pg. 12, Ashurst Submission to IPC, 2020)
7. When mine extension will commence (life of project) **a. Timeframe for exporting the coal**	15 July 2021 (five years) a. Coal exported in September 2021 b. Coal combusted in November-	2022 (10 years) Extraction - Currently scheduled for secondary extraction (i.e. longwall extraction of coal) in September 2022. It takes 1 to 2 months for	2022 (eight years)	TBA (25 Years)

Project Name and (EPBC Reference)	Russell Vale Colliery Revised Underground Expansion Project (2020/8702)	Tahmoor South Coal Project (2017/8084)	Mangoola Continued Coal Operations Project (2018/8280)	Vickery Extension Project (EPBC 2016/7649)
b. When coal is likely to be used (combusted)	December 2021 (for the first development panel and assume remaining coal will be combusted within the 5 year life of the project)	the coal to be processed and loaded onto ships. Combustion – for the furthest customer, it would be approximately 3 months (assuming the customer uses the product relatively quickly, which Tahmoor Coal assumes they do).		
8. Emissions **a. Scope 1** **b. Scope 2** **c. Scope 3**	a. 1,419,000 t CO2-e b. 104,000 t CO2-e c. 9,600,000 t CO2-e	d. 26.7 Mt CO_{2-e} (19Mt CO2-e abated) e. 1.24 Mt CO_{2-e} f. 65.8 Mt CO_{2-e}	a. 3.25 Mt CO2-e(table 6.35 EIS) b. 402,192 t CO_{2-e} (table 6.35 EIS) c. 104.3 Mt CO_{2-e}(table 6.35 EIS)	a. 0.0 Mt CO_{2-e} (Legal Cons p52) b. 0.15 Mt CO_{2-e}(Legal Cons p52) c. 100 Mt CO_{2-e}(Legal Cons p52)

Project Name and (EPBC Reference)	Russell Vale Colliery Revised Underground Expansion Project (2020/8702)	Tahmoor South Coal Project (2017/8084)	Mangoola Continued Coal Operations Project (2018/8280)	Vickery Extension Project (EPBC 2016/7649)
9. Customer (JV/owner)	Jindal Steel and Power PTY limited (owner)	Whyalla Steel Works BlueScope's Port Kembla steelworks	Unknown	Unknown
10. Contracts in place in place with customer(s)	N/A as the mine is part of the customer's corporate structure.	Tahmoor Coal advised that the usual practice for coal mines is to secure contracts approximately one year in advance. The Tahmoor Coal mine does negotiate longer term contracts from time to time. One key customer is BlueScope Steel (Port Kembla), and the two operations are strategically close in	Unknown	Unknown

Project Name and (EPBC Reference)	Russell Vale Colliery Revised Underground Expansion Project (2020/8702)	Tahmoor South Coal Project (2017/8084)	Mangoola Continued Coal Operations Project (2018/8280)	Vickery Extension Project (EPBC 2016/7649)
		distance. This alliance is important for the ongoing viability of BlueScope Steel operations, as presented by BlueScope Steel at the IPC Hearings.		
Product Destination	Orissa India	25% domestic (South Australia and Port Kembla), 75% to international markets	81% of product coal for export to China, India, Japan, Malaysia, Philippines, South Korea, Taiwan, Vietnam 19% of product coal to go domestically (Bayswater, Liddell Power Stations)	Taiwan, South Korea, Japan

Project Name and (EPBC Reference)	Russell Vale Colliery Revised Underground Expansion Project (2020/8702)	Tahmoor South Coal Project (2017/8084)	Mangoola Continued Coal Operations Project (2018/8280)	Vickery Extension Project (EPBC 2016/7649)
11. Source of Replacement Coal and GGE Intensity of that coal	Jindal Steel advised it has no replacement option for this coal.	Tahmoor Coal advised that the Tahmoor Mine extracts premium quality coking coal from the Bulli Seam. The same coal seam is mined by South32. It is worth noting that South32 Dendrobium Mine has a limited life with approval to approximately 2024.		
7. Information sources	EPBC Act referral [link] Refence no. 2020/8702 Russell Vale Underground Expansion Project	EPBC Act referral [link] Refence no. 2017/8084 NSW Assessment reports & EIS [link]	EPBC Act referral [link] Refence no. 2018/8280 NSW Assessment reports & EIS [link]	EPBC Act referral [link] Refence no. 2016/7649 NSW Assessment report and EIS [link]

Project Name and (EPBC Reference)	Russell Vale Colliery Revised Underground Expansion Project (2020/8702)	Tahmoor South Coal Project (2017/8084)	Mangoola Continued Coal Operations Project (2018/8280)	Vickery Extension Project (EPBC 2016/7649)
	public environment report [link] The NSW State Assessment report [link] Documents provided as part of the NSW assessment [link]	Independent Planning Commission site [link]	Independent Planning Commission site [link] EIS Appendix 25 – Glencore Position on Climate Change [link] EIS Appendix 22 – Greenhouse Gas and Energy Assessment [link]	Independent Planning Commission site [link] Ashurst Submission to IPC – Consideration of Greenhouse Gas Emissions and Climate Change (16 June 2020). [link]

1

RUSSELL VALE COLLIERY

AIR QUALITY AND GREENHOUSE GAS MANAGEMENT PLAN

RVC EC PLN 014

Revision history

PROPERTY	NAME
Approved by	
Document Owner	Richard Sheehan
Effective Date	

Revisions

VERSION	DATE REVIEWED	REVIEW TEAM (CONSULTATION)	NATURE OF THE AMENDMENT
1	22/02/2021	EMM Consulting Pty Ltd	Draft Air Quality and Greenhouse Gas Management Plan
2	29/03/2021	EMM Consulting Pty Ltd	Final Air Quality and Greenhouse Gas Management Plan
3	20/04/2021	EMM Consulting Pty Ltd	Final Air Quality and Greenhouse Gas Management Plan
4	26/05/2021	EMM Consulting Pty Ltd	Final Air Quality and Greenhouse Gas Management Plan
5	18/06/2021	EMM Consulting Pty Ltd	Final Air Quality and Greenhouse Gas Management Plan
6	24/06/2021	Wollongong Coal Ltd	Final Air Quality and Greenhouse Gas Management Plan

Contents

Table of Figures

2 INTRODUCTION

2.1 Overview

This Air Quality and Greenhouse Gas Management Plan has been prepared by EMM Consulting Pty Limited (EMM) on behalf of Wollongong Coal Limited (WCL) for the underground expansion of the Russell Vale Colliery, in accordance with the conditions of the approval. This document is generally referred to hereafter as the 'Management Plan'.

This Management Plan, including a review of the existing monitoring program and trigger action response plan (TARP), has been prepared by EMM's National Technical Leader for air quality, Scott Fishwick and Associate Director, Dr Paul Boulter. Scott and Paul have over 15 years' and 25 years' experience respectively in air quality consulting and specialise in air pollution emission estimation, atmospheric dispersion modelling, air quality impact assessments, meteorological processes, ambient air quality and meteorological monitoring and management plans.

2.2 Project background

Wollongong Coal Limited (WCL) operates the Russell Vale Colliery (formerly the NRE No.1 Colliery) in the Southern Coalfield of New South Wales (NSW). Russell Vale Colliery is an underground coal mine located at Russell Vale, approximately 8 km north of Wollongong and 70 km south of Sydney, within the local government areas (LGAs) of Wollongong and Wollondilly.

The Colliery which has been on 'care and maintenance' since 2015. WCL successfully sought Approval under the *Environmental Planning and Assessment Act 1979* (EP&A Act) to expand the mining operations at the Colliery; this ongoing application is referred to as the Underground Expansion Project (UEP). The UEP has recently been approved under the EP&A Act by the Independent Planning Commission (IPC).

Mining as has been undertaken at Russell Vale Colliery since the 1880s. Continuous mining has been a feature since 1887 and surface facilities have operated at the Russell Vale site since this time. With the advent of more sophisticated mining methods in the 1960s, workings progressed further west of the Illawarra Escarpment. Subsequently, four ventilation shafts (Shaft Numbers 1, 2, 3 and 5) and a shaft to provide personnel and materials access to the workings (No. 4 Shaft) were sunk to the west of the escarpment.

Mining has occurred in three seams, the Bulli Seam, Balgownie Seam and the Wongawilli Seam. The Balgownie seam is located approximately 10 metres (m) below the Bulli Seam and the Wongawilli Seam is located approximately 20 m below the Balgownie Seam. All three seams outcrop along the Illawarra Escarpment and the seams are accessed by adits1 directly into the seams. There are two main mining areas within the Russell Vale Colliery lease area, which are referred to as Wonga East and Wonga West. In the Wonga East area, the Bulli Seam and Balgownie Seam have largely been fully extracted. The existing and proposed workings are contained within Consolidated Coal Lease 745 (CCL745) and Mining Lease 1575 (ML1575).

The Colliery Pit Top is located at the base of the Illawarra Escarpment above the suburb of Russell Vale (refer to Figure 1.1). The Pit Top facilities occupy an area of approximately 100 hectares (ha) at the eastern extent of the Colliery holdings. The site is accessed via a private driveway from the Princes Highway at a signalised intersection with Bellambi Lane. Coal has historically been hauled from Russell Vale Colliery to Port Kembla Coal Terminal (PKCT) by truck, via Bellambi Lane and Memorial Drive.

The original UEP application submitted by Gujarat NRE Coking Coal Ltd in 2009 involved a substantial expansion of longwall mining in the Wongawilli Seam across the Wonga East area (a total of 11 longwall panels) and Wonga West area (a total of seven longwall panels) to extract 31 million tonnes (Mt) of run-of-mine (ROM) coal over a project life of 18 years. In response to concerns from the public and government agencies, the original UEP application was substantially revised over time to reduce the potential adverse impacts of the mine.

In order to address residual uncertainty regarding the impacts of longwall mining raised by the PAC Second Review Report, a revised mine design was developed based on a non-caving first workings mining system. The revised mine plan has been designed to be long term stable with negligible risk of pillar failure to address potential subsidence-related mining impacts on groundwater, surface water and biodiversity within the Cataract Reservoir catchment.

Changes to the Russell Vale Pit Top are also proposed to address concerns regarding potential amenity impacts to surrounding residential areas. This revised plan is referred to as the Revised Preferred Project. After a formal review process by the PAC, the Independent Planning Commission (IPC) of NSW granted a Development Consent (MP09_0013) on 8 December 2020 for the Revised Preferred Project in assessment reports, is referred to as 'the project' from here on.

The location of the project is shown in **Figure 1**, and its main features are summarised in Section 2 of this Management Plan.

2.3 Surface Facilities

2.3.1 Colliery Pit Top Facilities

The Pit Top is located on the lower slopes of the Illawarra Escarpment, adjacent to the suburbs of Russell Vale and Corrimal, occupies an area of approximately 100 ha's and includes coal handling, processing, storage and transport facilities, a mine water management system, mine entry adits, workshops and administration buildings.

Upgrades to the existing surface infrastructure will be undertaken in accordance with the Revised Preferred Project approval MP09_0013 under the NSW EP&A Act. These upgrades include the following:

- Redesign of the Pit Top layout to reduce amenity impacts.
- Construction of a coal processing plant and associated infrastructure to improve coal quality. This plant will comprise a coal sizing plant that will remove reject rock material using dry separation methods.
- Additional noise mitigation works, including extension and construction of bunds and noise walls.

Works associated with the planned upgrade are all located within the existing disturbance footprint of the Colliery, and within the boundary and capacity of the approved Pit Top surface water management system.

2.3.2 Ventilation shaft sites

The Colliery has five shafts, four are exclusively ventilation shafts (Vent Shafts No. 1-3, 5) and one is a shaft for personnel, materials and ventilation (Vent Saft No. 4) – refer Figure 2 and Figure 3.

Figure 1 – Project location

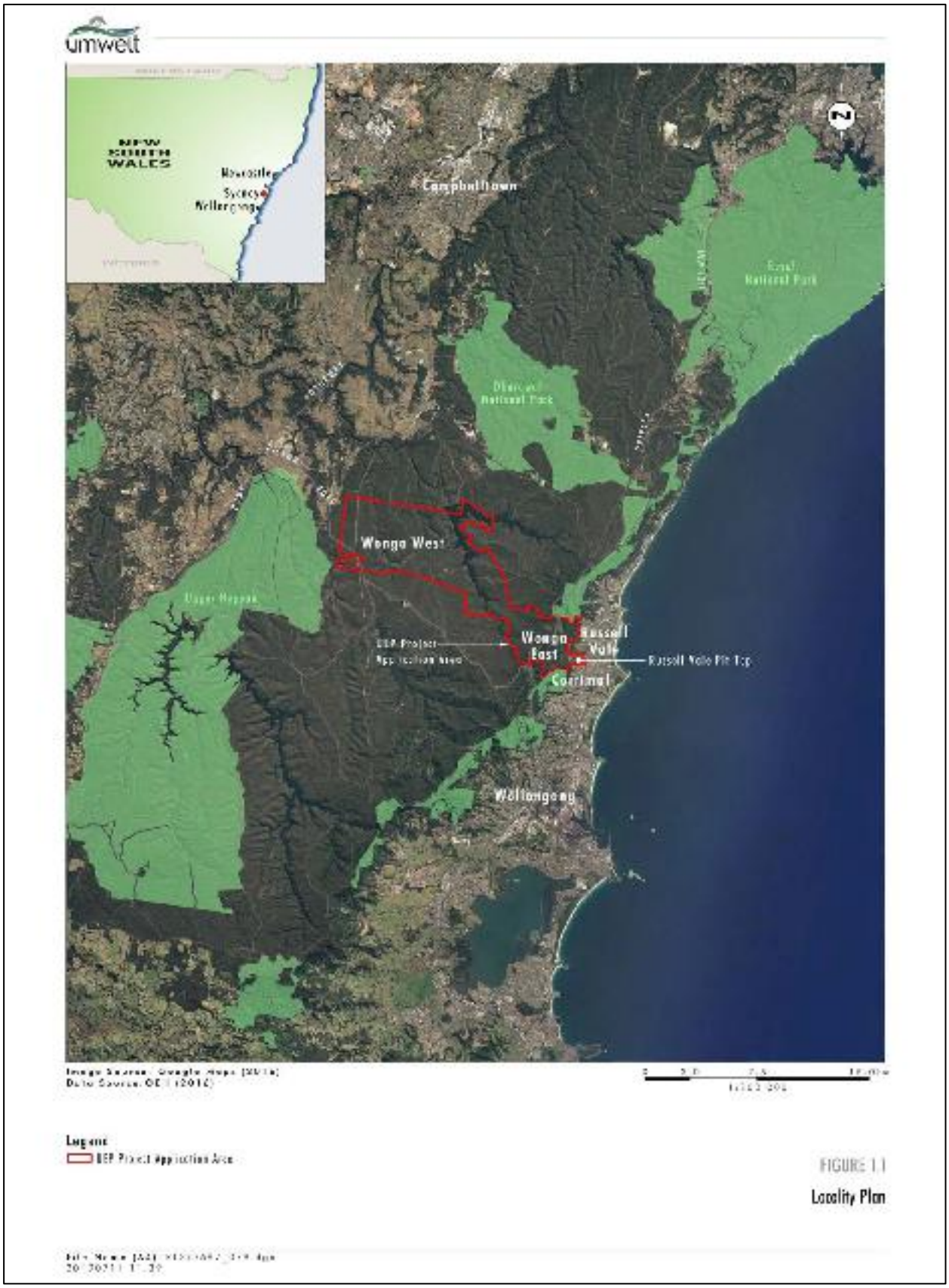


Figure 2 – Russell Vale Colliery ventilation shaft study areas (Vent shaft 1,2,3)

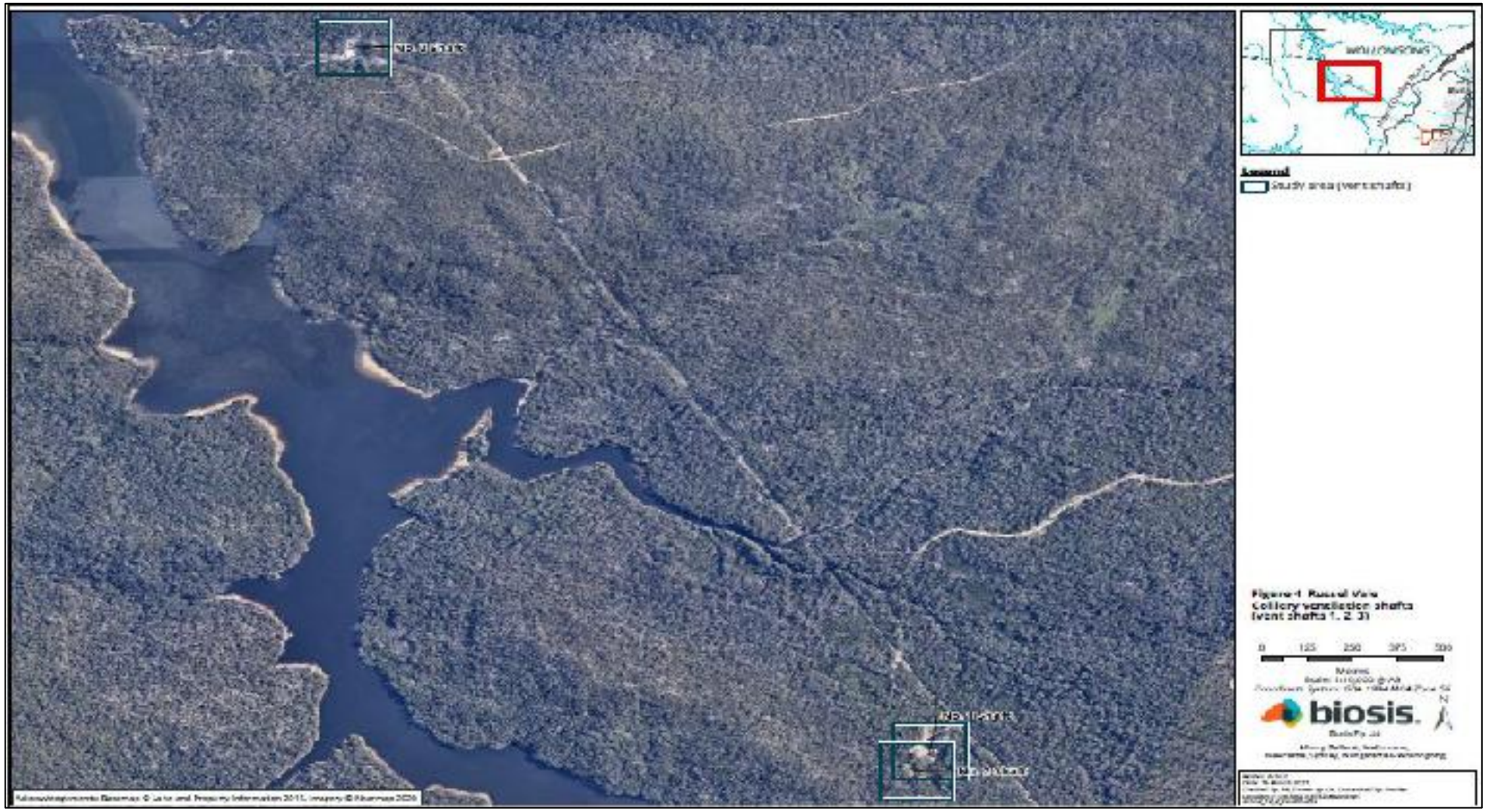


Figure 3 – Russell Vale Colliery ventilation shaft study areas (Vent shaft 4)

2.3.3 Vent Shafts No. 1, No. 2, No.3 and No. 5

Ventilation Shafts No. 1, No. 2 No. 3 and No. 5 site and associated facilities are located on CCL 745. No.1 Shaft is an upcast ventilation shaft, which allows waste air to be removed from underground workings and has a fan capacity air flow rate of 90 cubic metres per second. It provides effective ventilation for selected sections of the mine and complements the other upcast No.5 Shaft located further to the west. No.2 Shaft is an old ventilation shaft, which has been, decommissioned. No.3 Shaft is currently a downcast ventilation shaft providing clean air to the underground workings, while No.5 Shaft is an upcast ventilation shaft allowing waste air to be removed from the underground workings.

2.3.4 No. 4 Shaft

The No. 4 Shaft and associated facilities are located is approximately 10km north-west of the Colliery on a part of CCL 745. The No. 4 Shaft is used for moving men and materials between the underground workings and surface facilities. Site facilities include a winder, offices, bath-house, stores, workshop, a car parking area, water management facility, sewage treatment plant, electrical sub-station and explosives magazine.

2.4 Air Quality and Greenhouse Gas Management Plan

The purpose of the Management Plan is to provide a structured approach and best practice measures for the management of potential air quality, odour and greenhouse gas (GHG) issues that could arise during the operation of the project.

The main objectives of the Management Plan are to:

- describe how WCL will manage and control project risks associated with air quality and GHGs;
- ensure the protection of nearby sensitive receptors when carrying out the project activities;
- ensure that relevant stakeholders are involved in the formulation and implementation of this Management Plan; and
- address the requirements of applicable legislation, this approval, and statements of commitments.

The Management Plan has been prepared to address any relevant commitments or recommendations identified in the documents listed in Condition A2, including:

- the conditions of Development Consent;
- all written directions of the Planning Secretary; and
- the Revised Preferred Project Report and the project layout.

2.5 Document structure

The Management Plan is divided into sections to address specific requirements and objectives, as detailed in Table 1.2.

Table 1.1 – Structure of Management Plan

Section	Content
Section 1 Introduction	Provides the background, purpose and structure of this Management Plan, outlines the conditions of consent, document scope, as well as consultation requirements and outcomes.
Section 2 Project description	Provides a description of the project and operational activities.
Section 3 Planning requirements	Outlines compliance with legislative framework, and approvals, permits and licences required for the operation of the project, as these relate to air quality and GHG emissions.
Section 4 Consultation	Outlines consultation undertaken by WCL in preparing this management plan.
Section 5 Performance Criteria	Provides the specific criteria for air quality and GHG s in the Development Consent.
Section 6 Baseline data and potential impacts	Summarises the baseline conditions and potential impacts of the project.
Section 7 Potential impacts of the project	Outlines potential air quality and greenhouse gas impacts of the project.
Section 8 Air quality monitoring	Defines air quality and greenhouse gas monitoring and reporting.
Section 9 Air quality management	Defines specific mitigation and management strategies for air quality, including the air quality management system, monitoring and reporting.
Section 10 Greenhouse gas management	Defines specific mitigation measures for GHGs.
Section 11 Incidents, non-compliance and complaints	Describes the protocols for the handling of incidents, complaints and non-compliance with the criteria in the Development Consent.
Section 12 Plan administration	Details how the Plan will be implemented, managed, reviewed and updated.
Section 13	Details how the Plan will be reviewed and revised.

Section	Content
Review and revision of management plan	
Section 14 Records and documents	Details how environmental records and document control will be administered.
Section 15 References	Lists the documents cited in the Management Plan.
Section 16 Glossary of terms and abbreviations	Lists the terms and abbreviations cited in the Management Plan
Appendix A	Agency consultation.
Appendix B	Russell Vale Colliery - Air Quality Emissions Analysis - Stage 1
Appendix C	Trigger action response plan (TARP).
Appendix D	Mine Dust and You

3 PROJECT DESCRIPTION

3.1 Project Scheduling

The project will be implemented in stages as per below with the scope of this Plan covering all stages:

- **Stage 1** - Construction of noise walls and noise berms prior to commencement of mining operations and ramping up the production in parallel to commencing the process for construction of the surface infrastructure works and loading of the ROM coal through truck loading bins. The primary sizer which delivers on the requirements for both the identified primary and secondary sizer will be installed at this time. The previously identified secondary sizer will not be required.

  Until the truck loading bins are installed and operational ROM coal will occur from the stockpile. Once the truck loading bins are installed

  Construction of the suitable coal processing plant will also be evaluated at this stage.

- **Stage 2** - will be ramping up to full approved production to align with completion, installation and commissioning of the surface infrastructure and loading the ROM Coal through the truck loading bins.

  Production capacity noted as production rate of up to 1 million tonnes of product coal per year (equivalent to approximately 1.2 million tonnes of ROM coal per year).

3.2 Project Overview- Surface Infrastructure

The project involves a revised mine plan that has been designed to have negligible subsidence to address potential subsidence-related mining impacts on groundwater, surface water and biodiversity within the Cataract Reservoir catchment. The project also involves changes to the Russell Vale Pit Top (the Pit Top), which includes key project components (i.e., surface infrastructure) requiring construction.

The current and proposed surface infrastructure are presented in **Figure 4** and **Figure 5** respectively.

The key elements of the project are:

- mining by bord and pillar mining techniques only with the workings designed to be long-term stable with minimal subsidence impacts.
- extraction of approximately 3.7 million tonnes of Run-of-Mine (ROM) coal at a reduced production rate of up to 1 million tonnes of product coal per year (equivalent to approximately 1.2 million tonnes of ROM coal per year).
- redesign of the Pit Top layout to relocate infrastructure to more shielded locations to reduce amenity impacts.
- operation of surface facilities and product transport, typically limited to daytime hours (7.00am to 6.00pm Mondays to Friday, 8.00am to 6.00pm Saturday, no Sundays and Public Holidays), with provision for occasional operation until 10.00pm Monday to Friday to cater for unexpected port closures or interruptions.

- reduced product trucking rates relative to the previous UEP mine plan with a maximum of 17 trucks permitted per hour.
- extension to the height of existing bunds, construction of new bunds and noise walls within the existing surface infrastructure area for improved noise mitigation.
- construction of a new truck loading facility and associated conveyors.
- construction of a suitable dry coal processing plant to improve the quality of product coal removing reject rock material via use of dry separation methods will also be evaluated at this stage and if required to be installed, will be commissioned to align with the ramp up of production to 1.2Mtpa ROM.

3.2.1 Coal Handling and Processing

Stage 1 of the Operations incudes the new coal handling facilities and surface infrastructure upgrades are proposed as part of the Revised Preferred Project to improve the quality of ROM coal in order to meet market demands and to minimise impacts on the environment and local community. The proposed coal handling facilities and surface infrastructure upgrades are illustrated in **Figure 5**. will be undertaken in accordance with the UEP Project Consent under the NSW EP&A Act. The construction of the new CPP will be considered, and if determined to be feasible will be constructed post commencement of mining operations.

During this time, ROM coal will be transported from the underground workings via the existing underground conveyor system and a new primary sizer located inside an acoustically clad structure where it will be crushed to required size. This crushed coal will then be transferred to the ROM stockpile (see **Figure 5**) from where a front-end loader will load the ROM coal onto trucks to be transported to PKCT until the construction of the truck loadout facility is completed and commissioned.

Works associated with the planned upgrade are all located within the existing disturbance footprint of the study area. The planned Upgrades to the existing surface infrastructure within the study area (**Figure 4**) are shown on **Figure 5** and include the following:

- Stage 2 comprises full production operations when the new coal handling facilities and associated infrastructure is fully operational. Up to 1.2 million tonnes per annum (Mtpa) ROM coal will be transported from the underground workings via the existing underground conveyor system and primary sizer. The production process comprising:
    - From the ROM Coal stockpile, coal will be fed into an existing underground coal reclaim using a dozer.
    - Coal will be transferred to the new surge bin by conveyor. From this point the ROM Coal is transferred to the Truck Loading Bin and loadout facilities. (See **Figure 5**) or the CPP if installed.
        - The requirement and suitability of a Coal Processing Plant will be evaluated and if feasible, will comprise a dry separation process. No washing of coal will occur on site.
        - If the CPP is utilised Product coal will then be transferred to Truck Loading Bin from where it will be either loaded onto road trucks for transportation to PKCT or transferred to the product stockpile area for temporary stockpiling (see Figure 5) as may be required from time to time for such occasions as

delays or closure at the PKCT. Coal from this stockpile will be loaded from the clean coal stockpile onto road trucks by front end loader.

- During operation of the CPP (if installed) the rocky material that is generated will be transferred to a rejects stockpile by the rejects conveyor (see **Figure 5**). From the CPP the reject material will be either used in site rehabilitation or transferred to the mine portal and emplaced underground.

3.2.2 Reject Material Handling

Following commissioning of a suitable CPP, it is anticipated that approximately 0.2 Mtpa of reject material will be produced at full production. Reject material consisting of rock material from the CPP will be transferred via the rejects conveyor to the reject stockpile (see Figure 5).

Beneficial reuse would be dependent on further application and or approval, whilst Underground emplacement would only be carried out if testing determines the material to be suitable – see RVC Waste Management Plan.

Reject material that after suitable testing meets the specifications (see Waste Management Plan *RVC ENV PLN 033*) are hauled back to the mine portal via the internal haul road (see **Figure 5**) for emplacement underground.

3.2.3 Coal Stockpiling

Three main coal stockpiles will operate within the Pit Top operational area, these being the main ROM stockpile (30,000 tonne (t) capacity), product stockpile (14,000 t capacity) and proposed temporary rejects stockpile (1,500 t capacity).

3.3 Vent Shafts

The vent shafts as described in the description of the surface facilities in Section 1.3.2 continue to be subject to ongoing maintenance of ventilation shafts, water and electrical facilities. Their baseline condition is described in the '*Baseline*' section of this management plan.

3.4 Construction Activities

Construction of the proposed Pit Top upgrades as detailed below will commence prior to commencement of mining operations.

- Noise and Visual mitigation measures. Note that minor changes as have been made to the noise barrier design since the Project Approval have been incorporated in the noise management strategy: [1]
    - New 5 m high noise wall along the northern boundary of the site starting from the Princes Highway entrance to the old Broker Street site gates.
    - New 5 m high noise barrier along the site access road on top of Bund 1
    - Extension/raising of existing bunds around the Pit Top using material won onsite or imported clean fill material as follows:

[1] Note: details of these changes to that described in RPPR with regard to the noise mitigation measures are detailed in the Noise Management Plan (**see WCL EMS Figure 6**).

- Bund 2 will be raised and extended to reach Reduced Level (RL) of 56 m throughout its length.
- Bund 3 will be raised and extended to reach an RL of 47 m throughout its length.
- Bund 4 will be raised by 4-5 m to reach an RL of 44 m throughout its length.
- Bund 5 will be raised by additional 3 m throughout its length and extended to the south to the access road.

- Installation of a primary sizer located inside an acoustically clad structure to crush the ROM coal to required size. This crushed coal will then be transferred to the ROM stockpile by the existing RV1 conveyor.
- Establishment of a new conveyor system for transferring coal from the underground reclaim bin to the new truck loading surge bin and or coal processing plant.
- A new truck loading surge bin, loadout infrastructure, and associated conveyors,
- A truck haulage access route and truck parking bay.
- The requirement for a new dry coal CPP will be evaluated and if feasible constructed.
- New rejects conveyor and establishment of temporary reject stockpile area as part of the CPP if constructed.

These construction activities will be managed via the RVC Construction Environmental Management Plan (CEMP) (see Figure 6).

3.4.1 Bellambi Gully Creek

The RPPR describes proposed Bellambi Gully Creek realignment works as being a part of a modification to the previous project consent MP10_0046, i.e., MOD 4. The Modification was subsequently withdrawn, and the project was included in the UEP major project application. Subsequent to the issue of the RPPR in July 2019, and the UEP Additional Information Response Report in June 2020, on 23 July 2020 WCL was issued with an enforcement order by DPIE in relation to the replacement of the underground section of Bellambi Gully pipe. Generally the order requires WCL to engage a suitably qualified independent licensed engineer to develop detailed plans for the replacement of the underground pipe section of Bellambi Gully Creek with a suitably designed and engineered open channel, generally in accordance with the design parameters outlined in *Cardno 2020 Phase 1 and 2 Bellambi Gully Flood Assessment Proposed Stormwater Diversion Drain*.

As a result of and in compliance with this order the detailed design for Bellambi Gully Diversion and associated site water management system improvements was completed in late 2020 with works commencing onsite post approval of the Construction Management Plan (CMP) by DPIE in April 2021. The construction works associated with the construction of the new diversion channel and associated site water management system improvements are reasonably expected to be completed by November 2021 are addressed in the Bellambi Gully Creek Diversion CMP. The operation of this new channel once completed in accordance with the DPIE order will be detailed in a specific maintenance plan inclusive of an implementation plan which would be included as appropriate in the RV Surface Operations Water Management Plan. This is shown in the context of the site EMS in Figure 6.

3.5 Rehabilitation

WCL intends to continue use of the site post the 5-year term of this MP09_0013 Consent. As a result, decommissioning and closure of the Russell Vale Colliery Pit Top facilities are not proposed following the completion of the UEP project.

Rather, if required pending the completion of the 5-year term of the current approval if there are delays to expected future planning assessment process such that mining operations are required to cease the site would be maintained in care and maintenance capacity until such time as a planning consent for mining operations is obtained. If consent for continuing use of the site is at the times not anticipated to be forthcoming, WCL will prepare and implement a detailed mine closure and rehabilitation plan in consultation with the Resources Regulator and other relevant government agencies and stakeholders.

For this project term of 5 years from the date of commencement of mining operations, the existing rehabilitation and mine closure strategy outlined in the current Russell Vale Colliery Rehabilitation Management Plan or its equivalent Mine Operations Plan, and generally in accordance with the Rehabilitation Objectives detailed in Table 5 of the Development Consent.

WCL will continue to progressively rehabilitate and decommission non-critical infrastructure as they are phased out of operations or become non-critical to potential future land use options at the Colliery. This will be further detailed in the Rehabilitation Management Plan or combined with the Mining Operations Plan as detailed in the RVC EMS (see Figure 6 of that document**)** and in accordance with **Condition B44.**

3.6 Environmental Duty of Care

WCL will implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the construction and operation of the project, and any rehabilitation required under the consent.

Figure 4 - Existing Russell Vale Colliery Pit Top

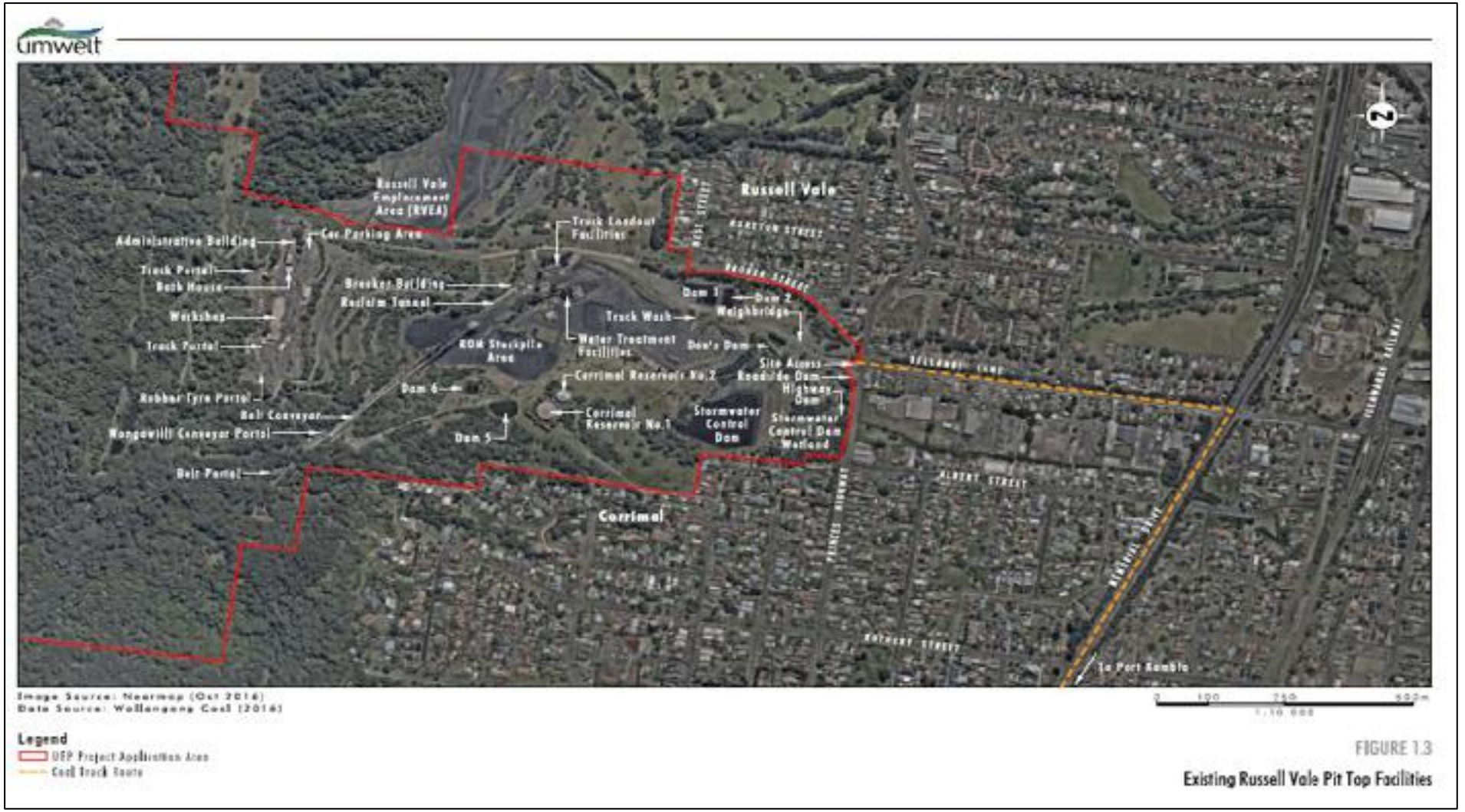
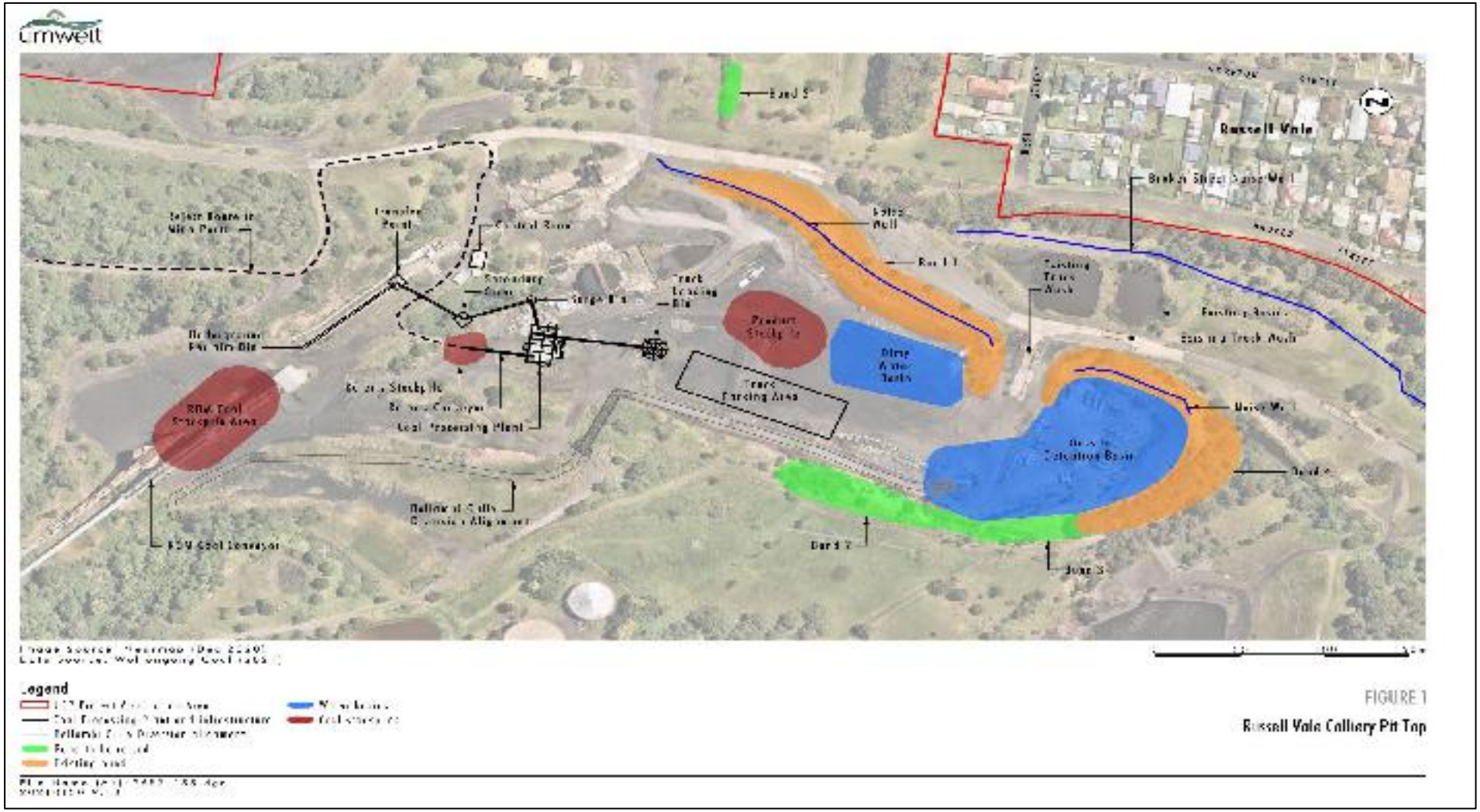


Figure 5 – Existing and proposed plant and infrastructure



Source: Umwelt 2021

4 PLANNING REQUIREMENTS

4.1 Environmental Management Strategy

Wollongong Coal has formalised an Environmental Management Strategy (EMS) for Russell Vale Colliery. The EMS provides a framework to ensure that activities at Russell Vale Colliery are undertaken in an environmentally responsible manner, and are in general accordance with the following:

- The Development Consent for the project.
- ISO14001 Environmental Management Standard.
- Legislative and other requirements.

The structure of the EMS is summarised in Figure 1.2. The EMS is implemented, managed and updated as required, most recently in accordance with the Russell Vale Underground Expansion Project major project approval MP09_0013 ('the approval') (Wollongong Coal 2021a).

The Development Consent, Schedule 2, Condition B9 contains a requirement for an Air Quality and Greenhouse Gas Management Plan which is required to address the detailed requirements in Conditions B6, B7, and B8. The Management Plan is one component of a larger suite of operational environmental management documents for the project. Figure 6 shows the position of the Management Plan in the EMS, as well as other key operational environmental management and monitoring programs.

4.2 UEP Development Consent

The scope of the Management Plan is defined largely by the Development Consent. Conditions B9 and B10 of the Development Consent stipulate the requirements of the Management Plan itself. Table 3.1 identifies the key conditions in the Development Consent and indicates where each one is addressed in the Management Plan in addition to the Statements of Commitments.

Table 3.1 – Requirements for inclusion in this Plan

Section of Development Consent and requirement	Section of Management Plan
Condition A1 – Obligation to Minimise Harm to the Environment *In addition to meeting the specific performance measures and criteria established under this approval, the Applicant must implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the construction and operation of the project, and any rehabilitation required under this consent."*	Section 2, Section 9, Section 10
Condition A2 – Terms of the Consent *The development may only be carried out:* *(a) in compliance with the conditions of this consent;* *(b) in accordance with all written directions of the Planning Secretary; and*	Section 3

Section of Development Consent and requirement	Section of Management Plan
(c) generally in accordance with the RPPR and the Development Layout.	
***Condition A20* – Evidence of Consultation** Where conditions of this consent require consultation with an identified party, the Applicant must: *(a) consult with the relevant party prior to submitting the subject document; and* *(b) provide details of the consultation undertaken including:* *i. the outcome of that consultation, matters resolved and unresolved; and* *details of any disagreement remaining between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.*	Section 4
Condition A21 – Staging, Combining, and Updating strategies, plans, or programs. With the approval of the Planning Secretary, the Applicant may: a) prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program); b) combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined); and update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this approval are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development).	Section 1, Section 7
Condition A27 Operation of Plan and Equipment. The Applicant must ensure that all plant and equipment used at the site is: (a) maintained in a proper and efficient condition; and (b) operated in a proper and efficient manner.	Section 1, Section 9, Section 10
Condition A28 – Compliance The Applicant must ensure that all of its employees, contractors (and their sub-contractors) are made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development.	Section 11, Section 12

Section of Development Consent and requirement	Section of Management Plan
Air Quality and Greenhouse Gas Management Plan	
Condition B6 **Odour** The Applicant must ensure that no offensive odours, as defined under the POEO Act, are emitted from the site.	Section 6 and Appendix C
Condition B7 **Air Quality Criteria** The Applicant must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate emissions generated by the development do not cause exceedances of the criteria listed in Table 2 at any residence on privately-owned land. **Table 2 of the Development Consent is recreated in Section 4.1 of this Management Plan.*	Section 9
Condition B8 **Air Quality Operating Conditions**	
The Applicant must: (a) take all reasonable steps to: (i) minimise odour, fume and particulate matter (including PM_{10} and $PM_{2.5}$) emissions of the development, paying particular attention to minimising wheel-generated haul road emissions (including but not limited to mitigation measures at coal transfer points, eg concealment of coal drops to minimise particulate matter, where practicable);	Section 9
(ii) eliminate or minimise the risk of spontaneous combustion;	Section 9
(iii) improve energy efficiency and reduce Scope 1 and Scope 2 greenhouse gas emissions of the development;	Section 10
(iv) minimise any visible off-site air pollution generated by the development; and	Section 9
(v) minimise the extent of potential dust generating surfaces exposed on the site at any given point in time.	Section 9
(b) ensure that major mobile diesel mining equipment used in undertaking the development includes reasonable and feasible diesel emissions reduction technology;	Section 9
(c) operate a comprehensive air quality management system that uses a combination of meteorological forecasts, predictive air quality modelling and real-time monitoring to guide the day to day planning of mining operations and the implementation of both proactive and reactive air quality mitigation measures to ensure compliance with the relevant conditions of this consent;	Section 9
(d) minimise air quality impacts of the development during adverse meteorological conditions and extraordinary events (see Note c to Table 2 above);	Section 9

Section of Development Consent and requirement	Section of Management Plan
(e) carry out regular air quality monitoring to determine whether the development is complying with the relevant conditions of this consent; and	Section 8 and Section 9
(f) regularly assess meteorological and air quality monitoring data, and modify operations on the site to ensure compliance with the relevant conditions of this consent.	Section 8 and Section 9
Condition B9 **Air Quality and Greenhouse Gas Management Plan** The Applicant must prepare a detailed Air Quality and Greenhouse Gas Management Plan for the development to the satisfaction of the Secretary. This plan must: (a) be prepared by a suitably qualified and experienced person/s; (b) prepared in consultation with EPA, NSW Health and the CCC; (c) be approved by the Secretary prior to the commencement of the mining operations under this consent; (d) describe the measures that would be implemented to ensure: (i) compliance with the air quality criteria and operating conditions in this consent; (ii) greenhouse gas emissions generated by the development do not exceed the criteria listed in Table 3*; (iii) best practice management is being employed (including in respect of minimisation of greenhouse gas emissions from the site and energy efficiency) to: • minimise the development's air quality impacts; • minimise the development's Scope 1 and 2 greenhouse gas emissions; and • improve the development's energy efficiency. (iv) the air quality impacts of the development are minimised during adverse meteorological conditions and extraordinary events; (e) describe the air quality management system in detail; and (f) include an air quality monitoring program undertaken in accordance with the Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (NSW DEC 2007), that: (i) uses monitors to evaluate the performance of the development against the air quality criteria in this consent and to guide day to day planning of operations; (ii) adequately supports the air quality management system; and (iii) includes a protocol for identifying an air quality incident and notifying the Department and relevant stakeholders of these events.	Section 9, Section 10 and Appendix C
Condition B10 **Air Quality and Greenhouse Gas Management Plan** The Applicant must implement the Air Quality and Greenhouse Gas Management Plan as approved by the Secretary.	Section 1

Section of Development Consent and requirement	Section of Management Plan
Condition B11 **Meteorological Monitoring** Prior to commencing construction under this consent and for the remaining life of the development, the Applicant must ensure that there is a suitable meteorological station operating in the vicinity of the site that: (a) complies with the requirements in the Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (NSW DEC 2007); (b) is capable of continuous real-time measurement of wind speed, wind direction sigma theta and temperature; and (c) is capable of measuring meteorological conditions in accordance with the Noise Policy for Industry (NPfI); unless a suitable alternative is approved by the Planning Secretary following consultation with the EPA.	Section 8
Condition E1 **Notification of Exceedances** As soon as practicable, and no longer than 7 days after obtaining monitoring results showing: (a) an exceedance of any relevant criteria in PART B of this consent, the Applicant must notify affected landowners in writing of the exceedance, and provide regular monitoring results to these landowners until the development is again complying with the relevant criteria; and (b) an exceedance of any relevant air quality criteria in PART B of this consent, the Applicant must also provide to any affected landowners and tenants a copy of the fact sheet entitled "Mine Dust and You" (NSW Health 2017).	Section 11
Condition E2 **Independent Review** If an owner of privately-owned land considers the development to be exceeding the relevant criteria in PART B or PART C of this consent, then he/she may ask the Secretary in writing for an independent review of the impacts of the development on his/her land.	Section 13
Condition E3 **Independent Review** If the Planning Secretary is not satisfied that an independent review is warranted, the Planning Secretary will notify the landowner in writing of that decision, and the reasons for that decision, within 28 days of the request for a review.	Section 13

Section of Development Consent and requirement	Section of Management Plan
Condition E4 **Independent Review** If the Planning Secretary is satisfied that an independent review is warranted, within 3 months, or other timeframe agreed by the Planning Secretary and the landowner, of the Planning Secretary's decision, the Applicant must: (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Planning Secretary, to: (i) consult with the landowner to determine their concerns; (ii) conduct monitoring to determine whether the development is complying with the relevant criteria in Part B and Part C; and (iii) if the development is not complying with the relevant criterion, identify measures that could be implemented to ensure compliance with the relevant criterion; and (b) give the Planning Secretary and landowner a copy of the independent review.	Section 13
Condition E5 **Independent Review** The Applicant must then comply with any written requests made by the Planning Secretary to implement any findings of the review and in accordance with any timeframes specified.	Section 13

4.3 Management Plan Commitments

A number of other requirements of the Development Consent are also of relevance to the Management Plan.

Table 3.2 identifies the key conditions in the Development Consent and indicates where each one is addressed in the Management Plan in addition to the Statements of Commitments.

Table 3.2 – Management plan commitments

Section of Development Consent and requirement	Section of Management Plan
Condition F4 **Adaptive Management** The Applicant must assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in this consent. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation, notwithstanding offsetting actions taken. Where any exceedance of these criteria and/or performance measures has occurred, the Applicant must, at the earliest opportunity: (a) take all reasonable and feasible steps to ensure that the exceedance ceases and does not re-occur; (b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action;	Section 11

Section of Development Consent and requirement	Section of Management Plan
(c) within 14 days of the exceedance occurring, submit a report to the Secretary describing these remediation options and any preferred remediation measures or other course of action; and (d) implement remediation measures as directed by the Planning Secretary; to the satisfaction of the Secretary.	
Condition F5 **Management Plan Requirements** Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	
(a) a summary of relevant background or baseline data;	Section 6
(b) details of: (i) the relevant statutory requirements (including any relevant consent, licence or lease conditions); (ii) any relevant limits or performance measures and criteria; and	Section 3
(iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	Section 5
(c) any relevant commitments or recommendations identified in the document/s listed in condition A2;	Section 1
(d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	Section 5, 8 and 9
(e) a program to monitor and report on the: (i) impacts and environmental performance of the development; and (ii) effectiveness of the management measures set out pursuant to condition F5(c);	Sections 8 and 9
(f) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	Sections 8, 9 and 11
(g) a program to investigate and implement ways to improve the environmental performance of the development over time;	Sections 8 and 9
(h) a protocol for managing and reporting any: (i) incident, non-compliance or exceedance of any impact assessment criterion or performance criterion; (ii) complaint; or (iii) failure to comply with other statutory requirements;	Section 11
(i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and	Section 1
(j) a protocol for periodic review of the plan.	Section 13
Condition F6 **Management Plan Requirements**	-

Section of Development Consent and requirement	Section of Management Plan
The Applicant must ensure that management plans prepared for the development are consistent with the conditions of this consent and any EPL issued for the site.	
Condition F7 **Revision of strategies, Plans and Programs** Within three months of: (a) the submission of an incident report under condition F9; (b) the submission of an Annual Review under condition F11; (c) the submission of an Independent Environmental Audit under condition F13; or (d) the approval of any modification of the conditions of this consent (unless the conditions require otherwise). The suitability of existing strategies, plans and programs required under this consent must be reviewed by the Applicant.	Section 13
Condition F8 **Revision of strategies, Plans and Programs** If necessary, to either improve the environmental performance of the development, cater for a modification or comply with a direction, the strategies, plans and programs required under this consent must be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document must be submitted to the Planning Secretary for approval within 6 weeks of the review. ***Note**: This is to ensure strategies, plans and programs are updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the development.*	Section 13
Condition F9 **Incident Notification** The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must identify the development (including the development application number and name) and set out the location and nature of the incident.	Section 11
Condition F10 **Non-Compliance Notification** Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must set out the condition of this consent that the development is noncompliant with, why it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. Note: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.	Section 11

Section of Development Consent and requirement	Section of Management Plan
Condition F11 **Annual review** By the end of March each year after the commencement of the development under this consent, or other timeframe agreed by the Planning Secretary, a report must be submitted to the Department reviewing the environmental performance of the development, to the satisfaction of the Planning Secretary. This review must: (a) describe the development (including any rehabilitation) that was carried out in the previous calendar year and the development that is proposed to be carried out over the current calendar year; (b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the: (i) relevant statutory requirements, limits or performance measures/criteria; (ii) requirements of any plan or program required under this consent; (iii) monitoring results of previous years; and (iv) relevant predictions in the document/s listed in condition A2(c); (c) identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid recurrence; (d) evaluate and report on: (i) the effectiveness of the noise and air quality management systems; and (ii) compliance with the performance measures, criteria and operating conditions of this consent; (e) identify any trends in the monitoring data over the life of the development; (f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and (g) describe what measures will be implemented over the next calendar year to improve the environmental performance of the development.	Section 13
Condition F12 **Annual Review** Copies of the Annual Review must be submitted to WCC, WSC and made available to the CCC and any interested person upon request.	Section 13

4.4 Statements of Commitment

A number of other requirements of the Development Consent are also of relevance to the Management Plan.

Table 3.3 identifies the Statement of Commitments and indicates where each one is addressed in the Management Plan.

Table 3.3 – Statement of Commitment

Statement of Commitment	Notes
WCL will review and update the existing Russell Vale Colliery Air Quality and Greenhouse Gas Management Plan and implement the updated plan for the Revised Preferred Project. The Air Quality and Greenhouse Gas Management Plan will detail the monitoring and management controls to be implemented to manage air quality impacts associated with the Revised Preferred Project including implementation of proactive and reactive management protocols in response to air quality trigger levels defined in the plan. Specifically, the proactive air quality management approach will include: • implementation of a system to provide the operation with a daily forecast of expected dust conditions in the vicinity of the operation. • discussion of the weather conditions and dust considerations at daily pre-shift meetings. • modifying or suspend the planned activities, as appropriate, to minimise dust impacts. Reactive air quality management will include the modification or suspension of activities in response to the following triggers: • visual conditions, such as visible dust from trucks above wheel height. • meteorological conditions, such as dry, windy conditions, with winds blowing towards sensitive receptors, and/or • ambient air quality conditions (that is, elevated short-term PM_{10} concentrations).	Sections 8 and 9
WCL will implement a range of air quality mitigation measures and controls during operation of the Revised Preferred Project: • Enclosure of conveyors and material transfer points on conveyors. • Enclosure of Coal Processing Plant. • Water sprays on ROM stockpile. • Water carts on unsealed haul routes. • Water sprays on stockpiles and exposed areas triggered during periods of high winds. • Water sprays on the bunds during construction. • Trucks will be covered before leaving the site. • Trucks will be washed before leaving the site. • Consideration of the use of stability polymer veneer coating on long-term unworked stockpiles (>30 days) and unsealed haul routes. • Revegetation/rehabilitation of exposed disturbed areas.	Sections 8 and 9
WCL will continue to monitor PM_{10} and $PM_{2.5}$ concentrations at the two tapered-element oscillating microbalance (TEOM) monitors for the duration of their operations.	Section 8 and quarterly air quality monitoring reports
WCL will continue to investigate emerging technologies for replacement of plant and equipment during steady state operations and will report on opportunities to implement that as part of the annual review.	Sections 9 and 10
WCL commit to investigating the feasibility of mechanisms and technological processes to capture and/or re-use ventilation gases.	Section 10
WCL commit to the ongoing review of operational energy use efficiencies where commercially feasible, and will review renewable energy opportunities as new	Section 10

Statement of Commitment	Notes
technology is developed and becomes viable. WCL will report opportunities to implement as part of the annual review.	

4.5 Other approvals, permits and licences

Wollongong Coal seeks to comply with all relevant environmental legislation, approvals, and licenses. These are identified in Table 1.2 of the EMS (Wollongong Coal 2021a). Adherence to statutory requirements has been required throughout the operation of the Colliery and will continue to be applied as required.

In relation to this Management Plan, two the most relevant requirements are compliance with the Environment Protection License (EPL) and the National Greenhouse and Energy Reporting (NGER) scheme.

4.5.1 Environment Protection Licence

Russell Vale Colliery is covered by EPL, number 12040, last updated on 6 May 21019. The requirements of the EPL that are of most relevance to this Management Plan are summarised in Table 3.4. There is significant overlap between the requirements of the EPL and the requirements of the Development Consent.

Table 3.4 – Requirements of Environment Protection Licence

Section of EPL and summary of requirement	Section of Management Plan
Condition P1 – Location of monitoring Specifies the locations of monitoring for dust deposition (5 sites) and meteorology (1 site).	Section 8
Condition O3 – Dust Specifies that all operations and activities occurring at the premises must be carried out in a manner that will minimise the emission of dust from the premises.	Section 8
Condition M1 – Monitoring records Specifies that the results of any monitoring must be recorded and retained as set out in the EPL.	Section 8
Condition M2 – Monitoring concentration of pollutants discharged Requires the monitoring of dust deposition at the 5 sites identified in Condition P1 of the EPL, including ash, combustible solids and insoluble solids, and in accordance with Australian Standard 3580.10.1-2003.	Section 8
Condition M4 – Weather monitoring Requires the monitoring of rainfall at the meteorological monitoring site identified in Condition P1 of the EPL.	Section 8
Condition M5 and M6 – Recording and responding to pollution complaints Requires WCL to keep a legible record of all complaints made in relation to pollution arising from any activity to which the EPL applies, and to respond to complaints.	Section 11
Condition M8 – Other monitoring and recording conditions Requires all continuous monitoring equipment to be operated and maintained	Section 8

Section of EPL and summary of requirement	Section of Management Plan
with the aim of achieving 100% availability in each year. Where a monitoring device does not achieve 95% availability, WCL must report reasons and corrective actions to the EPA in the Annual Return.	
Condition R1 – Annual return documents Requires WCL to complete and supply to the EPA an Annual Return in the approved form.	Section 13
Condition R2 – Notification of environmental harm (incidents) WCL must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred, and provide the details specified in the EPL.	Section 11

4.5.2 National Greenhouse and Energy Reporting

WCL is a listed entity under the Australian Government's National Greenhouse and Energy Reporting (NGER) legislation. WCL has reported the annual GHG emissions from the Russell Vale Colliery since the financial year 2008/09, as required under the legislation.

The management and reporting of GHGs is addressed in Section 10of this Management Plan.

5 CONSULTATION

5.1 Consultation during the environmental assessment process

Extensive community and government consultation has been carried out prior to and during the preparation of the original environmental assessment, the Revised Project Report, the Submissions Report and other project-related assessment documentation. The primary objective of consultation was to keep the community, government agencies and other stakeholders informed and involved during project development process.

Community engagement was carried out in two phases and is summarised in Section 4.1.2 and Section 4.1.3 of the Revised Project Report.

A complete summary of previous and ongoing government agency and stakeholder consultation is provided in Table 4.5 of the Revised Project Report. Consulted parties of relevance to this Management Plan included:

- the NSW Department of Planning, Industry and Environment (DPIE);
- NSW Environment Protection Authority (EPA); and
- Community Consultative Committee (CCC).

5.2 Consultation during the preparation of the Management Plan

In accordance with Condition B9, this Management Plan has been prepared in consultation with DPIE, the EPA, NSW Health and the CCC. The consultation undertaken as part of the preparation of the Management Plan is included in Table 4.1.

Table 4.1 – Consultation undertaken as part of the preparation of this Management Plan

Agency name	Issue summary	Where issue is addressed in Management Plan
DPIE	***Air quality management***	
	Various comments on the AQGHGMP received from DPIE on 5 May and 1 June 2021.	**Resolved** See Appendix A for details.
EPA	***Air quality management***	
	Sealed internal roads will be periodically inspected for accumulation of dust and cleaned, as necessary.	**Resolved** Corresponding text added to Section 9.
	Complaints handling	
	Investigation of complaints may include on-site air quality monitoring (using a portable dust deposition gauge or photometer) at potentially affected residences in agreement with the owner.	**Resolved** Corresponding text added to Section 8.2.

Agency name	Issue summary	Where issue is addressed in Management Plan
NSW Health	***Qualifiers***	
	Avoid the use of qualifiers like 'where practical' for control measures.	**Resolved** The wording 'where practical' has been removed from appropriate control measures but has been retained in Section 9.2.1 where the practicability needs to be considered over time and on a case-by-case basis. This is the case for low-emission vehicle technologies and covered conveyors.
	Performance indicators	
	Establish the actual performance indicators that will be used to monitor or judge the performance of proactive and reactive air quality control measures.	**Resolved** Corresponding text added to Section 8.4.
	Responses to reactive measures in TARP	
	The identified reactive measures include triggers from visual or meteorological conditions. However, the actions and responses in the TARP do not include reactive controls for these triggers.	**Resolved** Corresponding text added to Appendix C to ensure consideration of the daily weather forecasts and visual observations of dust from trucks as part of the TARP. Meteorological conditions and PM concentrations are already covered by the TARP.
CCC	***Air quality management***	
	Various comments on the AQGHGMP received from CCC on 8 March 2021.	**Resolved** See Appendix A for details.

6 PERFORMANCE CRITERIA

6.1 Air quality

Condition B7 stipulates that WCL shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate emissions generated by the project do not cause exceedances of the criteria listed in Table 5.1 and Table 5.2 at any residence on privately-owned land.

Table 5.1 – Criteria for airborne particulate matter

Pollutant	Averaging period	Criterion
Particulate matter <10 µm (PM_{10})	Annual	25 µg/m^3 (a, c)
	24 hour	50 µg/m^3 (b)
Particulate matter <2.5 µm ($PM_{2.5}$)	Annual	8 µg/m^3 (a, c)
	24 hour	25 µg/m^3 (b)
Total suspended particulate (TSP)	Annual	90 µg/m^3 (a,c)

Source: MP09_0013 Condition B7, Table 2.

(a) Cumulative impact (ie increase in concentrations due to the development plus background concentrations due to all other sources).
(b) Incremental impact (ie incremental increase in concentrations due to the development alone).
(c) Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Planning Secretary.

Table 5.2 – Criteria for deposited dust

Pollutant	Averaging period	Maximum incremental increase in deposited dust(a)	Maximum cumulative deposited dust(b)
Deposited dust(c)	Annual	2 g/m^2/month	4 g/m^2/month

Source: Development Consent, Table 2.

(a) Incremental impact (ie incremental increase in concentrations due to the development alone).
(b) Cumulative impact (ie increase in concentrations due to the development plus background concentrations due to all other sources).
(c) Deposited dust is assessed as insoluble solids as defined by AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.

6.2 Greenhouse gases

Condition B9 stipulates that the Management Plan must describe the measures that would be implemented to ensure that GHG emissions generated by the project do not exceed the criteria listed in Table 5.3. GHG mitigation measures associated with the project are listed in Section 10.

Table 5.3 – Criteria for greenhouse gas emissions

Scope	Total Project GHG Emissions (t CO_2-e)
Scope 1	1,418,997
Scope 2	103,500
Source: MP09_0013 Condition B, Table 3.	

7 BASELINE DATA

7.1 Air quality

7.1.1 Baseline data

The air quality metrics associated with the operation of the project are likely to be TSP, PM_{10}, $PM_{2.5}$ and deposited dust, and odour.

An environmental monitoring network has been in place at Russell Vale Colliery since 2014, and includes monitors and gauges to measure meteorology, ambient air quality (PM_{10} and $PM_{2.5}$ using TEOMs) and dust deposition[2]. The monitoring network is described in Section 8.1 of this Management Plan.

Although the TEOMs at Russell Value Colliery are capable of measuring $PM_{2.5}$, the reporting of $PM_{2.5}$ has not historically been required for compliance purposes. It is also worth noting that particulate matter associated with coal mining activities (other than fuel combustion) have a relatively large coarse component[3]. This means that, for project-related emissions, compliance with the criteria for PM_{10} is also likely to result in compliance with the criteria for $PM_{2.5}$. From Q3 2021, $PM_{2.5}$ concentrations at Russell Value Colliery will be included in the quarterly air quality monitoring reports.

PM_{10} and $PM_{2.5}$ are also measured continuously by DPIE at Wollongong, approximately 6 km south of the project. The station is located on Gipps Street, just north of the Wollongong city centre. The Wollongong station is located so as to be broadly representative of regional background air quality and – for periods when valid data are not available from the Russell Vale Colliery monitoring network – the Wollongong data are used as a proxy for the analysis of background conditions.

TSP is not measured at either Russell Vale Colliery or Wollongong. In areas where coal mining is a significant component of the local particulate emission inventory, PM_{10} typically comprises ~40% of the TSP (SPCC 1986). Annual mean TSP concentrations at both sites have therefore been estimated based on a particle size distribution in which PM_{10} is 39.1% of TSP (SPCC 1986).

7.1.1.1 Particulate matter

The concentrations of TSP, PM_{10} and $PM_{2.5}$ at Russell Vale Colliery and Wollongong are summarised in Table 6.1. The table displays the metrics which have corresponding air quality criteria, and the corresponding values for the 10-year period between 2011 and 2020 with the criteria from the Development Consent. Each maximum 24-hour mean[4] concentration is the highest value obtained during the year.

The estimated annual mean TSP concentrations at Russell Vale Colliery were well below the corresponding criterion of 90 µg/m³ in all years.

The measured annual mean PM_{10} concentrations at Russell Vale Colliery were below the criterion of 25 µg/m³ in all years. However, the maximum 24-hour PM_{10} concentration was above the criterion of 50 µg/m³ in 2018, 2019 and 2020, and increased quite dramatically in 2019 and 2020 as a result of the extensive bushfires in NSW in late 2019 and early 2020. The monitoring data

[2] The network also measures ambient noise.

[3] Coarse particles are those between 2.5 µm and 10 µm in diameter.

[4] Based on measurements from midnight of one day to midnight of the next day.

associated with such extraordinary events are excluded when compliance with the criteria in the Development Consent is being assessed.

Table 6.1 – Concentrations of airborne particulate matter between 2011 and 2020

Year	TSP (µg/m³)[a]	PM_{10} (µg/m³)		$PM_{2.5}$ (µg/m³)	
	Annual mean	Annual mean	Maximum 24-hour mean	Annual mean	Maximum 24-hour mean
Russell Vale Colliery[b]					
2011	-	-	-	-	-
2012	-	-	-	-	-
2013	-	-	-	-	-
2014	33.1[c]/30.0[c]	12.9[c]/11.7[c]	30.0[c]/34.3[c]	-	-
2015	33.1/31.1[d]	12.9/12.2[d]	38.9/43.5[d]	-	-
2016	29.0/28.5	11.3/11.2	46.9/44.9	-	-
2017	16.8/28.5	6.6/11.1	18.6/38.6	-	-
2018	24.4/52.0	9.6/20.3	60.8/50.1	-	-
2019	34.7/47.7[e]	13.6/18.7[e]	191.5/233.4[e]	-	-
2020	18.7[f]/36.7[f]	7.3[f]/14.3[f]	110.0[f]/119.9[f]	-	-
Wollongong					
2011	43.4	17.0	48.5	4.6	17.7
2012	46.1	18.0	47.5	4.6	15.6
2013	45.1	17.6	94.3	7.8	118.7
2014	45.2	17.7	45.3	7.0	17.3
2015	43.2	16.9	45.8	7.6	31.6
2016	44.3	17.3	52.9	7.4	33.7
2017	46.3	18.1	55.2	7.1	24.7
2018	50.6	19.8	59.7	7.3	47.6
2019	57.7	22.6	117.6	9.0	81.5
2020	48.1	18.8	121.6	7.8	100.9
Criterion	**90**	**25**	**50**	**8**	**25**

(a) Estimated from PM_{10}.
(b) The first result is for TEOM 1, and the second result is for TEOM 2.
(c) TEOM 2 data for August to December only.
(d) No TEOM 2 data for March to June.
(e) TEOM 2 data for July to December only.
(f) TEOM 2 data for January to September only.

The PM_{10} concentrations measured at Russell Vale Colliery have typically been similar to, or lower than, those measured at the DPIE Wollongong site. For example, for years with good data

availability, annual mean PM_{10} concentrations at Russell Vale Colliery were between around 25% and 65% lower than those at Wollongong. With the exception of 2019, as noted above, the maximum 24-hour PM_{10} concentrations at Russell Vale Colliery were either similar to or lower than those at Wollongong.

The measured annual mean $PM_{2.5}$ concentrations at Wollongong were below the criterion of 8 µg/m³ in all years except 2019. However, the maximum 24-hour PM_{10} concentration was above the criterion of 25 µg/m³ in several years, most notably in 2019 and 2020 due to the bushfires.

7.1.1.2 Dust deposition

The average dust deposition rates (in terms of insoluble solids) at Russell Vale Colliery between 2014 and 2020 are provided in Table 6.2**.** In all years, the dust deposition levels, inclusive of all historical activities at Russell Vale Colliery, were well below the criterion for cumulative impacts of 4 g/m²/month. No public information regarding background dust deposition levels is available for the Wollongong region, and therefore the project increment is difficult to determine. However, at most locations the total deposition rates were below the incremental criterion of 2 g/m²/month.

Table 6.2 – Average dust deposition rates between 2014 and 2020

Dust gauge ID	Annual mean (insoluble solids, g/m²/month)					
	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
G1	2.5	1.2	0.9	0.8	0.3	1.7
G2	0.8	0.6	1.0	0.6	0.9	1.4
G3	1.0	0.8	0.9	0.9	1.6	2.1
G4	1.2	1.2	1.1	0.8	1.0	1.2
G5	0.9	0.6	0.8	0.9	0.7	1.5
Criterion	**4**					

7.1.1.3 Summary on air quality as representative of baseline

The data from the RVC air quality monitoring network presented in the preceding sections include a period coinciding with RVC operations followed by a period after 2015 where RVC was placed on care and maintenance. To illustrate potential trends in the data over this period, the maximum 24-hour average and annual average PM_{10} concentrations for each year as recorded by the two RVC TEOMs and the Wollongong DPIE air quality monitoring station are presented in **Figure 6** and **Figure 7** respectively.

These figures show that there is a general increasing trend in recorded concentrations between 2014 and 2020 across all three monitoring locations. As discussed previously, there was an increase in the amount of regional-scale exceptional air quality events between 2018 and 2020 due to intensifying drought conditions (associated with dust storms) followed by extensive bushfires across NSW.

There is a slight decrease in annual average PM_{10} concentrations at the RVC TEOMs between 2015 and 2017, however this is not reflected in the maximum 24-hour plot (i.e., peak particulate matter concentration events). Both **Figure 6** and **Figure 7** show a general increasing trend agreement between the two TEOMs and the Wollongong DPIE air quality monitoring station. This analysis ultimately shows that regional scale events are the primary driver to recorded

particulate matter concentrations in the local environment. Consequently, the analysed period of data presented in this report is considered representative of baseline air quality conditions in the vicinity of the RVC.

Figure 6 – Recorded maximum 24-hour average PM10 concentrations – RVC TEOMs and DPIE Wollongong stations – 2014 – 2020.

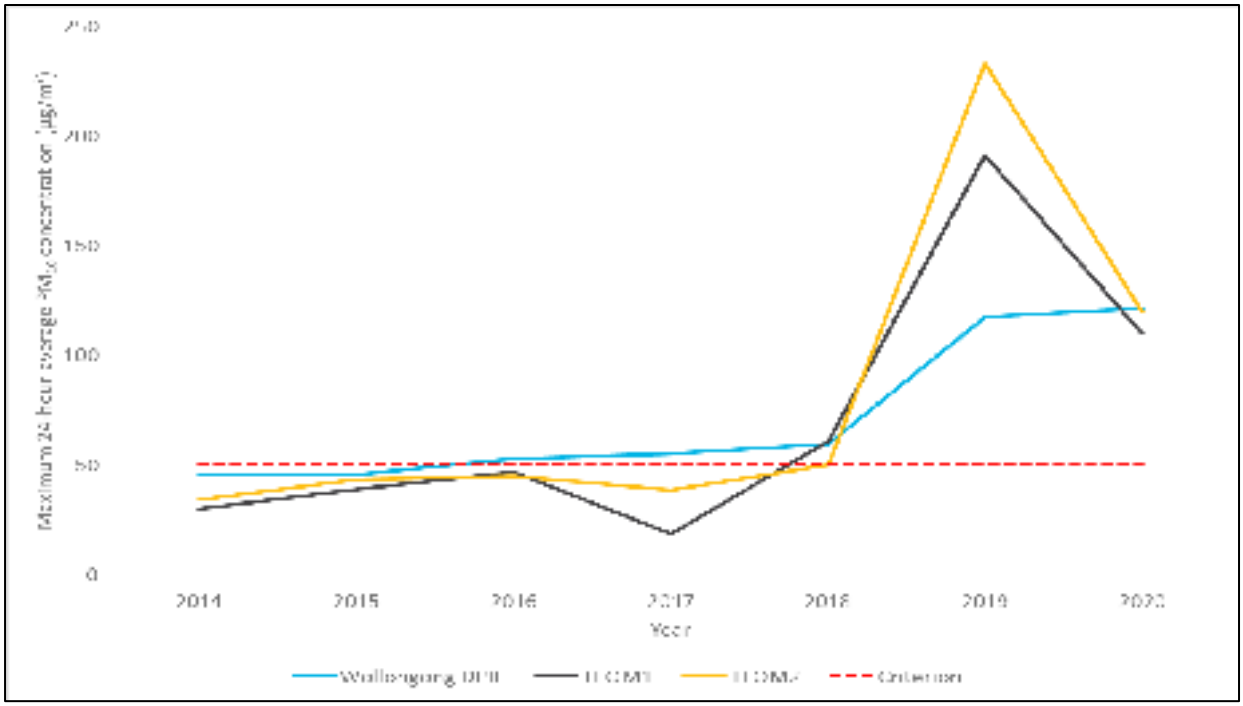
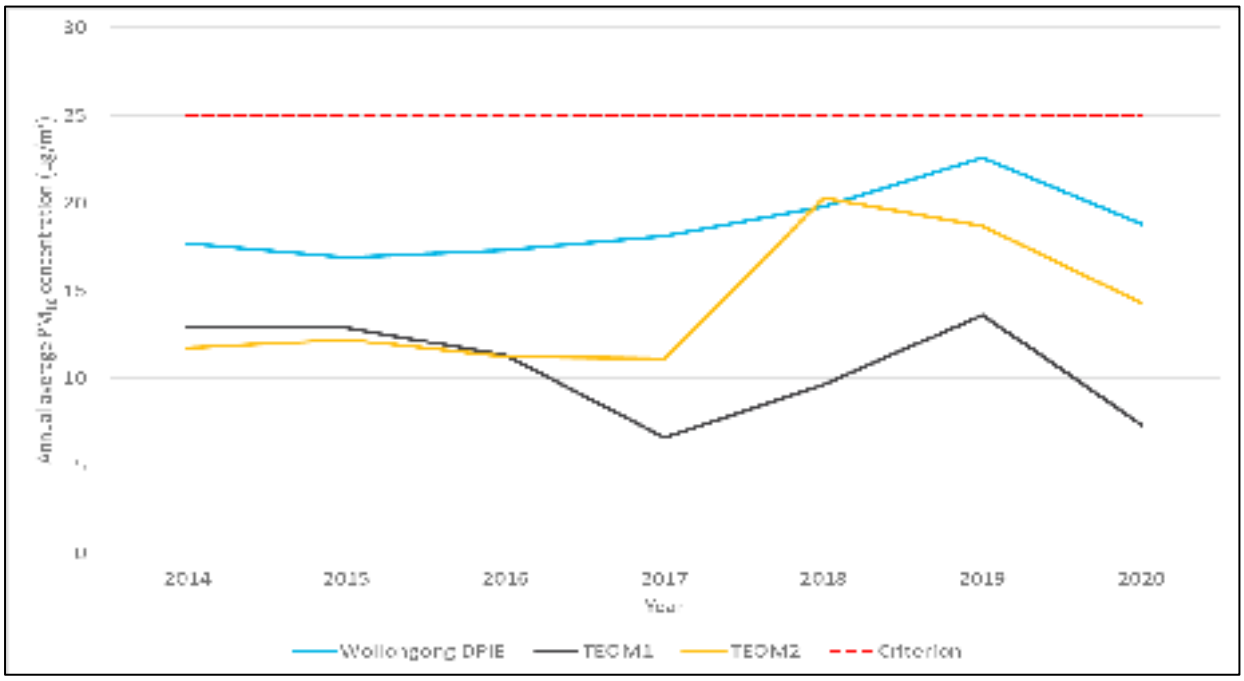


Figure 7 – Recorded annual average PM_{10} concentrations – RVC TEOMs and DPIE Wollongong stations – 2014 - 2020



This analysis illustrates that regional influences (e.g. in this case bushfires, dust storms) are key drivers to ambient air quality in the vicinity of the mine. Therefore the data presented is considered appropriate for representing background.

7.1.2 Odour

Historically odours have not been detected, and not likely to occur, at Russell Vale Colliery as the gases produced in the mine are odourless. However, if an odour is detected it will be managed through a review of the potential contributing source of emissions, and preparation and implementation of a site mitigation and an action plan as required.

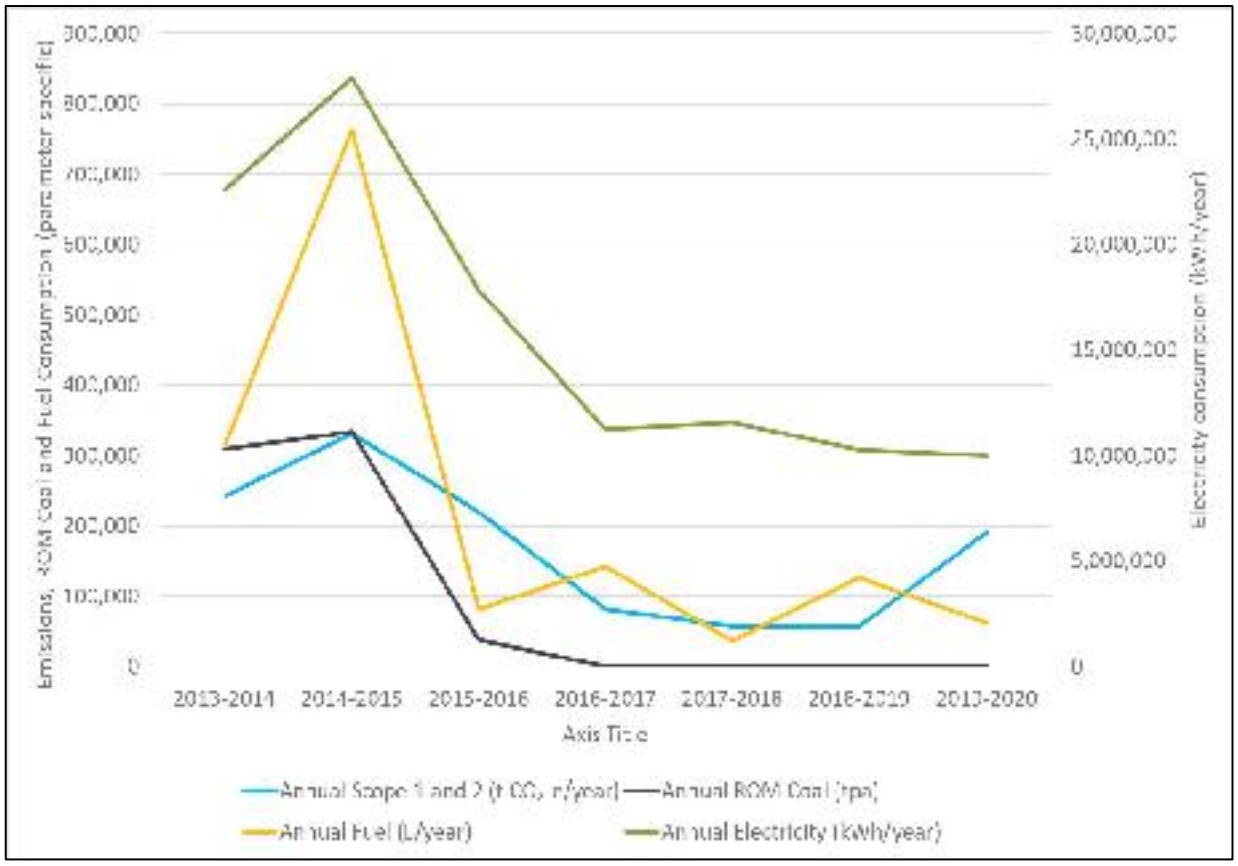
7.1.3 Fume emissions

Blast fume generation is the result of a less than optimal chemical reaction of ammonium nitrate explosives during the blasting process, resulting in the release of nitric oxide and nitrogen dioxide. No blasting is proposed at Russell Vale Colliery and therefore there is no potential for blast fume generation. Should blasting be needed in the future fume emissions would be considered and managed by the contractor.

7.2 Greenhouse gases

A graph of annual GHG emissions, ROM coal extraction and energy consumption (fuel and electricity) from the RVC for the period between 2013 and 2020 is presented in **Figure 8**. The data has been extracted from the annual NGERs reports for RVC.

Figure 8 – RVC NGERs reporting data – 2013 to 2020 - annual GHG emissions (Scope 1 and 2), ROM coal extraction, fuel consumption and electricity consumption.



Annual GHG emissions from RVC, along with annual fuel and electricity consumption, decreased after the mine was placed on care and maintenance in 2015. It is noted that annual electricity consumption and fuel consumption are projected to be lower for the preferred project due to changes in mining method leading to a reduction in equipment and energy consumption intensity.

Mine ventilation emissions data from the RVC was reviewed for the NGERs reporting years 2013-2014, 2014-2015 and 2015-2016. The methane content of the mine ventilation return air ranged from 0.1% to 0.15% across three reporting years corresponding to longwall mining operations on multiple seams.

8 POTENTIAL IMPACTS OF THE PROJECT

8.1 Construction

In accordance with Condition F5(c), the management of potential air quality and GHG issues that could arise during the construction of the project are addressed in the Construction Environmental Management Plan (CEMP) (Wollongong Coal 2021b).

8.2 Operation

8.2.1 Revised Preferred Project Report Air Quality Impact Assessment

An air quality assessment of the operational impacts of the project was carried out by ERM (2019). The assessment showed that the project operation would not have a significant impact on local air quality.

Two emission scenarios were considered:

- **Scenario 1**, which addressed the construction and phasing-in period for the new coal processing plant.

  This scenario involved ROM coal being delivered to the ROM stockpile at a rate of up to 630,000 tpa, then loaded to trucks and transported off the site without further processing via the CPP. It also included emissions associated with construction of the new CPP and noise bunds around the Pit Top.

- **Scenario 2,** which addressed full operation with the processing plant and associated infrastructure.

  This involved the new processing plant and associated infrastructure being fully operational. This scenario represented emissions at the full production rate of up to 1,000,000 tpa of product coal.

The assessment focussed on PM_{10} and $PM_{2.5}$, as well as dust deposition, with impacts relating to TSP not reported. The estimated annual emissions of PM_{10} and $PM_{2.5}$ by activity and scenario are given in Table 7.1 inclusive of reduction strategies associated with current best practice for on-site dust management. The best practice dust control measures already accounted for in the modelling results for the assessment were:

- Enclosure of conveyors and material transfer points.
- Enclosure of the coal processing plant.
- Water sprays on ROM stockpiles.
- Water carts on unsealed haul routes (it was assumed that haul roads would be watered twice per day to control dust from both spillages and vehicle movements).
- Water sprays on stockpiles and exposed areas triggered during periods of high winds.
- Trucks to be covered before leaving the site.
- Trucks to be washed before leaving the site.

These have been included as routine operational air quality management measures in Section 9.

The main sources of emissions from the project were found to include the following:

- Scenario 1
    1. Front-end loaders (FELs) loading ROM coal and berm material to trucks.
    2. Wind erosion.
    3. Bulldozers.
    4. Haulage of ROM coal on unsealed roads.
- Scenario 2
    1. Haulage on unsealed roads.
    2. Bulldozers.
    3. Wind erosion.
    4. FELs loading rejects to trucks.

Table 7.1 – Estimated annual emissions of PM_{10} and $PM_{2.5}$ by activity

Activity	Scenario 1		Scenario 2	
	PM_{10} (kg/y)	$PM_{2.5}$ (kg/y)	PM_{10} (kg/y)	$PM_{2.5}$ (kg/y)
ROM – transfer to primary sizer building	2	0.3	4	1
ROM – crushing in the primary sizer building	6	6	14	14
ROM – transfer to ROM stockpile area	168	25	404	61
ROM – dozers on ROM stockpile	645	67	1,289	133
ROM - transfer to secondary sizer building	-	-	4	1
ROM - crushing in secondary sizer building	-	-	14	14
ROM - transfer to surge bin	-	-	4	1
ROM - transfer to processing plant	-	-	7	7
ROM coal-haulage off site (unsealed road)	936	94	-	-
Clean coal - transfer to trucks for loadout	-	-	146	22
Clean coal - haulage off site (unsealed road)	-	-	1,872	187
Clean coal - transfer to emergency stockpile	-	-	14	2
Clean coal - loading from emergency stockpile with FEL	-	-	281	35
Rejects - transfer to reject stockpile	-	-	21	3
Rejects - FELs loading to trucks	-	-	1,125	139
Rejects - haulage to berms for construction	-	-	1,248	125
Rejects - dumping to berms	-	-	21	3
Rejects - dozers pushing material	-	-	817	92
FEL loading ROM coal to trucks	2,814	348	-	-
FELs loading berm material to trucks	1,125	139	-	-
Haulage to berms for construction	374	37	-	-
Dumping material to berms	21	3	-	-
Dozers pushing material	409	46	-	-
Construction of new infrastructure	13	1	-	-
Wind erosion - ROM stockpile area	701	105	701	105
Wind erosion - Clean coal stockpile area	-	-	219	33
Wind erosion - inactive areas	438	66	438	66
Total	**7,651**	**937**	**8,645**	**1,043**

Source: ERM (2019)

These results have implications for the mitigation measures for air quality, in that an efficient approach would be for the measures to prioritise, as far as possible, the specific activities described above.

Ground-level concentrations of PM_{10} and $PM_{2.5}$ (24-hour maximum and annual average) were estimated using an atmospheric dispersion model for 10 sensitive receptors[5] and across a 2 km x 2 km model domain. Background concentrations were added to the model predictions to give cumulative (total) concentrations. Deposited dust was also considered. The assessment results were compared with relevant air quality criteria.

Figure 9 shows an example of the dispersion model predictions across the domain, in this case for cumulative annual average PM_{10}. It can be seen that concentrations higher than the corresponding criterion of 25 µg/m³ were limited to an area well inside the site boundary.

No exceedances of the PM_{10} criteria were predicted at any sensitive receptor. The cumulative 24-hour PM_{10} concentrations were predominantly less than 30 µg/m³. The maximum 24-hour average PM_{10} concentrations were highest at receptors near the northern site boundary, and on days when background concentrations were high.

In the case of $PM_{2.5}$ there were two exceedances of the maximum 24-hour average criterion, but these were due to background levels already exceeding 25 µg/m³. The modelled maximum 24-hour average concentrations were very low, and were not predicted to cause any additional exceedances.

8.2.2 Revised Operations and Air Quality Review

After approval of the Revised Preferred Project, WCL engaged EMM to quantify particulate matter emissions from the staged progression of construction activities and concurrent ramp up in ROM coal extraction from 500,000 tpa (Scenario 1 from ERM 2019). The intention of the exercise was to demonstrate that the two emission scenarios modelled in the AQIA (ERM 2019) were suitably conservative to represent potential air quality impacts at any period of the staged construction and phase-in of mining operations.

To undertake this exercise, EMM quantified particulate matter emissions for two additional intermediate scenarios:

- Scenario 1a - construction activities that were consistent with the activity rates adopted in Scenario 1 (ERM 2019a), an underground ROM coal extraction rate of 630,000 tpa, and loading of coal to trucks via front-end loader (FEL) / excavator (as per Scenario 1 ERM 2019); and
- Scenario 1b - construction activities that were consistent with the activity rates adopted in Scenario 1 (ERM 2019), an underground ROM coal extraction rate of 900,000 tpa, and loading of coal to trucks via a new truck loading facility (as per Scenario 2 ERM 2019).

The results of the emissions quantification exercise demonstrated that the quantified emission totals for Scenario 1a and Scenario 1b were lower, or equivalent to, the annual emission totals presented in the AQIA (ERM 2019).

Consequently, the air quality impacts presented in the AQIA would not increase if the emission inventories for Scenario 1a and Scenario 1b were modelled. Therefore, it was concluded that the emission inventories presented in the AQIA (ERM 2019) present a set of modelling results that

[5] Sensitive receptors include, but are not limited to, hospitals, schools, day care facilities, elderly housing and convalescent facilities. These are areas where the occupants are more susceptible to the adverse effects of exposure to toxic chemicals, pesticides, and other pollutants. Extra care must be taken when dealing with contaminants and pollutants in close proximity to areas recognized as sensitive receptors.

conservatively accounts for potential air quality impacts during the staged construction and ramp-up or operations at the RVC.

Appendix B provides a detailed discussion on the staged development emission calculation analysis.

Figure 9 – Predicted annual average cumulative PM_{10} concentrations due to the proposed operations and background concentrations (Scenario 2).

8.3 Greenhouse Gas

The annual and life-of-mine (LOM) GHG emissions for the operation of the project were determined by Umwelt (2019a). The assumptions used in the GHG calculations are summarised in Table 7.2. The GHG emissions are based on approximately 3.7 million tonnes of ROM coal being recovered over five years.

Table 7.2 – Assumptions for GHG emission calculations

Activity	Average annual value	LOM (5 years)
Electricity use (kWh)	25,020,000	125,100,000
ROM coal (t)	740,000	3,700,000
Diesel use (kL)	450	2,250

Annual average and life of mine GHG emissions as quantified by Umwelt 2019a are presented in Table 7.3. A breakdown of emissions by scope is provided in the following sections.

Table 7.3 – Calculated GHG emissions from Project – Umwelt 2019a

Emissions scope	Source	Calculated emissions (t CO_2-e)	
		Average annual value	LOM (5 years)
Scope 1 (direct)	Diesel use	1,219	6,097
	Fugitive emissions	282,580	1,412,900
Scope 2 (indirect)	Electricity	20,700	103,500
Scope 3 (Indirect)	Product use	1,838,560	9,192,798
	Associated with energy	3,033	15,163
	Product transport	83,023	415,117
	Waste transport	70	349
Total GHG Emissions for Operations		2,229,185	11,145,924

Source: Umwelt 2019a

8.3.1 Scope 1 Emissions

Scope 1 emissions from the project relate primarily to the release of fugitive emissions (99.6%) and the combustion of diesel (0.4%). Fugitive emissions result from the release of gas stored in the materials mined (primarily carbon dioxide and methane), with the gases mostly vented during extraction. Some gas is also released fugitively post-mining from coal stored in the stockpile area.

The project is forecast to generate approximately 1,419,000 t CO_2-e of Scope 1 emissions during its operational phase, and this is reflected in the limit in Table 5.3.

8.3.2 Scope 2 emissions

Scope 2 emissions are those emissions associated with the production of electricity used by the project. These emissions occur at the point of electricity generation. The project is forecast to be associated with approximately 103,500 t CO_2-e of Scope 2 emissions during its operation phase.

8.3.3 Scope3 emissions

The Project is forecast to be associated with approximately 9,624,000 t CO2-e of Scope 3 emissions. Scope 3 emissions will be generated by third parties who transport and consume coal products. Approximately 1,925,000 t CO_2-e per annum of Scope 3 emissions are expected to be associated with the Project.

9 AIR QUALITY MONITORING

9.1 Existing network

As noted earlier, an environmental monitoring network has been in place at Russell Vale Colliery since 2014. The broad objectives of the monitoring are to:

- support the implementation of the air quality management system;
- ensure that the operation of the project does not adversely impact air quality at nearby sensitive receptors; and
- ensure that the operation of the project satisfies the conditions specified in the Development Consent.

Specific objectives are to:

- identify triggers for the implementation of management measures;
- assess the effectiveness of air quality control measures;
- quantify changes in air quality at residences and private properties near the project;
- ensure that particulate emissions generated by the project do not cause exceedances of the criteria listed in Table 5.1 and Table 5.2 at any residence on privately-owned land;
- obtain information to provide a basis for assessing the ongoing impact of the Russell Vale Colliery operations on air quality; and
- provide data that are suitable for demonstrating compliance with the Development Consent.

In accordance with the Project Approval, the environmental monitoring network for RVC consists of the following:

- one automatic weather station (AWS);
- two continuous ambient air quality monitors, measuring airborne particulate matter (PM_{10} and $PM_{2.5}$);
- five dust deposition gauges, which measure monthly deposition[6]; and
- two real-time monitoring (TEOM) units are linked to short term trigger concentrations (as specified in Appendix C) designed to assist with the on-going reactive management of emissions and impacts from the Russell Vale Colliery.

TSP monitoring has not been a requirement of the existing RVC monitoring network and is not proposed to be introduced moving forward. As highlighted in Section 6.1.1, PM_{10} concentrations are typically 40% of ambient TSP concentrations. For the purpose of compliance reporting against the TSP criterion in Table 2 of the Project Approval, this ratio will be applied to recorded annual average PM_{10} concentrations from TEOM1 and TEOM2. If recorded annual average PM_{10} concentrations at TEOM1 and TEOM2 comply with the applicable criterion of 25µg/m³, the corresponding annual average TSP concentration will therefore comply with the applicable criterion for TSP (90 µg/m³).

[6] Dust deposition is also measured at a further six sites for due diligence purposes. However, the reporting of the data from the additional sites is not required by the Environment Protection Licence for the Colliery.

The monitoring network is summarised in Table 8.1, and the monitoring locations are shown in **Figure 10**. The parameters that are measured by the monitoring network, the instruments that are used, and the standards that apply are summarised in Table 8.2.

The Russell Vale Colliery ambient air quality monitoring network are sited at locations that are suitably representative of surrounding private residences taking the location of key particulate matter sources and dominant wind directions into consideration.

Table 8.1 – Summary of monitoring network for Russell Vale Colliery

	Location ID	Description of location	EPL ID	Coordinates (MGA 56)	
				Easting (m)	Northing (m)
Meteorology	M01	Near water tanks on ridge line	No. 14	306297	6195791
Air quality	A01	Near site entrance access road (east of settling pond)		306619	6195943
	A02	Site boundary at Lyndon Street		306046	6195555
Dust deposition[a]	G01	Rear of 2 Broker Street	No. 4	306729	6195973
	G02	Northern end of Midgley Street	No. 8	306647	6195603
	G03	Adjacent to Sydney Water Compound	No. 5	306162	6195720
	G04	South-west corner of 30 West Street	No. 6	306441	6196079
	G05	Rear of 22 West Street	No. 7	306466	6196156

(a) Dust deposition is also measured at a further six locations (G06, G07, G09, G10, G11 and G12), although the reporting of the data is not required by the approval or the EPL. However, the data are useful in relation to the TARP (see Appendix C).

Figure 10 – Russell Vale Colliery monitoring network

Table 8.2 – Summary of parameters and monitoring methods for Russell Vale Colliery

Parameter	Location ID	Parameter	Height	Instrument	Standard
Meteorology	M1	Wind speed	10 m	Vaisala WXT563	AS 3580.14
		Wind direction	10 m		
		Sigma-theta	10 m		
		Temperature	10 m		
			2 m		
		Relative humidity	2 m		
		Pressure	2 m		
		Solar radiation	2 m		
		Rainfall	Ground level		
Air quality	A1	PM_{10} and $PM_{2.5}$	1.5 m	TEOM Series 1405-DF	AS 3580.9.8-2008
	A2	PM_{10} and $PM_{2.5}$	1.5 m	TEOM Series 1405-DF	
Dust deposition	G01 to G05		2 m	Dust deposition gauge	AS/NZS 3580.10.1:2003

The AWS continuously measures mean wind speed, mean wind direction, the standard deviation of wind direction (referred to as 'sigma-theta'), mean temperature, mean relative humidity, pressure, solar radiation and accumulated rainfall. The measurements are recorded as 15-minute values.

The AWS is compliant with AS/NZS 3580.14:2014 *Methods for sampling and analysis of ambient air Meteorological monitoring for ambient air quality monitoring applications* and therefore satisfies the requirements of the NSW EPA documents Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales and the Noise Policy for Industry (NPfI).

In relation to air quality, the metrics that are measured are PM_{10} and $PM_{2.5}$ The measurements are taken continuously and recorded as 5-minute and 1-hour mean values in micrograms per cubic metre ($\mu g/m^3$) with daily average concentrations also calculated.

The TEOMs are located and installed in accordance with *AS 3580.1.1:20216 Methods for sampling and analysis of Ambient Air- Guide to Siting Air Monitoring Equipment*, and the *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (NSW DEC 2007). The locations of the TEOMs coincide with the site boundaries closest to residences relative to the main areas of potential particulate matter emissions.

The TEOMs for WCL Russell Vale Colliery are operated and maintained in accordance with AS 3580.9.8 – 2008: *Method for sampling and analysis of ambient air – Determination of suspended*

particulate matter – PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser.

Dust deposition is measured as a monthly total amount of dust deposited in a gauge (g/m^2/month), including ash, combustible solids and insoluble solids. The dust deposition gauges are located and installed in accordance with *AS 2922:1987 Ambient Air - Guide for the Siting of Sampling Units (NSW EPA Method AM-1)*, and the *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (NSW DEC 2007). The dust deposition gauges for WCL Russell Vale Colliery are operated and maintained in accordance with *AS/NZS 3580.10.1:2003 Methods for sampling and analysis of ambient air: Determination of particulate matter—Deposited matter—Gravimetric method*.

Inspection, cleaning and maintenance of the monitoring equipment is undertaken routinely in accordance with the corresponding Australian Standards and manufacturer's specifications (see Table 8.2).

In accordance with Conditions F17(a)(vi) and F11(b), the results of the air quality monitoring program are made available on a quarterly basis via a summary report uploaded to the WCL website, and on an annual basis[7] as included in the WCL annual report. This includes an evaluation of the project performance against the air quality criteria in the Development Consent.

All continuous monitoring equipment (i.e. TEOMs, weather station and dust deposition gauges) will be operated and maintained with the aim of achieving 100% data availability in each licence year. Where a monitoring device does not achieve 95% availability, the reasons for missing data and related corrective actions will be reported to DPIE and the EPA in the Annual Return reporting.

9.2 Future monitoring

WCL will maintain the air quality and dust deposition monitoring networks, as defined above, for the duration of the project.

A video camera will be installed at the stockpile area to assist with visual monitoring by site personnel. The camera will be used in particular during periods of adverse weather conditions for wind erosion emissions generation (e.g. sustained periods of windy, hot and dry weather). In the event that visual dust emissions from the stockpile are observed, mitigation measures will be adjusted accordingly to reduce the generation of wind erosion emissions. The video records will be retained for a period of five years.

WCL will conduct air quality monitoring (using a portable dust deposition gauge or portable optical photometer) at potentially affected residences in agreement of the owner. Portable monitoring would be deployed on an 'as needs' basis. Example occasions for the implementation of portable monitoring may include:

- in response to the receipt of a complaint from a resident;
- a short-term monitoring campaign at a specific location near an emission source of concern; or
- assistance with verifying visual dust inspections.

[7] https://wollongongcoal.com.au/monitoring-r/

9.3 Real-time air quality management

9.3.1 Air quality management during adverse meteorological conditions

Condition B9 requires WCL to minimise the air quality impacts of the project during adverse meteorological conditions. The identified risks, measures and responsibilities are summarised in Table 8.3.

Table 8.3 – Risk assessment and management actions – adverse meteorological conditions

Identified risk	Unmitigated likelihood	Unmitigated consequence	Management and mitigation	Responsibility
Sustained periods of hot and dry weather and/or high wind speeds can lead to high concentrations of particulate matter.	Moderate – during prolonged dry periods.	Medium – a number of residences are close to the project.	Site inspections by Environmental Manager or delegated personnel to complete visual monitoring of dust emissions leaving the site boundary. Control room visual monitoring via CCTV Air Quality system alarms. Targeted use of water sprays on the identified contributing dust emission sources, or the temporary restriction and/or cessation of activity until adverse weather conditions have eased.	Control room Operator to notify Operational Manger or Under Manager or Shift Supervisor as appropriate Environmental Manager to coordinate action

9.3.2 Trigger Action Response Plan

Condition F5(f) requires WCL to establish a contingency plan to manage any unpredicted impacts and their consequences, and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible.

In relation to air quality management, this takes the form of a Trigger Action Response Plan (TARP), as presented in Appendix C. The TARP provides a simple, transparent and useable reference for the short-term management of air quality at Russell Vale Colliery, and the implementation of appropriate management measures. The TARP will be linked to the two real-time monitoring units (TEOMs) from the existing Russell Vale Colliery air quality monitoring network.

In the event of a trigger level exceedance, the Environment Manager or delegate will receive an automatic notification via text message or email and will take appropriate action on the basis of the trigger level exceedance (1 – 3) experienced in accordance with the TARP (Appendix C). To understand regional air quality concentrations during a trigger level exceedance, a review of coincident measurements from the NSW DPIE Wollongong air quality monitoring station will also be completed.

As noted in Appendix C, the TARP will be subject to an initial verification period of around 6 months, during which the appropriateness of the alarm levels and corresponding responses will be evaluated and, if necessary, adjusted.

9.4 Performance measures

Condition F5(b)(iii) requires WCL to provide details of the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures.

The air quality criteria listed in Table 5.1 and Table 5.2 are for compliance. WCL commits to the following key performance indicators (KPIs) to demonstrate the performance of ongoing air pollution management practices at Russell Vale Colliery:

- Maintenance of an effective on-site air quality monitoring network (as per Section 8.1).
- Continued successful monitoring and implementation of the air pollution control measures outlined in Sections 8 and 9 and the TARP in Appendix C.
- Maintaining records of the reactive measures and action taken in response to a potential breach of short-term trigger levels identified in the TARP (Appendix C).
- No exceedance of the applicable air quality criteria (Table 5.1 and Table 5.2) that can be attributed to Russell Vale Colliery operations, based on measurements from the air quality monitoring network (see Section 8).
- No confirmed air quality-related complaints from the operation of the Russell Vale Colliery (see Section 11).

In the event that these KPIs are not met, air pollution mitigation measures and maintenance practices will be reviewed and amended, as necessary.

Monitoring of performance measures will be the responsibility of the Environment Manager/Site Environment Representative or delegate.

WCL will review the performance of air quality mitigation measures on a minimum quarterly basis through the quarterly reporting process. If the identified KPIs are not being achieved, WCL will review the measures and associated emission sources to identify opportunities to improve operations and management practices. Full details of mitigation measure review and improvements will be reported on as part of the Annual Review.

9.5 Greenhouse Gas monitoring and reporting

WCL will monitor GHG emissions released by the project. The objectives of the GHG monitoring program include:

- obtaining information for assessing the ongoing impact of Russell Vale Colliery operations on GHG emissions;
- obtaining information in order to implement reasonable measures for minimising GHG emissions in accordance with the Development Consent; and
- providing effective and accurate quantification of GHG emissions and data suitable for reporting under the NGER scheme via implementation of WCL has developed a 'Basis of Preparation' (Wollongong Coal 2021c).

WCL will monitor GHG emissions through a schedule of monthly ventilation surveys at the mine. The GHGs that will be monitored are methane (CH_4) and carbon dioxide (CO_2).

CH_4 and CO_2 will be monitored using real-time monitors, tube bundle analysis and hand-held portable gas detectors. Gas monitoring arrangements at the mine are overseen by the statutory

ventilation officer in accordance with the requirements of the NSW *WH&S (Mines & Petroleum's sites) regulation 2014*.

The real-time monitors in use at the mine are Trolex type that are design registered and approved for underground use and are calibrated and maintained in accordance with all relevant Australian Standards and industry guidelines. The hand-held portable gas detectors are manufactured by Draeger, with the model in use known as XAM-5000. These are also design registered and approved for underground use and are calibrated and maintained in accordance with all relevant Australian Standards and industry guidelines.

Annual GHG emissions from mine ventilation will be quantified primarily based on the monthly surveys and supported by the results obtained from real-time monitors, tube bundle analysis and hand-held portable gas detectors. Total annual GHG emissions will be recorded in the annual GHG report.

10 AIR QUALITY MANAGEMENT

10.1 Air quality management system

WCL will implement a comprehensive air quality management system that uses a combination of meteorological forecasts, site inspections and real-time particulate matter monitoring to guide the day-to-day planning of mining operations.

The air quality management system will be implemented to cover all stages (i.e. Stage 1 and Stage 2) of the project as outlined below. In the event of a trigger level exceedance, the Environment Manager or delegate will take appropriate action in accordance with the Adaptive Management approach detailed in Section 11.6 and the appropriate TARP (Appendix C).

10.2 Air quality management measures

In accordance with Conditions B7, B8(a)(i) and B9(d)(i), WCL will implement a range of air quality management measures to ensure compliance with the air quality criteria and operating conditions in the Development Consent. These measures are described in the following sections.

10.2.1 Routine operational measures for specific activities

A range of routine air quality mitigation measures and controls have been included in the project design and will be implemented by WCL in the ongoing operation of the project (Umwelt 2019a) to ensure all reasonable and feasible mitigation measures are employed, in accordance with Condition B7. These include:

- all plant and equipment installed, operated and maintained in accordance with Australian Standards and best practice;
- enclosure of conveyors and material transfer points on conveyors;
- enclosure of the coal processing plant;
- water sprays on ROM stockpiles;
- water carts on unsealed haul routes;
- water sprays on stockpiles and exposed areas triggered during periods of high winds;
- water sprays on the noise berms during construction;
- trucks will be covered before leaving the site;
- trucks will be washed before leaving the site;
- use of a stabilising agent on long-term unworked coal stockpiles (>30 days) and unsealed haul routes, as required; and
- stabilisation and progressive revegetation/rehabilitation of exposed disturbed areas.

In addition to the above, sealed internal roads will be periodically inspected for accumulation of dust and cleaned, as necessary. Detectable odour at the site boundary will be monitored during routine site inspections.

These controls will be implemented upon commencement of the relevant activity, and will continue to be implemented over the life of the project.

As required by Condition B8(b), WCL will ensure that major mobile diesel mining equipment used on the project includes reasonable and feasible diesel emissions-reduction technology. WCL commit to the implementation of diesel particulate matter reduction technology for underground plant and equipment and will continue to investigate emerging technologies for replacement of plant and equipment (e.g. hydrogen trucking fleet) on an ongoing basis throughout operations. WCL will report on opportunities to implement diesel emissions reduction technology as part of the Annual Review. WCL will consider such technology where it does not involve excessive cost.

Further details of the work practices that will be used to control the air quality impacts of the project are summarised in Table 9.1. This table identifies the key potential risks along with appropriate mitigation measures to manage those risks. Risks are summarised according to their potential to impact sensitive receptors or WCL operations, and are assessed for likelihood on a scale of low, medium or high. An appropriate level of mitigation is then applied.

The relevant procedural guidelines are also shown in Table 9.1. These contain the detailed actions for each of the environmental issues.

Mitigation measures have been based on the NSW EPA example of best practice (Katestone 2011) (NB: this is still considered to represent best practice). A review of dust mitigation measures implemented at the Russell Vale Colliery was also conducted by PAEHolmes (2012) under Pollution Reduction Program 5 issued by the NSW EPA. The 2012 review identified that the measures implemented were generally in accordance with NSW EPA best practice for the control of particulate matter emissions.

On the basis of compliance with best practice measures and in combination with the dispersion modelling results presented Section 5.1.2 (ERM 2019), it is considered that all reasonable and feasible avoidance and mitigation measures have been applied to reduce emissions at the Russell Vale Colliery and WCL will continually monitor to improve site operations.

In addition to the routine control measures outlined above, a range of proactive and reactive dust control strategies will be implemented, as described below. Some other measures implemented by WCL will also be relevant to air quality. Further, WCL will act to ensure that all plant and equipment used at the Colliery will be maintained in a proper and efficient condition and operated in a proper and efficient manner.

Table 9.1 – Air quality risk assessment and management actions

Identified risk	Unmitigated likelihood	Unmitigated consequence	Management and mitigation	Responsibility
Traffic on unsealed haul roads generates fugitive dust emissions.	Moderate – during prolonged dry periods.	Medium – a number of residences are close to the project.	Internal roads will be sealed and the haulage route clearly marked and identified. Unsealed haul routes on the site (e.g. coal stockpile area) will be wetted down as required to minimise particulate matter emissions. Establishment of suitable drainage arrangements for the internal haulage road and driver vehicle inspections prior to leaving site will assist in preventing the tracking of material onto sealed roads. Monitoring of visual conditions (e.g. visible dust from trucks).	Logistics Manager Environmental Manager Truck Drivers
Monitoring equipment malfunctions, causing an extended gap in records and resulting in a technical non-compliance.	Low.	Low-Med – a number of sensitive receptors are close to the project.	All equipment is installed, operated and maintained to ensure 100% reliability in accordance with Australian Standards and best practice. WCL personnel and the third part monitoring provider will receive notification upon malfunctioning, which is referred to WCL staff for rectification, via access to the DataSight portal.	Logistics Manager Environmental Manager Environmental monitoring team leader
Coal handling including stockpiling activities causing potential dust emissions.	High – ongoing for on-site processing materials.	Medium – a number of residences are close to the project.	WCL's Preferred Project design has taken pro-active steps to further reduce the dust emissions by eliminating the manual screening on surface and has installed a sizer inline in the underground coal conveying system. This also eliminates the requirement for an additional 2 loaders and trucking from the ROM stockpile to the product stockpile (i.e. the installation of the sizer, the coal loading will only be carried out with a loader directly into the trucks without requiring the movement of the coal from the ROM stockpile to the product stockpile). The design suitability of the appropriate dry processing	Logistics Manager Environmental Manager Electrical Manager

Identified risk	Unmitigated likelihood	Unmitigated consequence	Management and mitigation	Responsibility
			plant is also in progress. After commencement of production, representative samples will be tested in the pilot plant in Newcastle to finalise the capacity and design of the dry processing unit. Coal will be transported on site using a network of covered conveyors wherever practicable. The practicability of this measure will be considered on a case-by-case basis. Project has dust suppression system composed of water retention ponds, water reticulation lines, pumps, spray cannons and sprinklers that spray stockpile emplacements areas, in addition to this; water carts operate on site during production periods. Water sprinkler system operation is linked to meteorological triggers including wind speed and rainfall.	
Transport of coal resulting in dust emissions.	Moderate – could happen.	Medium – a number of residences are close to the project and haul routes.	Road haul coal trucks will be covered before leaving the site in order to minimise the potential for dust. Drivers are required to abide by the Driver's Code of Conduct, which includes mitigation measures such as mandatory covering of trucks. WCL has committed to re–enforce the Driver's Code of Conduct, through continuing regular driver education (toolbox talks) and compliance checks. To ensure dust emissions along coal haul routes are effectively managed, truck washing arrangements including two fixed wash bays, and an operator manning a hose as required would operate during operational hours.	Logistics Manager Environmental Manager Truck Drivers
Existing truck wash not operational during coal loading directly from the stockpile, resulting in coal particulates being deposited on trucks and subsequently	Moderate – could happen.	Medium – A number of residences are close to the project.	In the unlikely event that the truck wash is not operational for a period of time, loading would cease until such time as the truck wash is once again operating or until suitable alternative measures are available to ensure that coal particulates are removed from trucks prior to leaving the site, minimising the generation of dust emissions from trucks	Logistics Manager Environmental Manager Electrical Manager

Identified risk	Unmitigated likelihood	Unmitigated consequence	Management and mitigation	Responsibility
deposited on public roads.			on public roads.	
Stockpiles becoming a potential source of fugitive dust emissions from the site.	Moderate – could happen.	Medium – a number of residences are close to the project.	Exposed areas will consist of one main stockpile area and smaller stockpile area for surge capacity as required. Water sprays will continue to be used on these areas to minimise airborne dust on an 'as needed' basis. The wetting down of stockpiles would assist in reducing particulate matter emissions.	Logistics Manager Environmental Manager
Emissions from spontaneous combustion event.	Low – unlikely to happen.	High – contributing to GHG emissions from site.	Since the 1880s the occurrence of spontaneous combustion at Russell Vale Colliery has been low. However, should it occur it will be managed as per the Spontaneous Combustion Principal Hazard Management Plans and TARPs (refer Appendix C).	Environmental Manager Production Manger
Offensive odour detected at the site boundary.	Low – unlikely to happen.	Medium – a number of residences are close to the project.	No identified source of odour that has the potential to cause a potential odour issues at the site. Odour monitoring at the site boundary to be conducted as part of weekly site inspections, or if otherwise noted by a site personnel, to ensure no offensive odour is detected which is attributable to site operations, and if detected review conditions and operations to identify potential root causes and implement mitigation measures as required.	Environmental Manager

10.2.2 Proactive management measures

Proactive air quality management will involve the planning of activities in advance of potentially adverse conditions. Specifically, the proactive air quality management approach will include:

- pre-works risk assessment for each site activity prior to commencement;
- implementation of a system to provide the operation with a daily forecast of expected dust conditions in the vicinity of the operation;
- discussion of the weather conditions and dust considerations at daily pre-shift meetings;
- modifying or suspending the planned activities, as appropriate, to minimise dust impacts;
- enclosure of conveyors and material transfer points;
- enclosure of Coal Processing Plant;
- water sprays on ROM stockpile;
- water carts on unsealed haul routes;
- water sprays on stockpiles and exposed areas triggered during periods of high winds;
- water sprays on the bunds during construction;
- trucks will be covered before leaving the site;
- trucks will be washed before leaving the site;
- consideration of the use of stability polymer veneer coating on long-term unworked stockpiles (>30 days) and unsealed haul routes;
- regular odour monitoring at the site boundary; and
- revegetation/rehabilitation of exposed disturbed areas.

10.2.3 Reactive management measures

Reactive air quality management will include the modification or suspension of activities in response to the following triggers:

- Visual conditions, such as visible dust from trucks above wheel height, will be assessed and reviewed by delegated personnel during routine site inspections or in response to TARP trigger concentration exceedances, in accordance with the Dust Assessment Handbook (EPA 2019).
- Meteorological weather conditions, such as dry, windy conditions, with winds blowing towards sensitive receptors and the Wollongong region.
- Ambient air quality conditions (that is, elevated short-term PM_{10} concentrations) as recorded by the TEOMs.
- Offensive odour detected at site boundary.

Details of the trigger levels linked to real-time particulate matter monitoring (ie TEOMs) and associated action responses are provided in Appendix C.

11 GREENHOUSE GAS MANAGEMENT

11.1 Greenhouse gas management measures

As outlined in the *Wollongong Coal Sustainability and Emission Reduction Strategy* (June 2021, Wollongong Coal 2021d), Wollongong Coal commit to the ongoing management and reduction of GHG emissions generated by the project. Assorted GHG emission management measures are documented in the following sections.

11.2 Fugitive emissions (Scope 1)

As identified in Section 6.2, mine ventilation emissions data from the RVC was reviewed for the NGERs reporting years 2013-2014, 2014-2015 and 2015-2016. The methane content of the mine ventilation return air ranged from 0.1% to 0.15% across three reporting years corresponding to longwall mining operations on multiple seams.

The Australian Government Clean Energy Regulator (2020) identifies that Section 1.8 of the NGER Measurement Determination defines a *gassy* mine as 'an underground mine that has at least 0.1% methane in the mine's return ventilation'. Further, the Clean Energy Regulator (2020) states that if there is notable methane in the coal extracted, the mine's return ventilation will typically exceed the threshold comfortably.

It is noted that the historic Russell Vale Colliery methane content from longwall mining is approximately equivalent to the NGERs threshold for a gassy mine. On the basis that the threshold is not exceeded "comfortably", the classification as a gassy mine is considered to be conservative for Russell Vale Colliery[8].

Finally, the Clean Energy Regulator (2020) acknowledges that where risks of outbursts exist due to the coal seams being 'gassy', gas drainage will be performed prior to mining. It is highlighted that the Russell Vale Colliery does not require pre-mining drainage of coal seam gas for safety reasons due to the low gas content of the worked seams.

It is acknowledged the CSIRO have partnered with South32 Illawarra Coal (2018) at the West Cliff Coal Preparation Plant to conduct research into several Ventilation Air Methane (VAM) abatement technologies as follows:

- VAMCAT – Ventilation Air Methane Catalytic combustion is an electricity-producing gas turbine that can be powered with 0.8% methane.
- VAMMIT – Ventilation Air Methane Mitigator is a compact flow reversal reactor with a newly-structured regenerative bed. It can be operated with 0.3% methane in air for destruction.
- VAMCAP – Ventilation Air Methane Capture uses carbon composite absorbents to enhance VAM into a higher concentration gas. Captured gas can then be used for power generation or flared.

On the basis of publicly available information, it is understood that these technologies remain in testing phase. Furthermore, the quoted methane contents featured with these trial technologies (0.3% to 0.8%) are above the historical recorded methane content values at the Russell Vale

[8] In the GHG and energy assessment for the UEP, emission factors for 'gassy mines' were used. This decision was taken in the absence of data for low-gas mines, and to introduce a margin of safety in the calculations.

Colliery (0.1% to 0.15%). The CSIRO has identified on their website that they are developing a catalytic version of VAMMIT for mine site trials which will target a minimum methane concentration of 0.15% however this is not currently implemented at an operational coal mine.

Furthermore, it is noted that the Centennial Coal Mandalong Mine has installed a VAM Regenerative After Burner (RAB) system to generate electricity from VAM. The methane content at Mandalong Mine is 0.6% (Corkey's 2011). However, while this plant was constructed in November 2013, due to technical issues the Mandalong VAM RAB plant is on hold at commissioning phase and has not progressed to formal experimental phase (Centennial Mandalong, 2021).

On the basis of the low methane content of the underground mine gas released from the Russell Vale Colliery, it is considered that there are currently no established measures that are feasible for adoption to reduce fugitive GHG emissions from the underground mine ventilation emissions.

WCL commit to approaching CSIRO to discuss the viability of the low methane content VAMMIT technology and will report on the outcomes of these investigations as part of the Annual Review.

Furthermore, opportunities for fugitive emission mitigation will be investigated by WCL as the mine progresses into the western regions of the Southern Coalfields, which is understood to contain higher coal seam gas concentrations than the current seam.

Summary of commitments for fugitive emissions:

- WCL commit to the ongoing measurement of methane content from ventilation shafts and in underground workings (as described in Section 8.5, with collected data used for NGERs reporting purposes.
- In the 2021-2022 FY, WCL commit to contacting CSIRO to discuss the low methane technology currently in development to determine the viability for implementation at the RVC, with findings to be reported in the next annual report. This is in addition intended to allow for registration of interest in any future developments of the technology by CSIRO or others.
- WCL commit to reviewing and reporting the methane content of fugitive emissions in the annual reporting documentation to track the methane content in the worked seam. In the event of an increase in methane content to a level where the technology is currently demonstrated to be viable WCL would commit to further investigations into CSIRO-developed abatement technology (or similar).

Regarding fugitive emissions from stockpiled coal, it is noted that the applicable NGERs emissions factor for post-mining fugitive emissions (ie from stockpiles) applies to gassy mines only. As has been established, the Russell Vale Colliery is at the threshold of a gassy mine definition, therefore the application of a gassy mine emission factor for fugitive emissions from the coal stockpiled at site, as quantified in the Umwelt 2019 GHG assessment, should be viewed as a conservative estimate of actual emissions. It is noted that there are currently no established practical methods for capturing fugitive emissions from stockpiled coal.

11.3 Fuel (Scope 1) and purchased electricity (Scope 2) consumption

The management of GHG emissions from the consumption of diesel (Scope 1) and electricity (Scope 2) is assisted by the following routine site management practices:

- Regular servicing and maintenance of plant, vehicles and mine equipment.

- The diesel trucks and buses used on site are maintained serviced in line with the intervals and procedures recommended by the original equipment manufacturer (OEM).
- Continued use of low sulphur diesel fuel in addition to exhaust scrubbers for all underground equipment.
- Performing pre-start inspections at each shift on mobile plant and vehicles.
- Tracking electricity bills and fuel usage.

While diesel combustion emissions are a relatively minor source of annual Scope 1 and 2 GHG emissions from Russell Vale Colliery operations, WCL commit to the investigation and acquisition of best available emissions technology when new plant and equipment is required for the site. The specific type of best available emissions technology will be determined on a case-by-case basis as the acquisition of new equipment is required. WCL commit to reporting on all opportunities to update plant and equipment as part of the Annual Review.

Regarding reduction of purchased electricity, WCL implement the following practices:

- Solar panels and battery storage have been installed at the No. 4 ventilation shaft.
- Solar panels will be installed to support solar hot water heating at the site bathhouse.
- WCL conduct annual reviews of operational practices to implement operational energy use efficiencies where commercially feasible such as continuing to investigate further solar options including lighting
- WCL will hold discussions with energy suppliers in FY21-22 to determine the opportunity to acquire purchased electricity from certified renewable generators, taking market availability and financial factors into consideration. The outcomes of these discussions will be presented in the next annual report.

11.4 Scope 1 and Scope 2 management practices summary

The work practices that will be used to control GHG emissions associated the project are summarised in Table 10.1. This table provides a summary of the key potential risks along with appropriate mitigation measures to manage those risks.

Table 10.1 – Greenhouse gas risk assessment and management actions

Identified risk	Unmitigated likelihood	Unmitigated consequence	Management and mitigation
Venting of coal seam gas (CSG) contributing greenhouse gas.	High – will happen.	High –contributing to GHG emissions from site.	Potential existing options to utilise mine ventilation methane for electricity generation are not feasible for implementation at the RVC due to the low methane content of the mine ventilation air (approximately 0.1% to 0.15% based on 2013 to 2016 monitoring data). The RVC does not feature drainage and capture of coal seam gas during mining operations, therefore reduction of fugitive emissions through flaring or electricity generation are not feasible options for the site. Opportunities for mitigation will be investigated as the mine progresses further

Identified risk	Unmitigated likelihood	Unmitigated consequence	Management and mitigation
			to the western regions of the Southern Coalfields, which is understood to contain higher coal seam gas concentrations than the current seam. In the event that a higher gas concentration is discovered, Wollongong Coal commit to investigating options for the mitigation or use of coal seam at that time.
Incorrect reporting of GHG emissions.	Low – unlikely to happen.	Medium - reporting obligations not met, resulting in fine.	The inventory of emissions developed for the EA will be maintained, as per the Basis of Preparation (Wollongong Coal, 2021c). Emissions and abatement strategies will be reported annually as part of internal environmental reporting and NGER obligations.
Excess fuel use contributing to GHG emissions.	Moderate – could happen.	Low - fuel use contributes a comparatively small component of total GHG emissions for the project.	As required for new or upgraded equipment the efficiency the upgraded mobile and fixed equipment will continue to be considered during procurement for fuel-powered equipment. As older mobile plant and fixed equipment is replaced it is anticipated that there will be fuel or power efficiency gains associated with upgraded equipment. Consequently, GHG emissions will be minimised.
Air pollutant emissions from spontaneous combustion event.	Low – unlikely to happen.	High contributing to GHG emissions from site.	Air pollutant emissions will be minimised in accordance with the Air Quality or Dust or Other Contaminants and the Spontaneous Combustion Principal Hazard Management Plans and TARPS. Since 1880s this mine has not had a propensity to spontaneous combustion events; however, should they occur it will be managed as per the Principal Hazard Management Plans and TARPS which will limit GHG emissions by emergency sealing of the mine. Mine standards that will assist in preventing spontaneous combustion include (but are not limited to): • accessible roadways maintained adjacent to goaf areas; • ventilation control devices installed and maintained to a high standard; • pillars where stoppings and seals are to be placed to contain a goaf are designed and roadways are supported to a standard so that they are stable when subject to abutment loading; • ventilation quantities, pressures and arrangements (e.g. goaf 'bleeds') are minimised consistent with requirements

Identified risk	Unmitigated likelihood	Unmitigated consequence	Management and mitigation
			related to gas and dust; • mine water is removed; • consideration taken to seal goaf areas of extracted and disused bord and pillar panels; • endeavour to load out the oldest stockpiled coal in preference to newer stockpiled coal; and • regular inspections of coal stockpiles, bringing to the attention of the Logistics Manager: o the presence of any coal that has been stockpiled for longer than 3 months so that consideration can be given to sealing this coal to prevent ingress of oxygen; and o immediately reporting any physical signs that may indicate the presence of a heating in a stockpile area.

11.5 Scope 3 emissions

The measures discussed in the previous sections for the reduction of Scope 1 and Scope 2 GHG emissions largely relate to the reduction of required energy consumption (ie diesel, petrol or purchased electricity). Scope 3 emissions associated with the consumption of fuel and purchased electricity are calculated using emission factors linked to the rate of energy consumption (eg Scope 3 diesel emissions are calculated from an emissions factor in units kg CO_2-e/kL of diesel). Consequently, the measures proposed to reduce Scope 1 and 2 emissions from assorted energy (fuel and purchased electricity) consumption would also serve to reduce associated Scope 3 emissions.

Regarding Scope 3 emissions from the downstream transportation of coal from site, in the 2020-2021 financial year, Wollongong Coal signed a contract with Linfox transport coal from Russell Vale Colliery to Port Kembla Coal Terminal. Fuel efficient fleet purchases using Euro VI technology is now standard for new purchases and electric fleet vehicles are beginning to be trialled.

With regards to Scope 3 emissions generated by the combustion of coal produced by the Project, Wollongong Coal expect that the majority of coal will be sent directly to India to the primary customer Jindal Steel and Power Limited (JSPL). Other potential users of product coal include China and domestically within Australia, depending on future commercial agreements. All three nations listed are signatory nations to the Paris Agreement.

At the 2015 United Nations Climate Change Conference (COP21) held in Paris in December 2015, Parties to the United Nations Framework Convention on Climate Change (UNFCCC) reached the Paris Agreement, a global climate change agreement aimed at reducing GHG emissions in order to limit global temperature rise this century to between 1.5-2°C above pre-industrial levels.

Under the Paris Agreement, all Parties are required to put forward GHG emission reduction targets through Nationally Determined Contributions (NDCs). All Parties are required to report on national emissions, with a review of targets set to occur every five years from 2020.

The UNFCCC provides the following description in relation to NDCs:

- NDCs are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement (Article 4, paragraph 2) requires each Party to prepare, communicate and maintain successive NDCs that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.

Therefore. any Scope 3 emissions associated with the consumption of product coal from the Project would be accounted for in the NDC commitments for the end user country and not directly accountable to the Project.

To understand the significance of GHG emissions associated with coal from the Project to the NDC 2030 target for the likely end-user India, 100% of calculated Scope 3 emissions from product coal combustion (annual average of 1,838,559 t CO_2-e as per Umwelt 2019a and presented in Table 7.3). The NDC 2030 target for India is between 6,034 to 6,203 Mt CO2-e. Therefore, the annual average Scope 3 GHG emissions from the combustion of product coal from the Project constitutes between 0.030% and 0.031% of India's NDC 2030 target.

Regarding management of Scope 3 emissions as direct Scope 1 emissions from end users, JSPL have implemented the following GHG emission management and offset strategies in the past five years:

- Implementation of ISO 50001 Energy Management Systems standardisation at four steel plants (Angul, Barbil, Raipur and Tamnar) and are in the process of implementing the energy minimisation, conservation and technology adoption measures across all remaining JSPL plants and facilities.
- Alignment of JSPL operations with the Indian Government *National Steel Policy 2012*, with the aim of improving energy-efficiency and environmental performance in the steel manufacturing sector;
- Installation of the following clean energy technology initiatives:
    - Back Pressure Recovery Turbine at the Blast Furnace at Raigarh;
    - Top Pressure Recovery Turbine at Blast Furnace at Angul;
    - The use of waste heat recovery boilers for power generation;
    - Modification of Electric Arc Furnaces to Neo-Oxy Furnaces and installation of a Coke Dry Quenching system at the Angul Plant coke oven.
- Sourcing of energy for steel plants in Raipur and Barbil from local solar power.
- Development and implementation of various energy conservation measures ranging from process re-engineering, enhanced capacity utilisation, use of higher quality fuel, installation of Variable Frequency Drives, replacement of conventional lighting with LED lights and waste utilisation.

- Conduct an annual review of potential energy efficiency measures for implementation all plants.
- Distributed saplings and preserved and developed 3 million plants over the last decade.

12 INCIDENTS, NON-COMPLIANCE, AND COMPLAINTS

12.1 Regulatory requirements

A summary of the legal requirements applicable to the project will be in the Compliance Register, which will be updated and will consider relevant legislation, conditions of consent and licence requirements. The Compliance Register will include both Federal and State legislation, as well as State Environmental Planning Policies (SEPPs)and any Codes of Practice to which the WCL is required to comply.

A copy of the Compliance Register is maintained on the Wollongong Coal Server.

12.2 Handling incidents and non-compliance

The Development Consent defines:

- an **'incident'** to be "an occurrence or *a set of circumstances that causes or threatens to cause material harm and which may or nor cause a non-compliance*".
- '**Non-compliance** as "*an occurrence, set of circumstances or development that is a breach of this consent*".

In accordance with Condition F1(d)(iv), any incidents, exceedance or non-compliance will be managed through established WCL procedures as detailed in the EMS (Wollongong Coal 2021a).

12.3 Incidents

Once notified of an incident, the Control Room Operator (CRO) is to mobilise internal and external expertise and resources. Where an incident represents and immediate threat to human health or property, the first point of contact should be the Emergency response hotline on 000.

If the incident does not require and initial combat agency, or once 000 has been called, in accordance with the EPA notification protocol, the relevant individual responsible for activating the Pollution Incident Response Management Plan (PIRMP) needs to be notified.

In accordance with Conditions F9 of the Consent, WCL will immediately notify DPIE and the EPA (e.g. EPA Environment Line Service on 131 555, in accordance with EPL Condition R2.1) of any incident that has caused or has the potential to cause significant risk of material harm to the environment. The notification will identify the development (including the development application number and name) and set out the location and nature of the incident.

A detailed report of the incident shall be provided to the Secretary of DPIE and the EPA within 7 days of the incident occurring consistent with Condition F10 of the Consent and EPL Condition R2.2.

12.4 Inspections

Compliance with all approvals, plans and procedures will be the responsibility of all personnel (staff and contractors) employed on or in association with WCL Russell Vale Colliery, and will be promoted via direct consultation and through the direction of the Operations Manager.

Regular targeted inspections and/or internal audits will be undertaken as required by suitably qualified personnel under the direction of the E&C Manager, to identify any remediation/rectification work required, and areas of actual or potential non-compliance.

A Compliance Register will be established to monitor compliance against Development Consent criteria, mining leases etc. Non-compliances identified through the Compliance Register are to be reported, with corrective actions implemented.

A review of WCL's compliance with all conditions of the Development Consent, mining leases and all other approvals and licences will be undertaken prior to (and included within) each Annual Review. The Annual Review will be made publicly available on WCL's website.

12.5 Non-compliance

As required by Condition F10, WCL will notify DPIE and the EPA of any non-compliance[9] within seven days of becoming aware of it.

For the purpose of this Management Plan, an exceedance of the criteria specified Table 5.1 – , or a Level 3 trigger alarm in the TARP (Appendix C) that is deemed to be the direct result of operational emissions from the site, will be classified as an air quality incident.

The notification will set out the condition of the consent that the project is noncompliant with, why it does not comply, the reasons for the non-compliance (if known), and what actions have been, or will be, undertaken to address the non-compliance.

In addition, as required by Condition E1, where there is an exceedance of any of the criteria in the Consent, WCL will notify:

- affected landowners in writing. Affected landowners will be notified of an exceedance as soon as practicable, and no longer than 7 days after the monitoring results have been obtained.

WCL will also provide regular monitoring results to these landowners until the project is again complying with the relevant criteria, and will provide to any affected landowners and tenants a copy of the fact sheet entitled "Mine Dust and You" (Appendix D).

12.6 Adaptive management

In accordance with Condition F4, where exceedances of criteria or performance measures has occurred, WCL will at the earliest opportunity:

- take all reasonable and feasible steps to ensure that the exceedance ceases and does not re-occur (i.e. TARPs, contingency planning);
- consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action;
- within 14 days of the exceedance occurring, submit a report to the Secretary describing the remediation options and any preferred remediation measures or other course of action; and
- implement remediation measures as directed by the Planning Secretary.

12.7 Contingency plan

Condition F5(f) requires Wollongong Coal to establish a contingency plan to manage any unpredicted impacts and their consequences, and to ensure that ongoing impacts reduce to

[9] A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.

levels below relevant performance measures or criteria as quickly as possible. This takes the form of a Trigger Action Response Plan (TARP), as presented in Appendix C.

The TARP provides a simple, transparent and useable reference for the short-term management of aspects or issues at Russell Vale Colliery, and the implementation of appropriate management measures.

TARPs are designed to summarise for each aspect or issue:

- monitoring requirements (may include different locations);
- trigger levels (performance measures or criteria) that flag implementation of contingency measures;
- management and contingency actions or reporting requirements;
- responsibilities; and
- timing.

The TARP uses the continuous data from the two on-site particulate monitors (TEOMs) to enable short-term, reactive air quality management at Russell Vale Colliery. Trigger values are set at three 'Levels' in response to PM_{10} concentrations, as defined in Table B1 of Appendix C.

The Level 1 and Level 2 PM_{10} triggers are applied to the rolling 1-hour average mass concentration from either of the two TEOMs and with respect to wind direction (eg when the monitor is downwind of mining operations).

For each TEOM location, wind direction alarm triggers can be set as follows:

- TEOM1 - Wind direction >= 230° and <= 310°
- TEOM2 - Wind direction >= 320° and <= 40°

In the event of a trigger level exceedance, the Russell Vale Colliery Environment Manager or delegate will receive an automatic notification via text message or email and will take appropriate action on the basis of the trigger level exceedance experienced.

The TARP will be subject to an initial verification period of around 6 months, during which the appropriateness of the alarm levels and corresponding responses will be evaluated and, if necessary, adjusted. The performance of RVC emissions management practices taking the TARP alarm triggers into consideration will be assessed and reported on a quarterly basis (ie number of trigger alarm breaches during reporting period, analysis of trigger events, etc).

Furthermore, discussion of the forecast weather conditions, and associated dust emissions management considerations will be held at daily pre-shift meetings. In addition to the above trigger levels, operational activities will be modified or suspended when unfavourable meteorological conditions are forecast (e.g. high winds) or visible dust from trucks is observed (e.g. above wheel height, incorrect or uncovered load).

Figure 11 provides a flow chart detailing the TARP process.

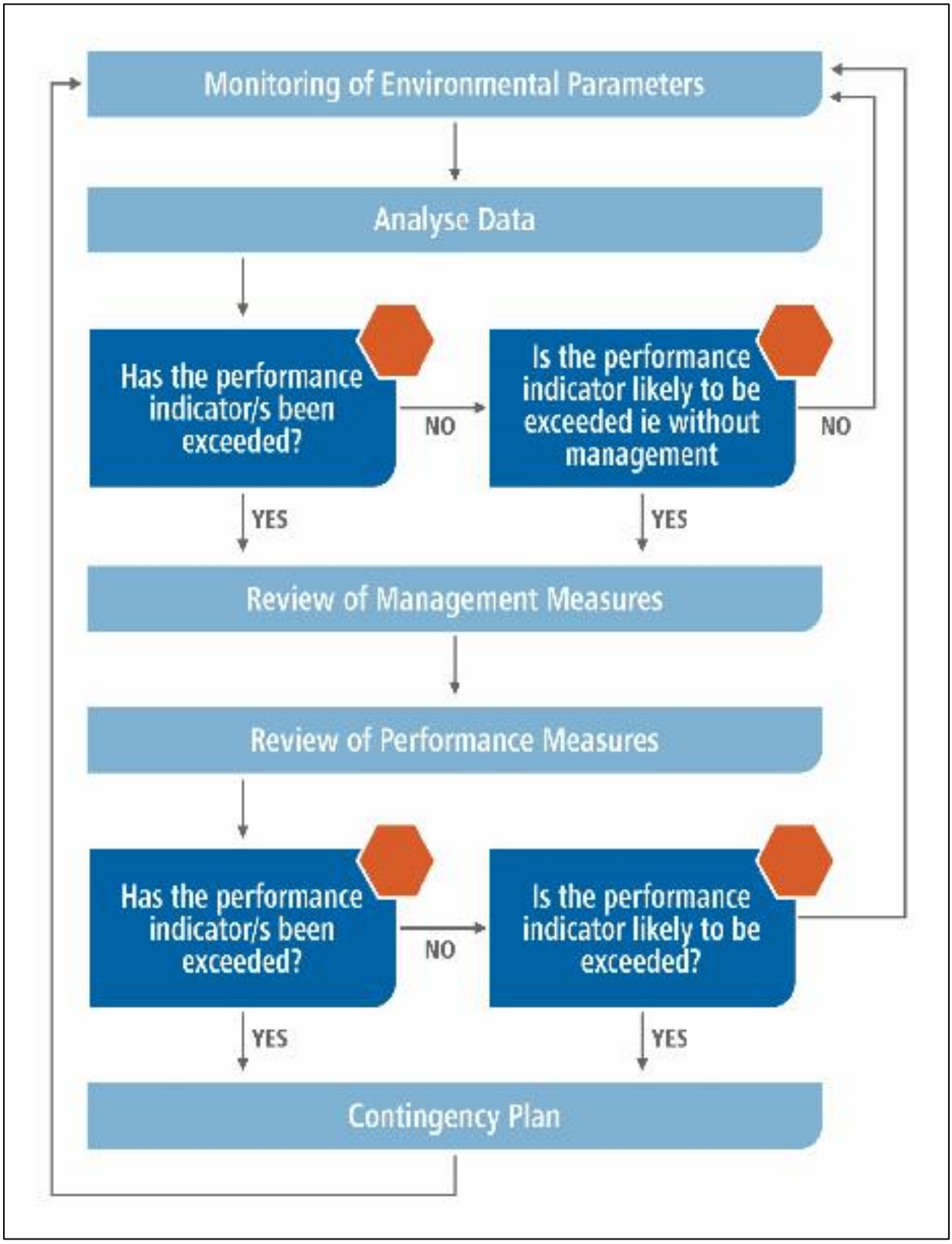


Figure 11 – TARP process

12.8 Handling complaints

The EM is responsible for maintaining a system for recording and responding to complaints.

The Colliery will ensure the telephone number and email address in which environmental, transport and pollution complaints can be made is easily accessible to the community, via both signage at the operation and advertised by the WCL website, in accordance with Condition F17 and EPL Conditions M6.1 and M6.2.

Notifications of complaints received are to be provided as quickly as practicable to EM, or delegate.

Complaints and enquiries do not have to be received via the telephone line or email and may be received in any form. Any complaint or enquiry relating to environmental management or performance is to be relayed to the EM or delegate as soon as practical. All Colliery employees are responsible for ensuring the prompt relaying of complaints. All complaints will be recorded in the Colliery Complaints Register, in accordance with Condition F17 and EPL Condition M5.1.

For each complaint, the following information will be recorded in the complaints register in accordance with EPL Condition M5.2:

- date and time of complaint;
- method by which the complaint was made;
- personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
- nature of complaint;
- the action(s) taken by the Colliery in relation to the complaint, including any follow-up contact with the complainant; and
- if no action was taken by the Colliery and the reason why no action was taken.

The EM is responsible for ensuring that all complaints are appropriately investigated, actioned and that information is fed back to the complainant, unless requested to the contrary.

The record of a compliant will be updated monthly on WCL's website in accordance with Condition F17. A copy of the complaint will be kept for at least 4 years after the compliant is made and will be provided to the EPA upon request, in accordance with EPL Conditions M5.3 and 5.4.

In accordance with Condition 10, an environmental incident complaint that has caused or has the potential to cause significant risk of material harm to the environment will be notified to DPIE and other relevant agencies with seven 7 days.

In accordance with Condition F17(a)(x) of the Consent, a Complaints Register will be made publicly available on the website and updated on a monthly basis. A summary of complaints received, and actions taken will be presented to the CCC as part of the operational performance review. A summary of complaints received, and actions taken will also be included in the Annual Review and the Annual Return.

13 PLAN ADMINISTRATION

13.1 Roles and responsibilities

Environment and community management is regarded as part of the responsibilities of all Russell Vale Colliery personnel. Roles and responsibilities are described in WCL's Management Operating System.

13.2 Resources required

In accordance with the WCL SYS POL 003 Environmental Policy, Management shall ensure that the appropriate resources are made available to achieve the implementation of this Management Plan.

It is the role of the Environment Manager to ensure that these requirements are communicated to WCL Management.

13.3 Training

All training and inductions that relate to this Management Plan are to be undertaken as per the WCL training procedures.

Staff training will be undertaken as detailed in the EMS. This consists of three levels of training applicable to different types of staff:

- Level 1 – High level training on air quality and GHG requirements (management staff).
- Level 2 – Operational level training (project managers, supervisors, surface personnel, control room operators).
- Level 3 – Basic awareness of air quality and GHGs (underground staff, all personnel).

Targeted air quality and GHG awareness training will be provided to individuals or groups of workers with a specific authority or responsibility for operational environmental management, or those undertaking an activity with a high risk of air quality or GHG impacts.

Training will be provided as deemed necessary to contractors to provide them with the knowledge, skills and awareness to minimise air quality and GHG impacts. At a minimum this will include:

- contractors whose activities are not directly supervised by Colliery personnel; and
- contractors whose activities are ongoing and have the potential to result in an air quality incident (eg stockpile contractors).

13.3.1 Inductions

All personnel, including contractors, sub-contractors and staff, are required to attend a compulsory site induction that includes an environmental component prior to commencement on site. The Environment Manager/Site Environment Representative, or delegate, will conduct the environmental component of the site induction.

The environmental component will include an overview of:

- general environmental duty of care;
- relevant details of this Management Plan, including purpose and objectives;

- key environmental issues (ie activities generating dust, and impacts of particulate matter);
- conditions of environmental licences, permits and approvals;
- specific air quality/GHG management requirements and responsibilities;
- mitigation measures for the control of air quality; and
- incident response and reporting requirements.

A record of all environment inductions will be maintained and kept on site. The Site Environment Representative may authorise amendments to the induction where required to address project modifications, legislative changes or amendments to this Management Plan or related documentation.

The Environment Manager will review and endorse the induction program and monitor its implementation.

13.3.2 Truck Drivers

Truck drivers will have a general environmental duty of care and provide evidence to the satisfaction of the Colliery Logistics Manager that they have been inducted and received training in:

- relevant details of this management plan, including truck specific air quality management mitigation measures (e.g. vehicle speed, truck wash down, visual inspections);
- the Russell Vale Colliery Traffic Management Plan; and
- the Drivers' Code of Conduct.

13.4 Record keeping and Distribution.

Environmental records are to be managed in accordance with the WCL SYS PRO 001 Document and Data Control procedure.

All relevant records will be stored so that they are readily retrievable and suitably protected from deterioration or loss. Archiving will be managed in accordance with the WCL SYS PRO 001 Document and Data Control procedure.

In accordance with EPL Condition M1, all ambient air quality monitoring results are kept in digital (pdf or excel file format) form and will be maintained for a minimum of four years after the period of collection. Monitoring data will clearly include the date, time, location and name of person undertaking the monitoring (as applicable).

All monitoring data stored will be made available to any authorised EPA officer on request.

A master copy of each EMS document including all appendices and supporting information is to be held in the office of the E&C Department.

In accordance with Condition F17, the Wollongong Coal website will be maintained as a means of providing information to stakeholders and interested parties about the operation and environmental performance of the Colliery. The items to be included are listed in Section 4.1 of the EMS.

The items that are directly relevant to this Management Plan include:

- Quarterly air quality monitoring reports.

- Annual summary of monitoring results.

A copy of this Management Plan will be made available to the public on WCLs website.

14 REVIEW AND REVISION OF MANAGEMENT PLAN

14.1 Annual review

In accordance with Condition F11, WCL will prepare an annual review of the environmental performance of the project. The timeframe and scope of the annual review are defined in Section 5.1 of the EMS.

The items that are directly relevant to this Management Plan include:

- a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, including a comparison of these results against the:
  - relevant statutory requirements, limits or performance measures/criteria;
  - requirements of any plan or program required under the Development Consent;
  - monitoring results of previous years; and
  - relevant predictions in the document/s listed in Condition A2(c).
- any non-compliance or incident which occurred in the previous calendar year, and what actions were (or are being) taken to rectify the non-compliance and avoid recurrence;
- evaluation and reporting on:
  - the effectiveness of the air quality management system; and
  - compliance with the performance measures, criteria and operating conditions of the approval.
- trends in the monitoring data over the life of the project;
- any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
- what measures will be implemented over the next calendar year to improve the environmental performance of the project.

A copy of the Annual Review will be submitted to WCC, WSC and made available to the CCC and any interested person upon request, in accordance with Condition F12.

In accordance with Condition M8 of the EPL, where a monitoring device does not achieve 95% availability, the licensee must report reasons and corrective actions to the EPA in the Annual Return.

14.2 Auditing

In accordance with Condition F13, an Independent Environmental Audit will be undertaken by a suitably qualified auditor and include experts in any field specified by the Secretary. The timeframe and scope of the audit are defined in Section 5.2 of the EMS.

Any condition of this consent that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, it is taken to be monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act.

14.3 Plan revision

In accordance with Condition F7, this Management Plan will be reviewed within three months of:

- the submission of an incident report under **Condition F9**;
- the submission of an annual review under **Condition F11;**
- the submission of an independent environmental audit under **Condition F13**; or
- the approval of any modification of the conditions of the Development Consent (unless the conditions require otherwise).

The suitability of existing strategies, plans and programs required under the Development Consent will be reviewed by WCL.

In accordance with **Condition F8**, if necessary, to either improve the environmental performance of the project, cater for a modification or comply with a direction, the strategies, plans and programs required under the Development Consent will be revised, to the satisfaction of the Planning Secretary. where revisions are required, the revised document will be submitted to the Planning Secretary for approval within 6 weeks of the review.

14.4 Independent review

Conditions E2 to **E5** define the procedure for an independent review where a landowner considers the development to be exceeding the criteria in Table 5.1and Table 5.2**.**

Where the Planning Secretary is satisfied that an independent review is warranted in response to a request from a landowner, WCL will do the following within 3 months of the Planning Secretary's decision, or within another agreed timeframe:

- commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Planning Secretary, to:
    - consult with the landowner to determine their concerns;
    - conduct monitoring to determine whether the development is complying with the criteria; and
    - if the development is not complying with the criteria, identify measures that could be implemented to ensure compliance; and
- give the Planning Secretary and landowner a copy of the independent review.

WCL will then comply with any written requests made by the Planning Secretary to implement any findings of the review and in accordance with any timeframes specified.

15 RECORDS AND DOCUMENT CONTROL

15.1 Environmental records

The Environment Manager/Site Environment Representative is responsible for maintaining all environmental management documents so that they are always current at the point of use.

Types of records include:

- monitoring, inspection and compliance reports/records;
- correspondence with public authorities;
- induction and training records;
- reports on environmental incidents, other environmental non-conformances, complaints and follow-up action;
- community engagement information; and
- minutes of environmental management system review meetings and evidence of any action taken.

All environmental management documents are subject to ongoing review and continual improvement. This includes times of change to scheduled activities or to legislative or licensing requirements.

Only the Environment Manager/Site Environment Representative, or delegate, has the authority to change any of the environmental management documentation.

15.2 Public sources of data

To assist the public and other stakeholders understand the impacts from the development, including monitoring results, newsletters and updates, and in accordance with Condition F5(i), WCL will:

- publish information on the company website;
- notify the local community through the Russell Vale CCC;
- contact individuals by direct notification (email subject to registration of interest) where relevant.

This information will be updated as required.

15.3 Document control

The Environment Manager/Site Environment Representative will coordinate the preparation, review and distribution, as appropriate, of the environmental documents. During construction and operation, the environmental documents will be stored at the main site compound.

This Management Plan will be developed, approved, implemented and maintained in accordance with the Document Control Procedure (WCL SYS PRO 001).

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GLOSSARY OF TERMS AND ABBREVIATIONS

Terms used in Development Consent	
Applicant	Wollongong Coal Limited, or any other person carrying out any development under the Development Consent.
Continuous process	The site is operating at full production capacity
Department/DPIE	Department of Planning, Industry and Environment.
Emergency	An unexpected and catastrophic event above and beyond the level which has been accounted for within the management plans and the TARPs
Exceedance or non-compliance	• Any inspection/test result that does not meet the acceptance criteria specified in the development consent, EPL and /or other conditions of approval identified in the EMS; • Any notice of non-compliance issued by the EPA; or • Any other regulatory authority with environmental jurisdiction.
Incident	An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance. Any event which has the potential to, or does, impact on one or more protected matter except as permitted by this approval.
Independent Audit (Cth)	Means an audit conducted by an independent and suitably qualified person as detailed in the *Environment Protection and Biodiversity Conservation Act 1999 Independent Audit and Audit Report Guidelines* (2019).
Material Harm	Harm to the environment is material if: • It involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or • It results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000.
Minimise	Implement all reasonable and feasible mitigation measures to reduce the impacts of the development.
Mining operations	The carrying out of mining, including the extraction, processing, stockpiling and transportation of coal on the site and the associated removal, storage and/or emplacement of vegetation, topsoil, overburden and reject material.
Minister	NSW Minister for Planning and Public Spaces, or delegate. Means the Australian Government Minister administering the **EPBC Act** including any delegate thereof
Minor	Not very large, important or serious.
Mitigation	Activities associated with reducing the impacts of the development.
Negligible	Small and unimportant, such as to be not worth considering.
Non-compliance	An occurrence, set of circumstances or development that is a breach of the Development Consent.

Planning Secretary	Planning Secretary under the EP&A Act, or nominee.
Privately-owned land	Land that is not owned by a public agency or a mining, petroleum or extractive industry company (or its subsidiary or related party).
Protected matter (Cth)	Means a matter protected under a controlling provision in Part 3 of the EPBC Act, being water resources and listed threatened species and ecological communities.
Reasonable	Means applying judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements.
Rehabilitation	The restoration of land disturbed by the development to a good condition, to ensure it is safe, stable and non-polluting.
The Colliery	Russell Vale Colliery
The Planning Secretary	The Planning Secretary of the Department of Planning, Industry and Environment (DPIE)
The Project	the Revised Preferred Project
Wollongong Coal Pty Limited	WCL

Abbreviations	
AS	Australian Standards
CCC	Community Consultative Committee
CAR	Corrective or preventative actions
CCL	Consolidated Coal Lease
CSG	coal seam gas
DPIE	Department of Planning, Industry and Environment
EA	Environmental Assessment
EMS	Environmental Management Strategy
EP&A Act	Environmental Planning & Assessment Act 1979
EPBC Act (Cth)	Environment Protection and Biodiversity Conservation Act 1999 (Cth)
EPA	Environment Protection Authority (NSW)
EPL	Environmental Protection License (issued under the POEO Act)

Abbreviations	
FEL	front-end loader
GHG	greenhouse gas
IPC	Independent Planning Commission
JSPL	Jindal Steel and Power Limited
LGA	local government area
Mtpa	million tonnes per annum
NDC	Nationally Determined Contributions
NGER	National Greenhouse Energy Reporting (scheme)
NRE	Gujarat NRE Coking Coal Limited
PAC	Planning Assessment Commission
PIRMP	Pollution Incident Response Management Plan
PM	particulate matter
$PM_{2.5}$	particulate matter with an aerodynamic diameter of less than 2.5 micrometres
PM_{10}	particulate matter with an aerodynamic diameter of less than 10 micrometres
POEO Act	Protection of the Environment Operations Act 1997
ROM	Run of Mine
TEOM	Tapered-element oscillating microbalance
tpa	tonnes per annum
TSP	total suspended particulate (matter)
UEP	Underground Expansion Project
UNFCCC	United Nations Framework Convention on Climate Change
WCC	Wollongong City Council
WCL	Wollongong Coal Limited

APPENDIX A – AGENCY CONSULTATION

APPENDIX B – RUSSELL VALE COLLIERY – AIR QUALITY EMISSIONS REVIEW

APPENDIX C – TRIGGER ACTION RESPONSE PLAN (TARP)

Table C1 – TARP levels, actions and responses – particulate matter

Alarm level	Action required	Response
Level 1 **Limit = 50 µg/m³** – Based on rolling 1-hour average PM_{10} (i.e., 12 consecutive 5-minute concentrations). – Triggered when the reading exceeds the limit consecutively for a period of 2 hours. – Alarm does not repeat during sustained exceedance.	Russell Vale Colliery Environment Manager to coordinate a desktop-based review of wind speed and direction conditions, real-time PM_{10} concentrations at both TEOMs to determine upwind-downwind concentration and review current site operations to identify potential source of concentrations.	Should the desktop- review identify that Russell Vale Colliery operations are the contributing source of concentrations, the Environment Manager or delegate will organise increased dust control practices specific to the contributing source(s) and discuss with the Operations Manager to consider temporarily modifying operations. Mitigation measures to be implemented will be specific to the emission source in question and are listed in Section 9.
Level 2 **Limit = 80 µg/m³** – Based on rolling 1-hour average PM_{10}. – Triggered when the reading exceeds the limit consecutively for a period of 2 hours. – Alarm does repeat every hour during sustained exceedance.	Following completion of Level 1 actions, Russell Vale Colliery Environment Manager or delegate to undertake an in-person inspection of likely contributing source of concentrations.	If site investigations identify that Russell Vale Colliery is the contributing source of concentrations, implement additional controls, relocate or cease dust emitting activities. Mitigation measures to be implemented will be specific to the emission source in question and are listed in Section 9.

Alarm level	Action required	Response
Level 3 **Limit = 200 µg/m³** – Based on rolling 1-hour average PM_{10}. – Triggered when the reading exceeds the limit consecutively for a period of 30 minutes. – Alarm does repeat every 30 minutes during sustained exceedance.	Following completion of Level 1 actions, Russell Vale Colliery Environment Manager or delegate to undertake an in-person inspection of likely contributing source of concentrations.	If site investigations identify that Russell Vale Colliery is the contributing source of concentrations, cease those activities immediately (as practicable to do so). Determine and implement additional controls and/or relocate activities prior to recommencement. **NB**: classified as an air quality incident. Mitigation measures to be implemented will be specific to the emission source in question and are listed in Section 9.

Table C2 – TARP levels, actions and responses - odour

ALARM LEVEL	ACTION REQUIRED	RESPONSE
Odour Performance Indicator Detectable odour at the site boundary during site inspections.	During routine weekly site inspection walkovers, the Environment Manager or delegate to note the detection of odour. In the event of odour detection, the Environment Manager or delegate to initiate investigation: • To determine if odour is attributed to site operations. • Review conditions and operations to identify potential root causes and implement mitigation measures as required.	• Investigation initiated immediately on detection of odour. • Based on the identified source of odour emissions, mobilise and implement appropriate emission control measures to eliminate the generation of odourous emissions • Long term (>week) detections of odour to be reported to DPIE and EPA. • Results of investigation reported to EPA within 1 week of completion. • Commence preparation of mitigation/action plan immediately on detection of odour, as required. • Monthly updates of investigation progress, if required by EPA and DPIE. • Monitoring results included in annual review. • Inform stakeholders of monitoring. • Identify, investigate and report on impacts to air quality.

Table C3 – TARP levels, actions and responses – spontaneous combustion

ALARM LEVEL	ACTION REQUIRED	RESPONSE
Spontaneous Combustion Performance Indicator Detectable signs that may indicate heating in a stockpile area.	During routine weekly site inspection walkovers, the Environment Manager or delegate to look for physical signs that may indicate the presence of a heating in a coal stockpile area. In the event of heating detected, the Environment Manager or delegate to initiate investigation: • to determine if spontaneous combustion is occurring; and • manage risks associated with any spontaneous combustion.	• If a spontaneous combustion or fire event was to occur on or within the stockpile, the response actions would include exposing the source of the heating and quenching with water to extinguish; • Ongoing monitoring and inspection program to ensure the heating does not re-ignite; • Investigation initiated immediately to determine the cause of the spontaneous combustion event and implementation of appropriate mitigation measures to prevent reoccurrence. • Ongoing monitoring of coal stockpile management (e.g. loading out older coal stockpiles, sealing coal that has been stockpiled for longer than 3 months to prevent ingress of oxygen).

Table C4 – TARP levels, actions and responses – dust deposition

ALARM LEVEL	ACTION REQUIRED	RESPONSE
DDGs – Deposited dust (Insoluble Solids) Performance[a] ***Indicator:*** • Monthly insoluble solids exceed 4/g/m^2/month • Annual average insoluble solids exceed 4/g/m^2/month ***Performance Indicators:*** Repeat dust deposition gauge sampling of impacted and adjacent DDGs.	If criteria trigger value is exceeded for the rolling 12 month average: · Environmental Manager to • Initiate a review of conditions and operations during the period of sampling to identify potential root causes and implement mitigation measures as required. • Inform EPA and DPIE of exceedance as required.	To Inform stakeholders of monitoring and to Identify, investigate and report on impacts the following would occur: • Report exceedances of criteria immediately once results are received. • Investigation initiated within 1 week. • Results of investigation reported to EPA and DPIE within 1 week of completion. • Commence preparation of mitigation/action plan within 1 week if required. • Prepare and implement a site mitigation/action plan in consultation with EPA and DPIE if appropriate including investigation of possible mitigation measures in consultation with EPA and DPIE. • Monthly updates of investigation progress, if required by EPA and DPIE. • Monitoring results included in annual review.

(a) Dust deposition is measured at five locations required by the approval and EPL (G01, G02, G03, G04 and G05). Dust deposition is also measured at an additional six locations (G06, G07, G09, G10, G11 and G12). Although the reporting of the data from the additional six locations is not required by the approval or the EPL, the data will be used to inform air quality management at Russell Vale Colliery.

APPENDIX D – MINE DUST AND YOU

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13 August 2021

Louise Vickery
Assistant Secretary
Environmental Assessment
(NSW, ACT) Branch
GPO Box 858
Canberra ACT 2601

Russell Vale Underground Expansion Project (EPBC 2020/8702)
Response to Request for Additional Information

Dear Louise,

Thank you for the Department of Agriculture, Water and the Environment's (**DAWE**) letter, and the request for additional information, received on the 12 August 2021. In response to the requested information outlined in the table 1 of your correspondence, Wollongong Coal Limited (**WCL**) has compiled a response to each of the items, as outlined below:

1. Proposed mitigation measures to reduce carbon emissions

The department notes that certain carbon emissions reduction measures proposed in the WCL Sustainability and Emission Reduction Strategy (June 2021) and the Draft Air Quality and Greenhouse Gas Management Plan have already been implemented.
Please provide a table that sets out all the mitigation measures to reduce carbon emissions. The table should:

- *clearly identify what measures have already been implemented, and when they were implemented;*
- *outline the proposed additional measures and timing for implementation of those additional measures;*
- *for each of the mitigation measures (both implemented and proposed) provide the expected carbon emission reduction for Scope 1 and 2 (t CO2 e).*

RESPONSE:

WCL has been proactive and taken initiatives to reduce the carbon emission reduction. The details of the implemented and proposed measures are outlined below, in **Figure 1**, with the original calculations attached in **Appendix 1**.

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Figure 1 – Proposed mitigation measures to reduce carbon emissions

Description	Per Annum			
	Energy Saving KWH	CO2 Reduction (T)	Trees returned to the planet	Year of implementation
Change from 2MTpa using LW to 1MTpa using Continuous Miners	5,000,000	5376	28,571	2021
Remove #5 Shaft Ventilation Fans	4,117,200	4427	23,527	2019
Replace Surface Lighting to LED	47,362	51	271	2021
Install Solar Panels on Main Bathhouse	38,857	42	222	2021
Install Solar Panels at C4 Shaft	6,023	6	34	2020
Install Solar Panels on Workshop	505,241	543	2,887	proposed 2021-22
Replace Surface lighting to LED-ongoing	100,000	109	571	ongoing 2021
SUB - TOTAL	9,814,573	10,553	56,081	

Tree plantation	Nos			
Wongawili	500	94		2021
Russell vale	750	141		ongoing 2021

Change in mining method

METHOD OF MINING	Longwall	Bord and Pillar (Phase Change)	% Reduction
PRODUCTION ESTIMATE	856,761 tonnes	202,118 tonnes	76%
GAS EMISSION	3,815,798m³	1,174,305m³	70%

To be done

Basis of Calculations	kwh/month	kwh/annum
June 2015 Energy Consumption data (from energy bill)	1263348	15,160,176
Minus #5 Shaft Fans		4,117,200
Longwall related Energy Consumption		11,042,976
Estimate of energy consumption using Continuous Miners		6,000,000
Energy Saving from Changing from LW to CM production		5,042,976

Assumption that 175 trees returned to the planet per kwh per annum

WOLLONGONG COAL

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2. Measure to reduce emissions associated with combustion of diesel

The draft Air Quality and Greenhouse Gas Management Plan notes that measures will be implemented to reduce emissions associated with the combustion of diesel (see page 46). Please provide the emissions reduction for Scope 1 and 2 i.e. predicted emissions once these measures have been implemented (t CO2-e). Please also provide the expected timeframe for implementing the measures.

RESPONSE:

In addition the measures outlined above for Item 1, the following Strategies for Diesel Emission Reduction have been implemented at Russel Vale Colliery (**RVC**) to reduce diesel emissions:

- Introduction of a hired diesel vehicle fleet, with machinery within a 2000 hour overhaul schedule. This will enable the retirement of the current fleet of diesel machinery that are reaching the end of their overhaul life.

- Proposed introduction of long life particulate filters to assist further in the reduction of diesel particulate matter being released.

  Introduction of an underground gas testing station. This will enable more accurate monitoring for diesel emissions, and assist in specific component maintenance to reduce diesel emissions.

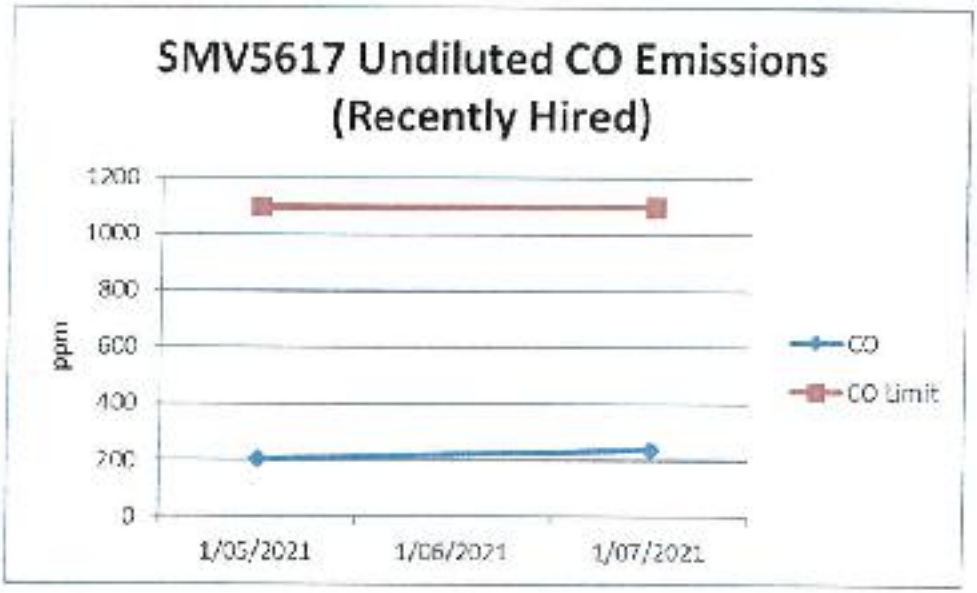
- Assistance from the original equipment manufacturer in the maintenance of the diesel fleet as product specialists, to minimize diesel emissions due to wear and tear of diesel vehicles on site.

- Optimisation of the diesel emissions maintenance system, through generated alerts, when diesel emissions testing is not within site specification. This will trigger an inspection of affected diesel systems to determine the cause and in turn minimise diesel emission generation.

- Investigations into establishing a low emission diesel fleet. This includes introducing proven machinery with the latest technologies in certified diesel engine systems with minimal diesel emissions. By 2030 there is to be a plan in place to implement battery powered man transports and load haul dump machinery on site with zero diesel emissions from the underground fleet.

Appendix 2 shows detailed graphs of the emissions for each of RVC's machines vs MDG29 specified limits, with **Figure 2** below providing an example of the details provided in **Appendix 2**.

Figure 2- Example of Machine emissions Vs Limitation Limits



3. Scheduled monitoring and real time monitoring.

The draft Air Quality and Greenhouse Gas Management Plan notes that the monitoring data will be used to investigate and implement reasonable measures for minimising GHG emissions in accordance with the Development Consent (see page 43, second bullet point under the heading "9.5 Greenhouse Gas monitoring and reporting").
Please describe what these measures will include, and what the predicted emissions reduction would be from implementing these measures (t CO2 e) and when emission reductions will be achieved.

Information for greenhouse gas reporting is obtained by 3 means and checked by a 4th method to ensure that sufficient, accurate data is available for implementing reasonable measures, with the aim of assisting in reducing greenhouse gas emissions. In addition, WCL is hiring a full-time Sustainability Initiative Officer to focus on developing and implementing the strategy that will be devised in consultation with global experts in the field. Please see link for the advertised role https://www.seek.com.au/job/53438409. The strategy for future emission reduction will be finalised by WCL within six months of commencement of mining operation at RVC.

The methods used for obtaining this data are as follows:

1. Real-Time Monitoring
The mine has a Real-Time Telemetric Monitoring System which is used to continually monitor the gas emitted at strategic locations underground, and at the cumulative

mine air exit point (full capture of mine emissions). The gases monitored includes Carbon Dioxide, Carbon Monoxide, Oxygen and Methane. This Telemetric Monitoring System is calibrated on a monthly basis and is subject to/and compliant with 6 monthly NATA accredited testing.

The information obtained from this monitoring system is stored and retained to form part of the mine record under Clause 58 'Records of Air Monitoring', section (3) of the Work Health and Safety (Mines and Petroleum) Regulation 2014. This information is also used to establish, monitor, and trend greenhouse gas emissions. **Figure 3** below shows the monitoring report screen that is observed in the mine's central Control Room.

2. Tube Bundle Monitoring

The mine has a Tube Bundle 'Post incident monitoring system' in place, which continually monitors the mines atmosphere. It's air sampling is supplied via a vacuum pump from the mines surface, and continually recorded with the use of an Infrared Analyser. The Infrared Analyser is considered to be the most accurate form of gas monitoring available at a mine site for continual monitoring. The Infrared Analyser is subject to NATA calibration and routine mine site maintenance. This information is also stored and subject to information retention under Clause 58 'Records of Air Monitoring', section (3) of the Work Health and Safety (Mines and Petroleum) Regulation 2014.
Information is gathered at the main mine return for GHG emission reporting. **Figure 4** below shows the tube bundle infrastructure, housing the infrared analyser and monitoring equipment.

3. Monthly Statutory Ventilation Report

The mine complies with the requirement to complete a statutory monthly ventilation report. This report forms part of the mine record. It includes gas readings taken at strategic locations, including the mine main return. This information is also stored and subject to information retention under Clause 58 'Records of Air Monitoring', section (3) of the Work Health and Safety (Mines and Petroleum) Regulation 2014. This gas monitoring is completed using hand held gas monitors, which are also subject to mine site maintenance and NATA calibrations.

4. Mine Inspection Plan (monitoring cross-checking)

The mine inspection plan includes regular inspections of areas of the pit where monitoring data is captured. The real time monitors underground display a concentration visually and these are checked against hand held devices to ensure that the monitors are reading accurately. This data is captured on supervisor statutory reports. This information is also stored and subject to information retention under Clause 58 'Records of Air Monitoring', section (3) of the Work Health and Safety (Mines and Petroleum) Regulation 2014.

The measures taken to reduce carbon emissions are detailed in the response to the above questions.

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Figure 3 - Monitoring display in control 'Control Room'

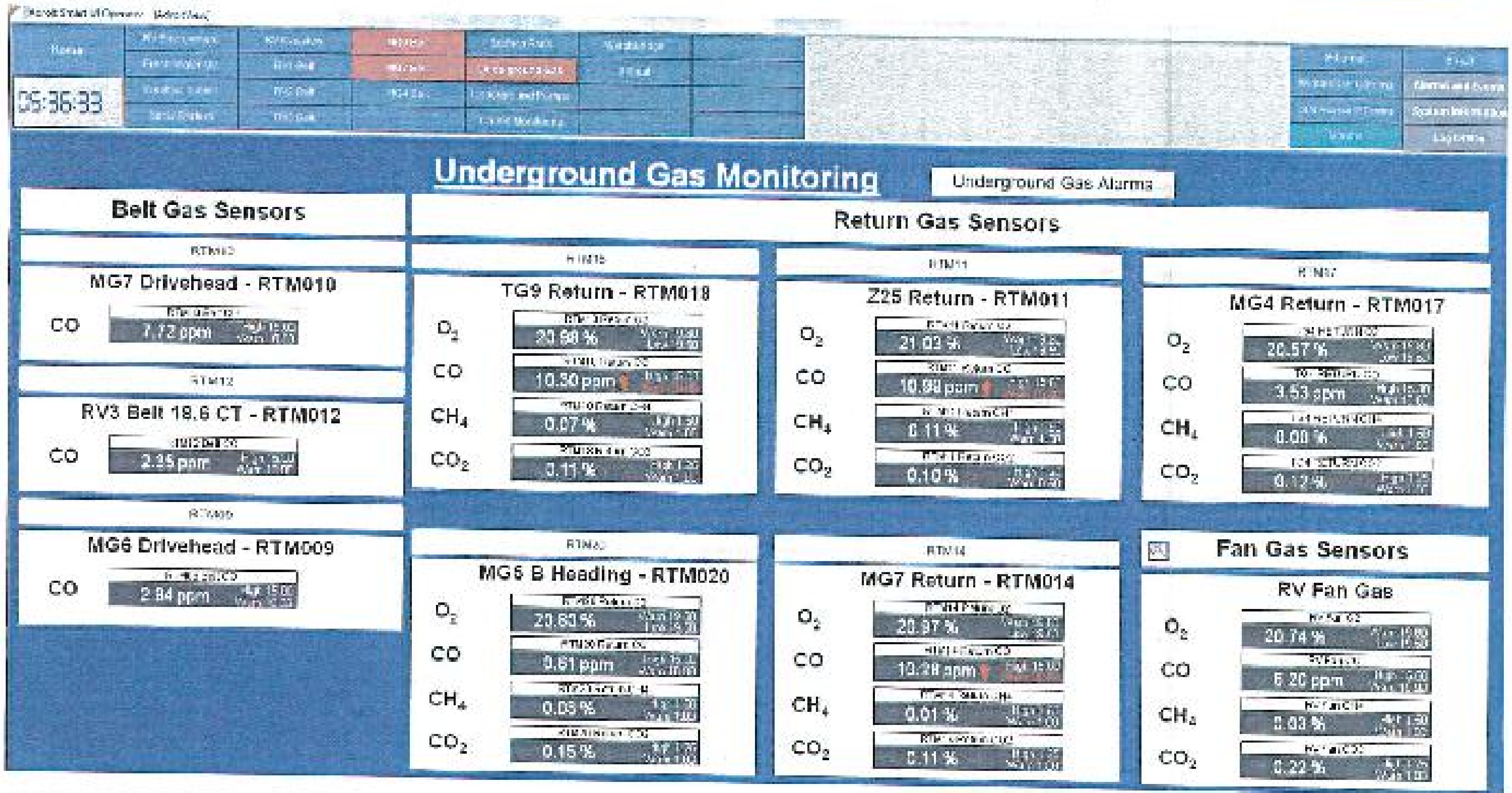

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Figure 1 – Tube Bundle enclosure

WOLLONGONG COAL

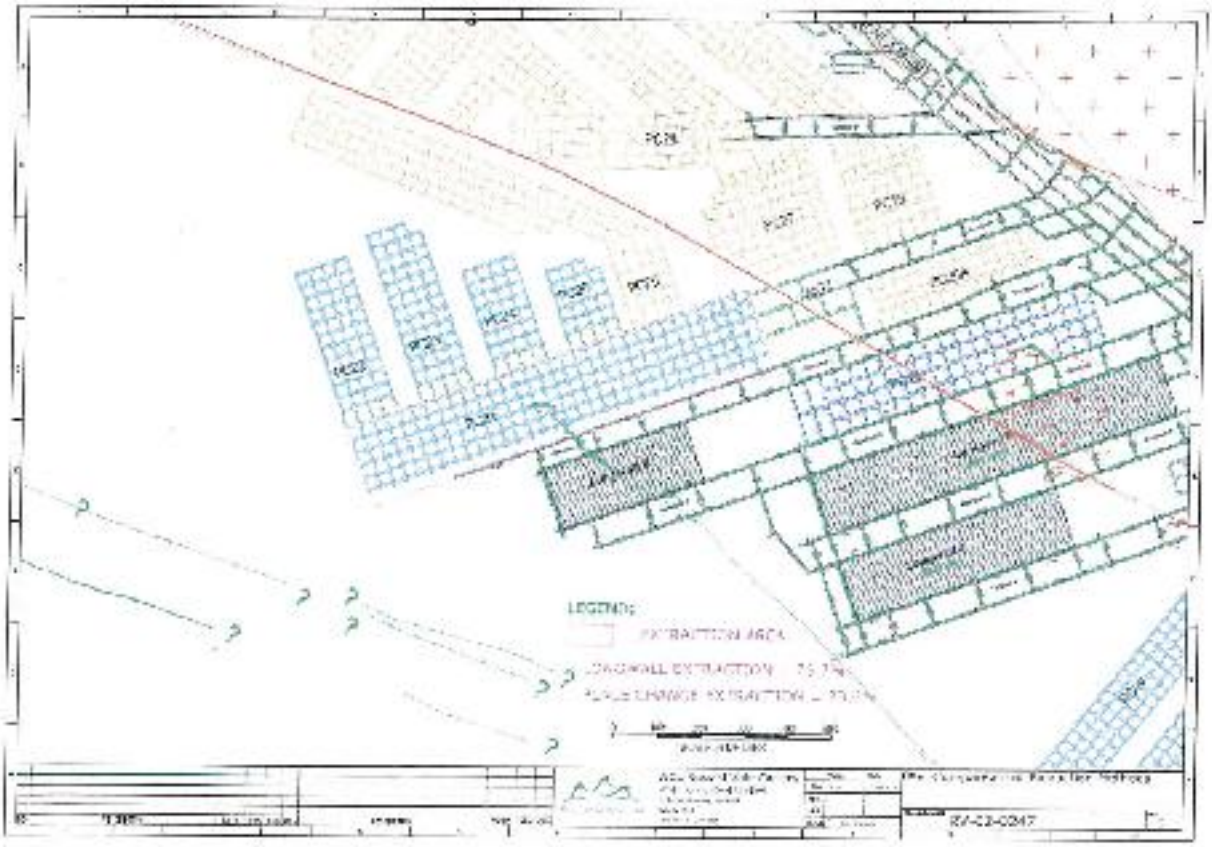
4. Change in mining method from longwall to Bord & Pillar

You stated in your letter of 5 July 2021 to Ms Vickery that the proposed extraction method will be utilising continuous miners which has an extraction of 40 to 50 per cent less than longwall extraction techniques. Please quantify the amount of coal that will remain in the ground if the bord and pillar technique is utilised, as compared to the longwall technique. Please also provide Scope 1, 2 and 3 emissions estimates (t CO2-e) for the initially proposed longwall extraction technique and for the now proposed bord and pillar extraction technique.

Russell Vale Colliery has previously operated a longwall extraction method in all seams of the mine. When extracting coal using the longwall method headings, known as gate roads, are driven out to frame the block of coal to be extracted.

Once the gate roads are completed a face road is driven to allow for the installation of the longwall equipment. The longwall then extracts all the coal between the gate roads. A typical longwall layout can be seen on the plan below with the grey shaded areas in longwalls 4, 5 and 6 indicating totally extracted coal (**Figure 5**).

Figure 5 – Longwalls 4, 5 and 6 Layout



The proposed mining methodology for Russell Vale is the Bord and Pillar system where pillars of coal are left in situ underground to reduce the effects of subsidence. From the plan above it can be seen that the roadways extracted are only a portion of the total coal available, with the majority of coal left as pillars.

Effects on CO2e Emissions

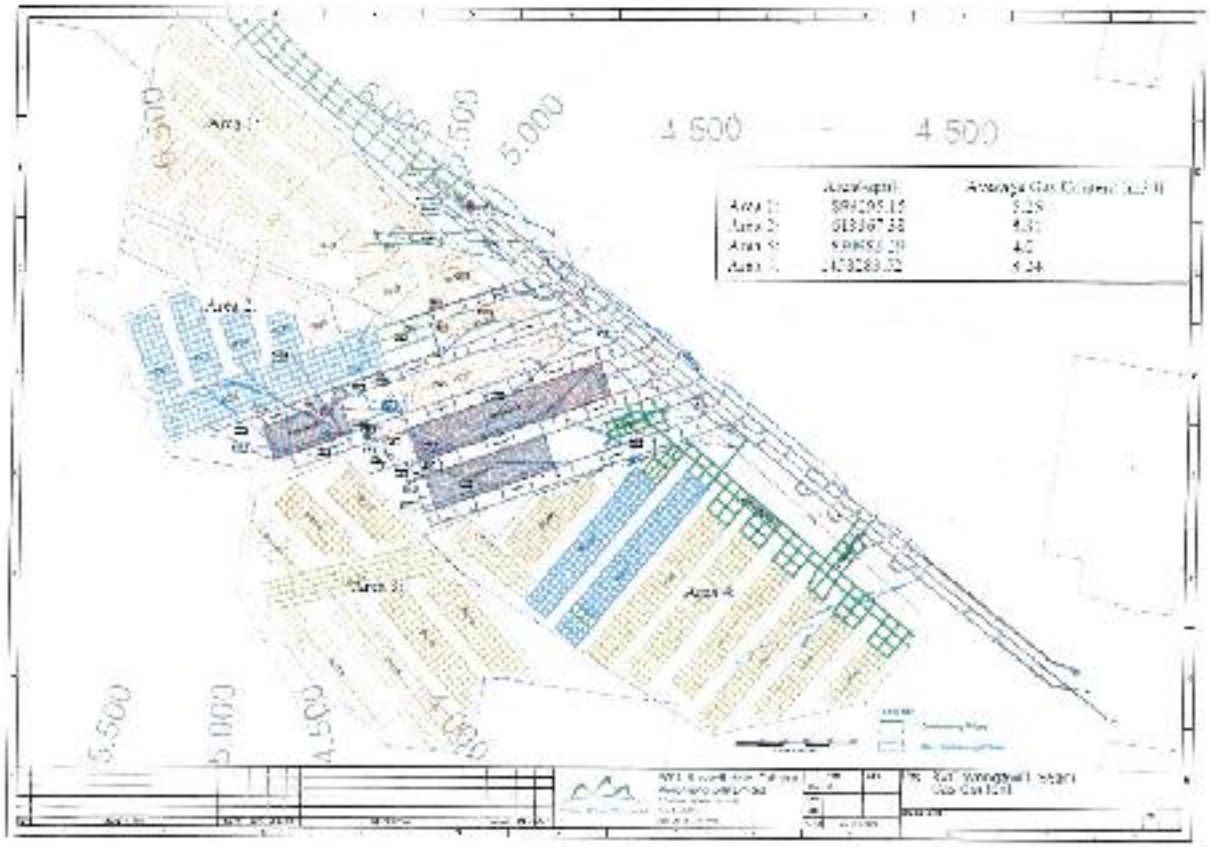
All coal contains a certain amount of gas that was trapped within the matrix at the time of deposition. This varies from mine to mine, between different coal seams and different portions of the same mine.

As coal is crushed the gas contained within the matrix is released and liberated to atmosphere. The ventilation system of the mine dilutes this gas and removes it from the mine workings.

It stands to reason that by reducing the amount of coal mined from the seam the amount of gas liberated will consequently be released. For Russell Vale the change in CO_2e is illustrated by comparing the gas released during mining from PC21 using a bord and pillar methodology and what would have been released if the same panel had been mined as a longwall.

Figure 6 below indicates the expected gas contents for Russell Vale as determined from gas sampling during exploration and in-seam drilling activities. PC21 is within the area 2 polygon on the plan with an indicated gas content of 5.81m³/t.

Figure 6 - Bord and Pillar Plan Change



By multiplying the tonnes extracted with the gas content it is able to determine and estimate of the gas released during mining. The gas is taken to be released directly after mining has fractured the matrix enough to release the gas.

METHOD OF MINING	Longwall	Bord and Pillar (Place Change)	% Reduction
PRODUCTION ESTIMATE	656,764 tonnes	202,118 tonnes	70%
GAS EMISSION	3,815,798m³	1,174,305m³	70%

This clearly shows a 70% reduction on coal extracted and a commensurate reduction in the gas emission.

5. Tree planting at Wongawilli and Russell Vale collieries

The WCL Sustainability and Emissions Reduction Strategy (June 2021) notes that you plan to increase the number of eucalypt trees by a further 1500 trees at the Wongawilli and Russel Vale collieries (see page 21).
For the two collieries, please provide a map showing the distribution and number of trees at specific locations, along with a statement of the predicted total emissions (t CO2-e) that will be sequestered per annum and in cumulative total reduction and the period over which the emissions sequestration will be achieved.

WCL is already in the process of planting trees. The attached presentation in **Appendix 3** shows the location of the trees planted in Wongawilli mine and the proposed trees to be planted in Russell Vale. The tree plantation in Russell Vale was planned to be undertaken during the month of August 2021 but has been rescheduled due to the ongoing COVID situation.

6. Offsetting Scope 1 and 2 emissions by 4% per annum cumulative commencing 2021 with intent of being carbon neutral by 2050.

Please provide:
further explanation of how this commitment is consistent with the Paris Agreement;
details on how the 4% offset was calculated and will be achieved;
the time sequence for implementing the offset to meet net zero by 2050.

WCL has been the pioneer in the Coal Industry in the Illawarra region in committing to a 4% reduction in carbon emission every year. The Australian government in its report "Australia's 2030 Emission Reduction Target 2015 **Appendix 4** has stated.

" The Australian Government will reduce greenhouse gas emissions to 26–28 per cent below 2005 levels by 2030. Our target is a step up from Australia's current target to reduce emissions to five per cent below 2000 levels by 2020".
In comparison WCL has already reduced the projected carbon emission - scope 1 and scope 2 by 8% for the current UEP project compared to 2014 – 2015 when coal was mined by longwall mining (. The 2014-2015 NGER report is attached as **Appendix 5.** The 4% reduction in emissions each year over the life of this project is over and above the above reductions already achieved in comparison to 2014 – 2015. WCL is well ahead of the target to achieve the net zero by 2050.

In summary the steps taken and proposed in the future are:

1. Whereas, WCL has already embarked upon the solar power generation project and installed solar power at two locations on site, a further expansion of the same is being planned throughout the surface area of the mine site.

2. An estimate of the CO2 elimination is provided through the measuring devices & software attached with the plant and is reproduced here, the diagram clearly shows how the saving is measured and WCL will continue to measure the positive effects of all its solar installations through such measuring software and devices.

3. In addition, WCL is hiring a full-time Sustainability Initiative Officer to focus on developing and implementing the strategy that will be devised in consultation with global experts in the field. Please see link for the advertised role https://www.seek.com.au/job/53438409

4. Further, the GHG reduction strategy timeline will follow the guideline set by Paris Climate Accord and reduction, though suggested at 4% per annum, will be accelerated/modulated as per the guidelines of the Paris Accord to reach the net zero target by 2050.

Please see **Figure 8**, **Figure 9** and **Figure 10** below the images of the solar system commissioned at Russell Vale

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Figure 7 - LW Mining Method Vs Bord and Pillar

Emissions scope (GHG Emissions from the project over a five year period)	Source	Calculated emissions (t CO_2-e)				
		2014-2015 (Longwall Extraction)	2014-15 LOM equivalent (5 years)	Average annual value for UEP	UEP LOM (5 Years)	% Reduction due to change in mining method
Production -tonnes		333,614	1,668,070		3,700,000	
Scope 1 (direct)	Diesel use	2,009	10,045	1,219	6,097	39%
	Fugitive emissions	305,432	1,527,160	282,580	1,412,900	7%
Scope 2 (indirect)	Electricity	23,979	119,895	20,700	103,500	14%
Total GHG Emissions for Operations		331,420	1,657,100	304,499	1,522,497	8%

Note:
The total production in 2014 - 20125 was 333,614 tonnes.
If this is extrapolated over a five year period the toal production would be about 1,668,070 tonnes.
Even with 50% production of the bord and pillar UEP project (3.7millinn tionnes) the emissions Scope 1 and scope 2, are 8% higher

Figure 8- Bathhouse Solar System

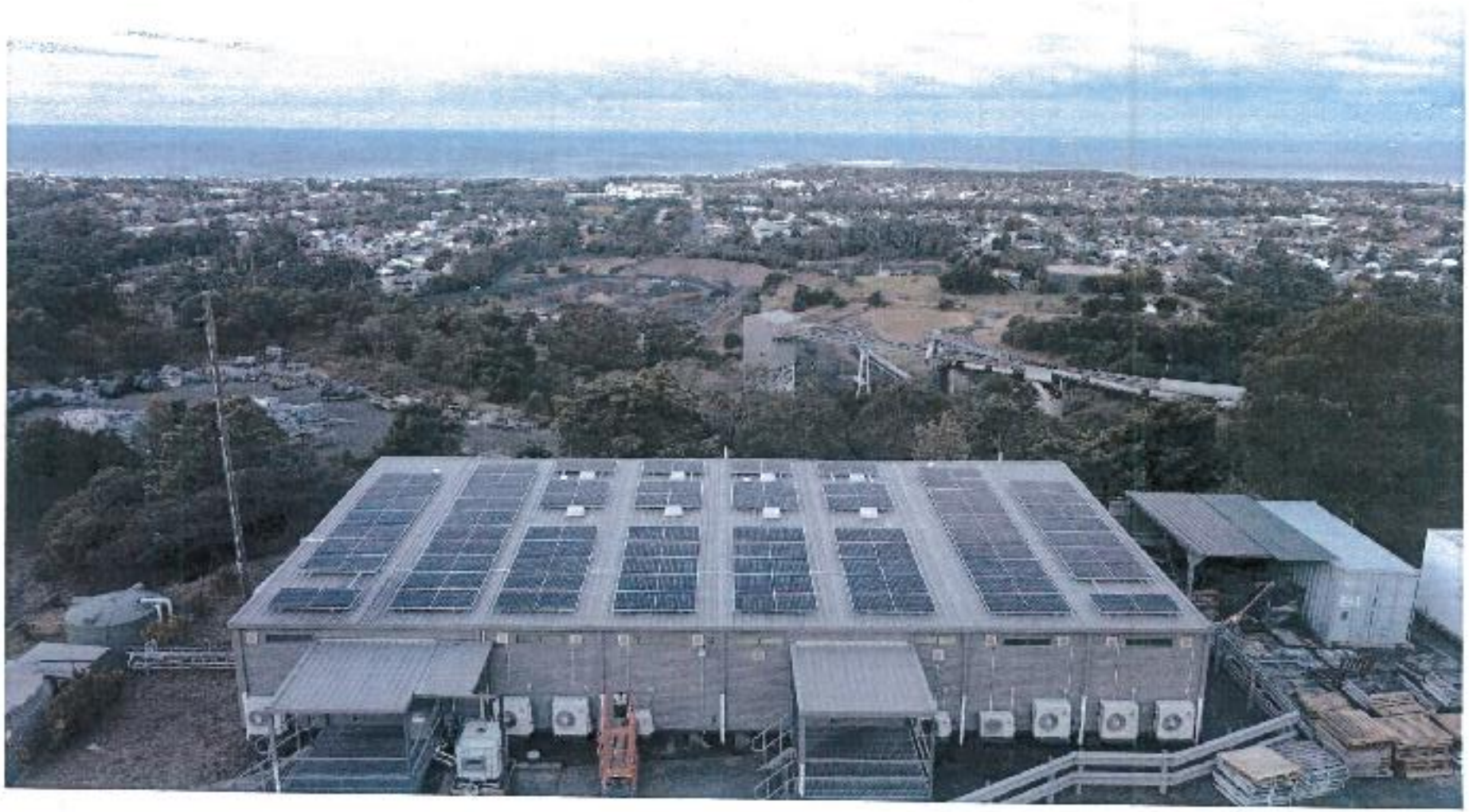

Figure 9 - Buildmotive Solar System

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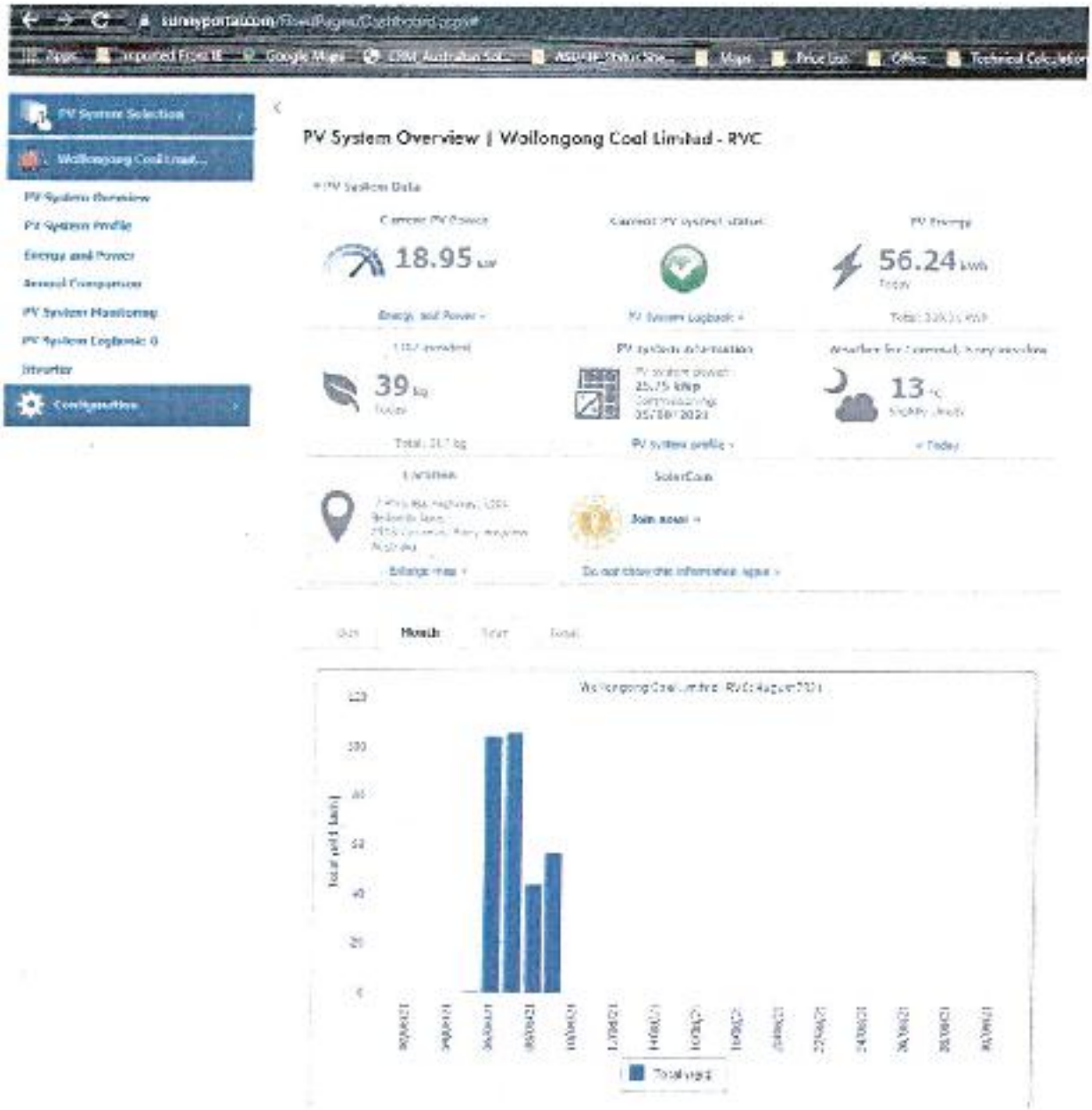
Figure 10 – Solar System Overview



WOLLONGONG COAL

13 General

13. Please provide details on the methodology for calculating carbon emissions reductions for the statements made in documents already provided (in particular WCL Sustainability and Emission Reduction Strategy (June 2021), the Draft Air Quality and Greenhouse Gas Management Plan and the Jindal Power and Steel Sustainability report as well as for the emissions calculated in response to this information request. In doing so, please provide any references to publicly available guidelines used in the methodology as well as any evidence that the methodology (and/or calculations) was independently verified/assured.

The methodology for calculating the carbon emission reduction is attached as **Appendix 7** and **Appendix 8**. The references to the publicly available documents are also referenced in **Appendix 7** and **Appendix 8**.

Appendix 1 – Carbon emission initiatives

Appendix 2 – RV Diesel Emissions

Appendix 3 – WCL tree plantation

Appendix 4 – Summary Report Australias 2030 Emission Reduction Target

Appendix 5 – 2014-15 Section 19 NGERs Report

Appendix 6 – Scope 1 & 2 Comparison

Appendix 7 – Greenhouse Gas and Energy Assessment, July 2019

Appendix 8 – RVC EC RPT 001 NGER Basis of Preparation, Rev 3

Yours sincerely

Warwick Lidbury
CEO
Wollongong Coal Limited

Description	Per Annum			
	Energy Saving kWH	CO2 Reduction (T)	Trees returned to the planet	Year of Implementation
Change from 2MTpa using LW to 1MTpa using Continuous Miners	5,000,000	5376	28,571	2021
Remove #5 Shaft Ventilation Fans	4,117,200	4427	23,527	2019
Replace Surface Lighting to LED	47,352	51	271	2021
Install Solar Panels on Main Bathhouse	38,857	42	222	2021
Install Solar Panels at #4 Shaft	6,023	6	34	2020
Install Solar Panels on Workshop	505,141	543	2,887	proposed 2021-22
Replace Surface Lighting to LED-ongoing	100,000	108	571	ongoing 2021
SUB - TOTAL	**9,814,573**	**10,553**	**56,083**	

Tree plantaion	**Nos**			
Wongawilli	**500**	**94**		2021
Russell vale	**750**	**141**		ongoing 2021

Change in mining method

METHOD OF MINING	Longwall	Bord and Pillar (Place Change)	% Reduction
PRODUCTION ESTIMATE	656,764 tonnes	202,118 tonnes	*70%*
GAS EMISSION	3,815,798m^3	1,174,305m^3	*70%*

To be done

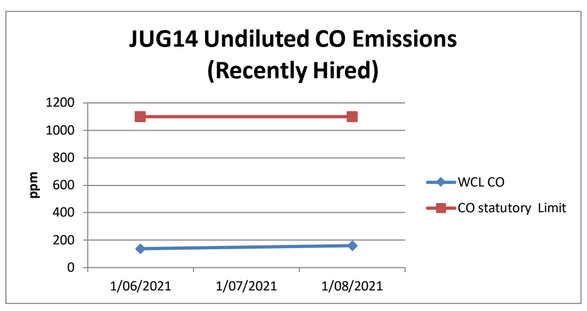
Basis of Calculations	kwh/month	kwh/annum
June 2016 Energy Consumption data (from energy bill)	1263348	15,160,176
Minus #5 Shaft Fans		4,117,200
Longwall related Energy Consumption		11,042,976
Estimate of energy consumption using Continuous Miners		6,000,000
Energy Saving from Changing from LW to CM production		5,042,976

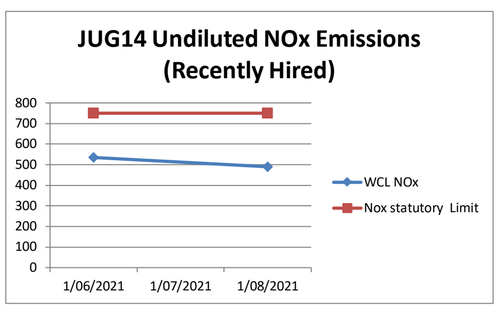
Assumption that 175 trees returned to the planet per kwh per annum

JUG14

	CO	NO2	NO
16/07/2021	7	0.3	5

	WCL CO	WCL NOx	WCL DP	CO statuto	Nox statut	Baseline C	Baseline N	Baseline DP
17/06/2021	138	535	2.5	1100	750	150	460	7.6
6/08/2021	160	490	9	1100	750	150	460	7.6

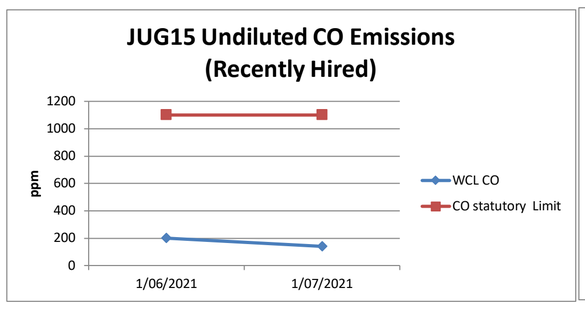


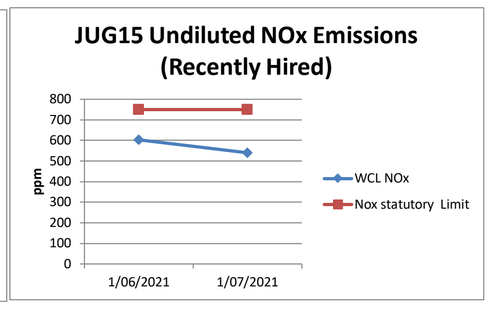


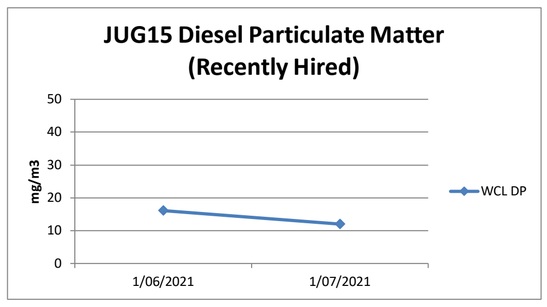
JUG001

	CO	NO2	NO
8/08/2021	6	0.2	4
17/07/2021	6	0.2	4

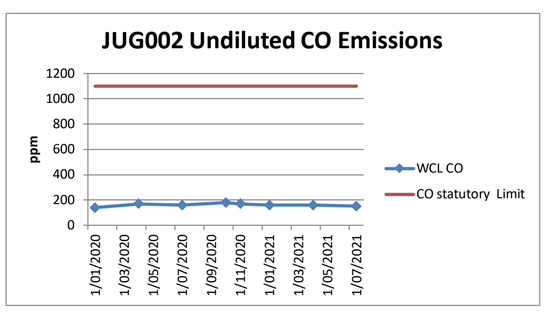
	WCL CO	WCL NOx	WCL DP	CO statuto	Nox statut	Baseline C	Baseline N	Baseline DP
18/06/2021	200	603	16.1	1100	750	164	590	16.8
29/07/2021	140	540	12	1100	750	164	590	16.8

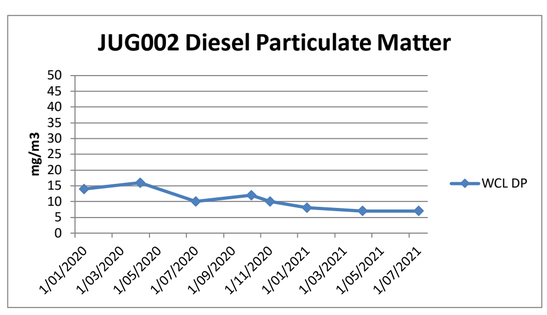


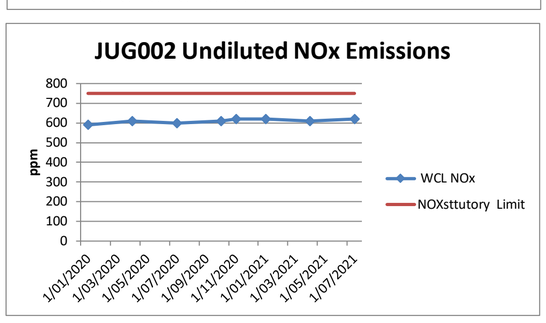




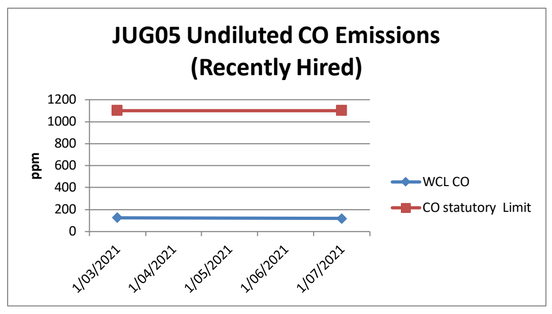
	WCL CO	WCL NOx	WCL DP	CO statuto	NOXsttuto	CO Baseline
29/07/2021	150	620	7	1100	750	150
28/04/2021	160	610	7	1100	750	150
28/01/2021	160	620	8	1100	750	150
30/11/2020	170	620	10	1100	750	150
29/10/2020	180	610	12	1100	750	150
30/07/2020	160	600	10	1100	750	150
30/04/2020	170	610	16	1100	750	150
30/01/2020	140	590	14	1100	750	150
Baseline	150	555	11			

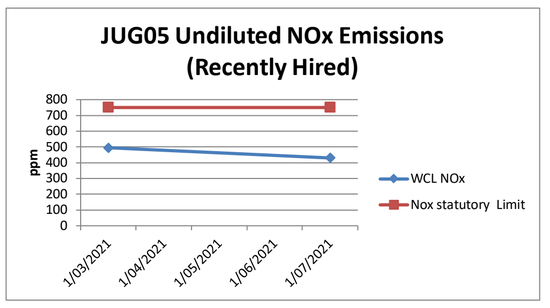




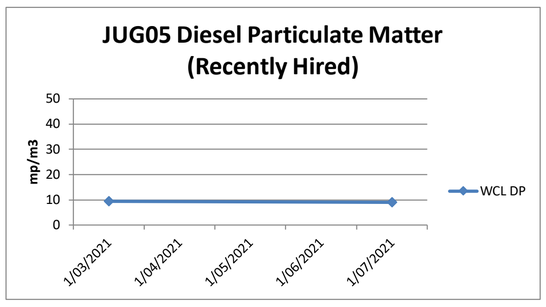


	WCL CO	WCL NOx	WCL DP	CO statuto	Nox statut	Baseline C	Baseline N	Baseline DP
19/03/2021	125	495	9.4	1100	750	125	495	9
29/07/2021	120	430	9	1100	750	125	495	9



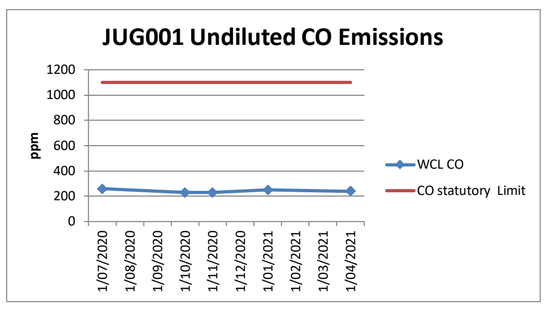


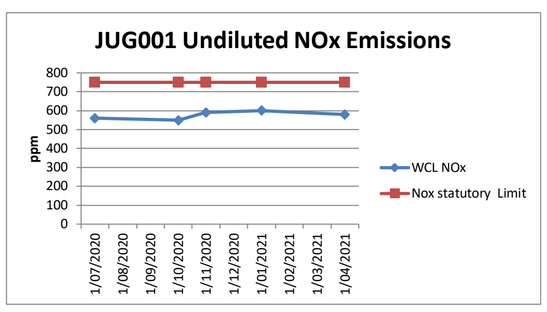
Baseline 125 495 9

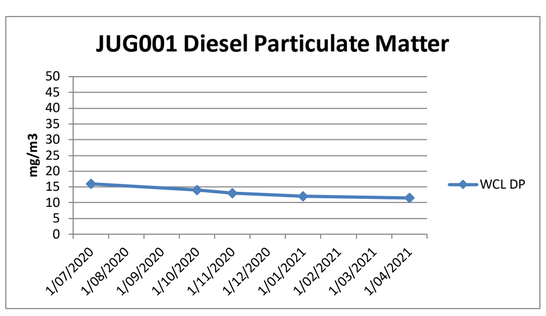


	WCL CO	WCL NOx	WCL DP	CO statuto	Nox statutory	Limit
28/04/2021	240	580	11.5	1100	750	
28/01/2021	250	600	12	1100	750	
30/11/2020	230	590	13	1100	750	
29/10/2020	230	550	14	1100	750	
30/07/2020	260	560	16	1100	750	

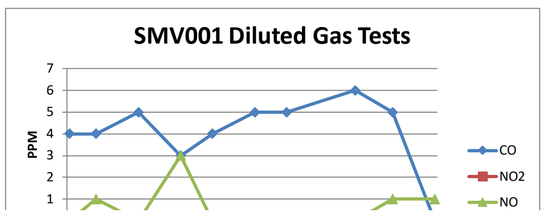
Baseline



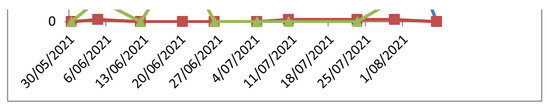




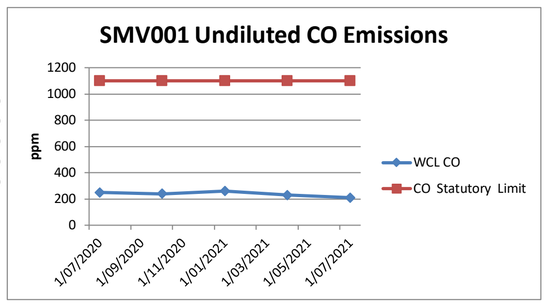
CO	NO2	NO
0	0	1
5	0.1	1
6	0.1	0
5	0.1	0
5	0	0
4	0	0
3	0	3
5	0	0
4	0.1	1

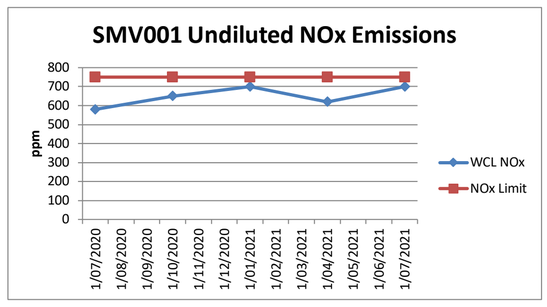


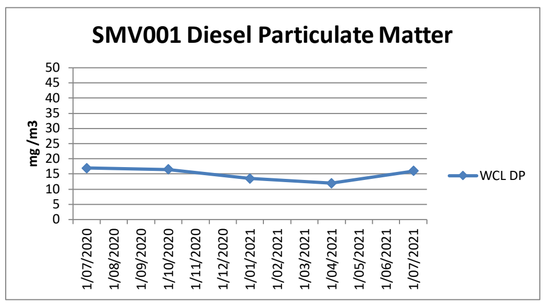
	4	0	0



	WCL CO	WCL NOx	WCL DP	CO Statute	NOx Limit
	210	700	16	1100	750
	230	620	12	1100	750
	260	700	13.5	1100	750
	240	650	16.5	1100	750
	250	580	17	1100	750
	215	690	12		



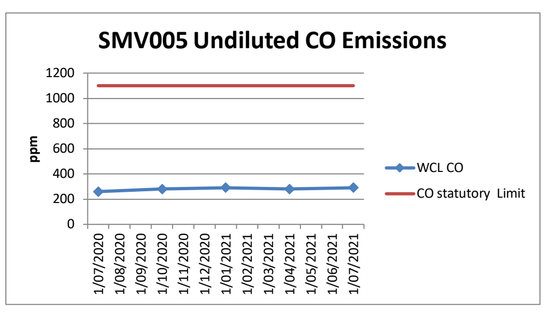


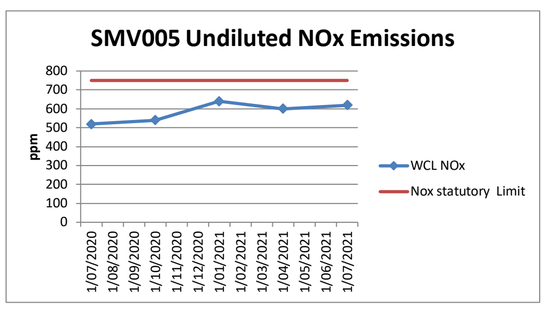


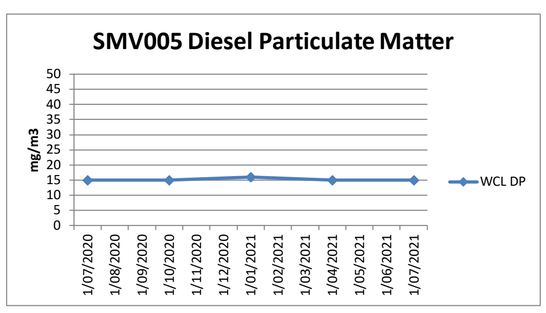
SMV005

	CO	NO2	NO
7/08/2021	4	0	1
31/07/2021	5	0	0
25/07/2021	5	0	0
19/07/2021	3	0	2
10/06/2021	4	0	0
2/07/2021	5	0	1
25/06/2021	5	0	0
20/06/2021	3	0	2
4/06/2021	3	0	1.5
28/05/2021	5	0	0

	WCL CO	WCL NOx	WCL DP	CO statuto	Nox statutory	Limit
29/07/2021	290	620	15	1100	750	
28/04/2021	280	600	15	1100	750	
28/01/2021	290	640	16	1100	750	
29/10/2020	280	540	15	1100	750	
30/07/2020	260	520	15	1100	750	
Baseline	235	700	9			

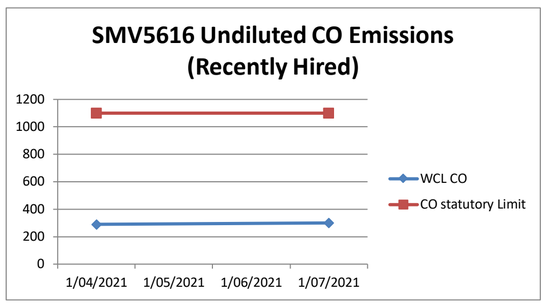


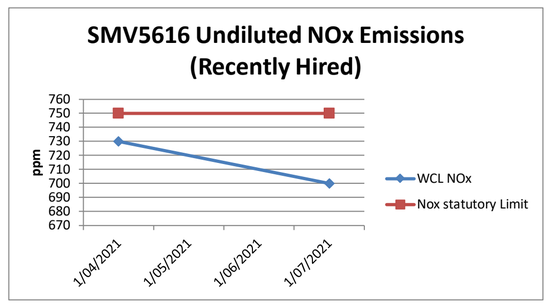


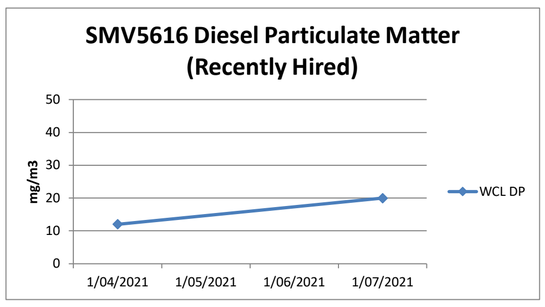


5/06/2021	5	0	0
29/05/2021	4	0	1

	WCL CO	WCL NOx	WCL DP	CO statuto	Nox statuto	Baseline CO	Baseline NO	Baseline DP
29/07/2021	300	700	20	1100	750	255	650	14.4
19/04/2021	290	730	12	1100	750	255	650	14.4
Baseline	300	700	19.8					





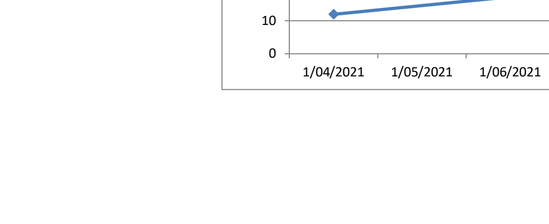


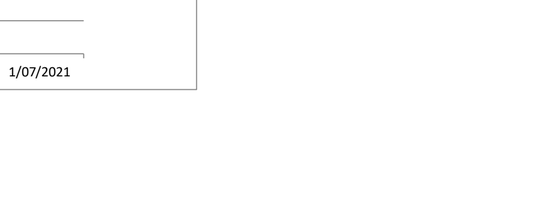
SMV5617

	CO	NO2	NO
7/08/2021	0	0	1.5
31/07/2021	4	0.1	0
25/07/2021	4	0	0
17/07/2021	4	0	0
28/06/2021			

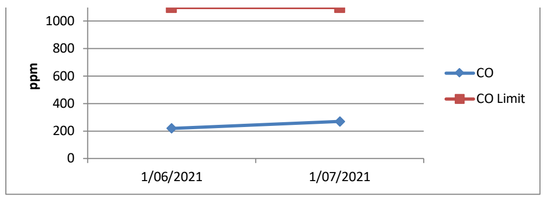
	WCL CO	WCL NOx	WCL DP	CO statuto	Nox statuto	Baseline CO	Baseline NO	Baseline DP
29/07/2021	240	650	12	1100	750	280	720	12.3
11/05/2021	205	634	6.2	1100	750	280	720	12.3
Baseline	280	720	12.3	1100	750			

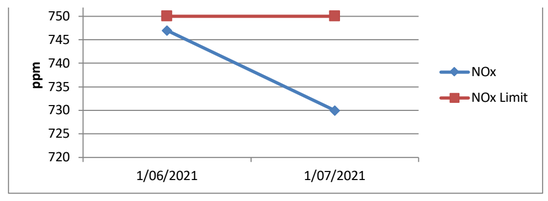
	CO	NOx	DP	CO Limit	NOx Limit
29/07/2021	270	730	20	1100	750
18/06/2021	219	747	14.1	1100	750

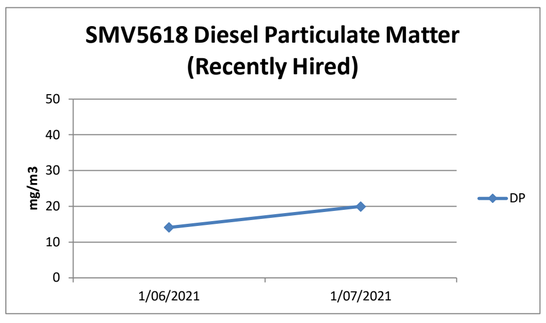




Baseline	300	700	19.8





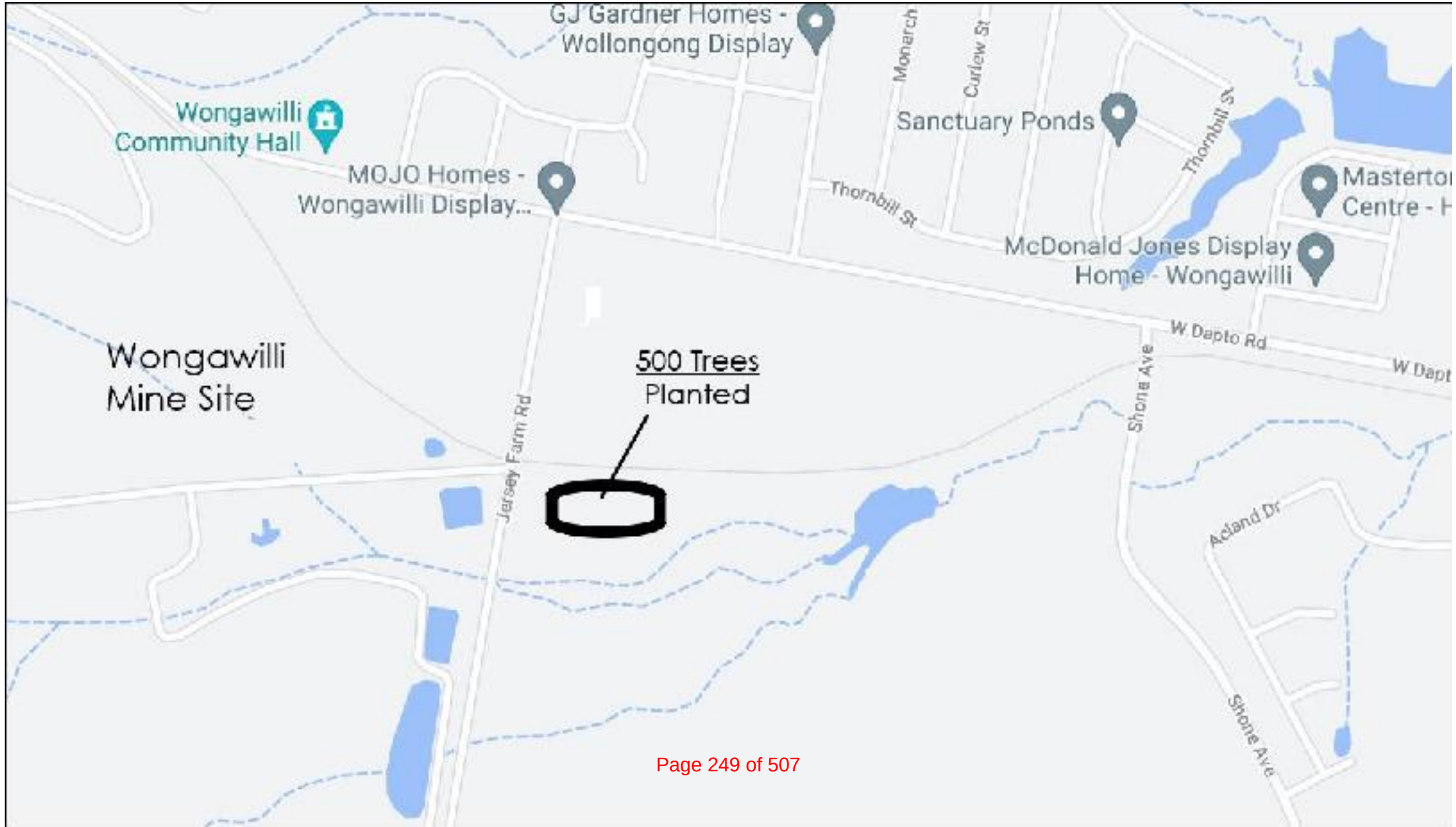


TREE PLANTATION WCL
WONGAWILLI AND RUSSELL VALE MINE

Wongawilli Mine Site Tree Planting

Location Wongawilli

WONGAWILLI MINE SITE



RUSSELL VALE MINE SITE

UNCLASSIFIED: FOR OFFICIAL USE ONLY

Australian Government
Clean Energy Regulator

ABN/ACN/ARBN/Trading Name:	28111244896
Version No:	3
Submission Status:	Submitted
Submission Date:	18/02/2016

NATIONAL GREENHOUSE AND ENERGY REPORTING SECTION 19 - ENERGY AND EMISSIONS REPORT

FOR THE REPORTING YEAR 2014 – 2015

REPORT UNDER SECTION 19 OF THE *NATIONAL GREENHOUSE AND ENERGY REPORTING ACT 2007*

Corporations registered under Division 3 of Part 2 of the *National Greenhouse and Energy Reporting Act 2007* (the NGER Act) are required to provide a report to the Clean Energy Regulator (the Regulator) by 31 October each year in respect of the previous financial year relating to:

- greenhouse gas emissions; and
- energy production; and
- energy consumption;

from the operation of facilities under the operational control of the corporation and entities that are members of the corporation's group, during that financial year.

A report under section 19 of the NGER Act must be given in a manner and form approved by the Regulator and set out the information specified in the *National Greenhouse and Energy Reporting Regulations 2008* (the NGER Regulations). The report must also be based on the methods, or methods which meet criteria, set out in the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (the Measurement Determination).

This report is an approved form in which a report under section 19 of the NGER Act may be given to the Regulator.

Giving false or misleading information is a serious offence.

SUBMITTING THE REPORT

The approved manner for submission of the section 19 report is completion and submission of the report in the Emissions and Energy Reporting System.

Your report must be submitted to the Regulator by 31 October 2015.

If a copy of this report is printed in hardcopy form for any purpose it does not represent, nor can it be treated as, an official version of the report submitted to the Regulator.

LEX-24805

CONTROLLING CORPORATION DETAILS

Name	Wollongong Coal Limited
Australian Business Number (ABN)	28111244896
Australian Company Number (ACN)	-
Australian Registered Body Number (ARBN)	-
Trading Name	-
Head office postal address:	
Postal address line 1	PO BOX 281
Postal address line 2	-
Postal address line 3	-
Postal city/suburb	FAIRY MEADOW
Postal state	New South Wales
Postal postcode	2519
Postal country	AUSTRALIA
Head office street address:	
Street address line 1	7 Princess Highway
Street address line 2	-
Street address line 3	-
Street city/suburb	Corrimal
Street state	New South Wales
Street postcode	2518
Street country	AUSTRALIA

EXECUTIVE OFFICER (OR EQUIVALENT) DETAILS

Name	Sanjay Sharma
Position	Company Secretary
Phone	0402 466 616
Mobile	-
Fax	-
Email	sharma@wcl.net.au
Postal address line 1	PO Box 924
Postal address line 2	-
Postal address line 3	-
Postal city/suburb	DAPTO
Postal state	
Postal postcode	2530
Postal country	AUSTRALIA

CONTACT PERSON DETAILS

Name	Kamlesh Prajapati
Position	Primary Contact
Phone	02 4223 6826
Mobile	0400352436
Fax	02 4283 7449
Email	kprajapati@wcl.net.au
Postal address line 1	PO BOX 281
Postal address line 2	-
Postal address line 3	-
Postal city/suburb	FAIRY MEADOW
Postal state	
Postal postcode	2519
Postal country	AUSTRALIA

LEX-24805

WOLLONGONG COAL LIMITED EMISSION AND ENERGY REPORT SUMMARY

The table below reports total scope 1 and scope 2 greenhouse gas emissions, energy produced and energy consumed by the corporate group Wollongong Coal Limited for the 2014 - 2015 reporting period.

GREENHOUSE GAS EMISSIONS (t CO2-e)		
Scope 1	**Scope 2**	**Total of Scope 1 and Scope 2**
308,494	25,972	334,466

ENERGY PRODUCED AND ENERGY CONSUMED (GJ)		
Energy Consumed Total	**Energy Consumed Net**	**Energy Produced**
139,257	139,257	10,608,600

GREENHOUSE GAS SCOPE 1 EMISSIONS BY GAS (t CO2-e)						
Carbon Dioxide CO2	**Methane CH4**	**Nitrous Oxide N2O**	**Perfluorocarbons PFCs**	**Hydro Fluoro Carbons HFCs**	**Sulphur Hexafluoride SF6**	**Total**
39,651	268,828	15	-	-	-	308,494

UNCERTAINTY

The NGER Regulations require a registered corporation's report to include the amount of uncertainty associated with estimates of scope 1 emissions for their corporate group. Uncertainty is to be assessed for an emissions estimate so that a range for statistical uncertainty is provided at a 95% confidence level. The uncertainty of emissions estimates is to be calculated in accordance with the rules set out in Chapter 8 of the NGER Determination, including in accordance with the Greenhouse Gas Protocol guidance on uncertainty assessment in greenhouse gas inventories and calculating statistical parameter uncertainty (September 2003), as applicable.

FACILITY NAME : RUSSELL VALE COLLIERY		
Source	**Emission Total (tCO2-e)**	**Uncertainty %**
Underground mines	305,432	28.20

WOLLONGONG COAL LIMITED EMISSION AND ENERGY REPORT DETAIL

Corporate Structure

The table below lists the entities whose greenhouse gas emissions and energy production and energy consumption are included in the S19 report.

No.	Entity Details	Scope 1 Emissions (t CO2-e)	Scope 2 Emissions (t CO2-e)	Energy Consumed Total (GJ)	Energy Consumed Net (GJ)	Energy Produced (GJ)
1	Russell Vale Colliery **Type:** Facility	307,465	23,979	129,587	129,587	10,008,420
2	Wongawilli Coal Pty. Ltd. **Type:** Group Member	1,029	1,993	9,670	9,670	600,180
3	Wongawilli mine **Type:** Facility	1,029	1,993	9,670	9,670	600,180

1: RUSSELL VALE COLLIERY - FACILITY

Name	Russell Vale Colliery
Facility Street Address	7 PRINCES HIGHWAY Corrimal New South Wales 2518 AUSTRALIA
Geographic Coordinates	Latitude 34.348S / Longitude 150.712E
Facility location	-
Activity location	New South Wales
Location description	Russell Vale Colliery Russell Vale
Activity description	Coal Mine
ANZSIC Code	060 - Coal mining
Operational Control	Wollongong Coal Limited
Number of Days with Operational Control	Full Year
Operational Control Dates	01/07/2014 - 30/06/2015

The following tables summarise total greenhouse gas emissions from operation of this facility during the period that it was under the operational control of Wollongong Coal Limited.

GREENHOUSE GAS EMISSIONS (t CO2-e)

Scope 1	Scope 2	Total of Scope 1 and Scope 2
307,465	23,979	331,444

ENERGY PRODUCED AND ENERGY CONSUMED (GJ)

Energy Consumed Total	Energy Consumed Net	Energy Produced
129,587	129,587	10,008,420

GREENHOUSE GAS SCOPE 1 EMISSIONS BY GAS (t CO2-e)

Carbon Dioxide CO2	Methane CH4	Nitrous Oxide N2O	Perfluorocarbons PFCs	Hydro Fluoro Carbons HFCs	Sulphur Hexafluoride SF6	Total
38,623	268,828	14	-	-	-	307,465

SCOPE 1 EMISSIONS

EC = Energy Content Factor, Z = Energy Content, EF = Emission Factor

Source Activity	Fuel / Criteria	Quantity	Energy Values (EC & Z)	Gas / Method	Scope 1 Emissions (t CO2-e)
Source category: Fuel combustion **Source of emissions:** Stationary and Transport energy purposes (excluding electricity generation) **Activity type:** Emissions released from combustion of gaseous fuels - Stationary energy purposes	**Fuel / Energy commodity:** Liquefied natural gas **Fuel usage:** combustion **Criteria:** AA	17.747 kL	**EC (GJ/Unit):** 25.3 **Z (GJ):** 449	**Gas:** CO2 **EF (kg CO2-e / GJ):** 51.2 **Method:** Method 1	23
				Gas: CH4 **EF (kg CO2-e / GJ):** 0.1 **Method:** Method 1	0
				Gas: N2O **EF (kg CO2-e / GJ):** 0.03	0

LEX-24805

				Method: Method 1	
Source category: Fuel combustion **Source of emissions:** Stationary and Transport energy purposes (excluding electricity generation) **Activity type:** Emissions released from combustion of liquid fuels other than petroleum oils or greases - Transport energy purposes	**Fuel / Energy commodity:** Diesel oil - Transport **Fuel usage:** combustion **Criteria:** AA	411.646 kL	**EC (GJ/Unit):** 38.6 **Z (GJ):** 15,890	**Gas:** CO2 **EF (kg CO2-e / GJ):** 69.2 **Method:** Method 1	1,100
				Gas: CH4 **EF (kg CO2-e / GJ):** 0.2 **Method:** Method 1	3
				Gas: N2O **EF (kg CO2-e / GJ):** 0.5 **Method:** Method 1	8
Source category: Fuel combustion **Source of emissions:** Stationary and Transport energy purposes (excluding electricity generation) **Activity type:** Emissions released from combustion of liquid fuels other than petroleum oils or greases - Transport energy purposes	**Fuel / Energy commodity:** Diesel oil - Transport **Fuel usage:** combustion **Criteria:** AA	332.856 kL	**EC (GJ/Unit):** 38.6 **Z (GJ):** 12,848	**Gas:** CO2 **EF (kg CO2-e / GJ):** 69.2 **Method:** Method 1	889
				Gas: CH4 **EF (kg CO2-e / GJ):** 0.2 **Method:** Method 1	3
				Gas: N2O **EF (kg CO2-e / GJ):** 0.5 **Method:** Method 1	6
Source category: Fuel combustion **Source of emissions:**	**Fuel / Energy commodity:** Petroleum based oils	0.54 kL	**EC (GJ/Unit):** 38.8	**Gas:** CO2 **EF (kg**	1

LEX-24805

Stationary and Transport energy purposes (excluding electricity generation) **Activity type:** Emissions released from combustion of petroleum based oils or greases	(other than petroleum based oil used as fuel) **Fuel usage:** combustion **Criteria:** AA		**Z (GJ):** 21	**CO2-e / GJ):** 27.9 **Method:** Method 1	
		Source Total	29,208		2,033
Source category: Fuel combustion **Source of emissions:** Emissions released from fuel use by certain industries (including electricity generation) **Activity type:** Chemical and metal product - Gaseous fuels	**Fuel / Energy commodity:** Gaseous fossil fuels other than those mentioned in items 17 to 26 **Fuel usage:** combustion **Criteria:** AA	0.432 m3	**EC (GJ/Unit):** 0.0393 **Z (GJ):** -	**Gas:** CO2 **EF (kg CO2-e / GJ):** 51.2 **Method:** Method 1	0
				Gas: CH4 **EF (kg CO2-e / GJ):** 0.1 **Method:** Method 1	0
				Gas: N2O **EF (kg CO2-e / GJ):** 0.03 **Method:** Method 1	0
		Source Total	-		-
Source category: Fugitive emissions **Source of emissions:** Underground mines **Activity type:** Fugitive emissions from extraction of coal	-	-	-	**Gas:** CO2 **EF (kg CO2-e / GJ):** - **Method:** Method 4	36,610
				Gas: CH4 **EF (kg CO2-e / GJ):** - **Method:** Method 4	264,151
Source category: Fugitive emissions **Source of emissions:** Underground mines **Activity type:** Fugitive emissions from post mining activities	-	-	-	**Gas:** CH4 **EF (kg CO2-e / GJ):** 0.014 **Method:** Method 1	4,671

			Source Total	-	305,432
			Total	29,208	307,465

MATTERS TO BE IDENTIFIED (MTBI) PER SOURCE

Source of Emissions	MTBI	Methods	Activity	Activity Value	Unit
Underground mines	the tonnes of coal mine waste gas (CO2-e) flared	Method 1	-	0	tonnes (CO2-e) (flared)
Underground mines	the tonnes of raw coal produced	Method 4	Fugitive emissions from extraction of coal	333,614	tonnes
		Method 1	Fugitive emissions from post mining activities	333,614	tonnes
	the tonnes of carbon dioxide captured for energy production on site	Method 4	Fugitive emissions from extraction of coal	0	tonnes (CO2-e)
	the tonnes of methane (CO2-e) captured for energy production on site	Method 4	Fugitive emissions from extraction of coal	0	tonnes (CO2-e)
	the tonnes of carbon dioxide captured and transferred off site	Method 4	Fugitive emissions from extraction of coal	0	tonnes (CO2-e)
	the tonnes of methane (CO2-e) captured and transferred off site	Method 4	Fugitive emissions from extraction of coal	0	tonnes (CO2-e)
	the tonnes of carbon dioxide flared	Method 4	Fugitive emissions from extraction of coal	0	tonnes (CO2-e)
	the tonnes of methane (CO2-e) flared	Method 4	Fugitive emissions from extraction of coal	0	tonnes (CO2-e)
	whether the mine is a gassy mine or a non-gassy mine	Method 1	Fugitive emissions from post mining activities	Gassy	

SCOPE 2 EMISSIONS

Activity Type	Amount	Units	Emission Factor (kg CO2-e / unit)	Scope 2 Emissions (t CO2-e)
Purchase of electricity from main electricity grid in a State or Territory	27,882,920.197	kWh	0.86	23,979
			Total	23,979

LEX-24805

ENERGY CONSUMED BY MEANS OF COMBUSTION FOR PRODUCING A CHEMICAL OR METAL PRODUCT

Activity Type	Fuel / Energy Commodity	Fuel Usage	Criteria	Amount	Units	Energy Content Factor (GJ/Unit)	Energy Content (GJ)
Chemical and metal product - Gaseous fuels	Gaseous fossil fuels other than those mentioned in items 17 to 26	combustion	AA	0.432	m3	0.0393	0
						Total	-

ENERGY CONSUMED BY MEANS OF COMBUSTION FOR TRANSPORT

Activity Type	Fuel / Energy Commodity	Fuel Usage	Criteria	Amount	Units	Energy Content Factor (GJ/Unit)	Energy Content (GJ)
Emissions released from combustion of liquid fuels other than petroleum oils or greases - Transport energy purposes	Diesel oil - Transport	combustion	AA	411.646	kL	38.6	15,890
Emissions released from combustion of liquid fuels other than petroleum oils or greases - Transport energy purposes	Diesel oil - Transport	combustion	AA	332.856	kL	38.6	12,848
						Total	28,738

ENERGY CONSUMED BY MEANS OF COMBUSTION FOR PURPOSES OTHER THAN PRODUCING ELECTRICITY, PRODUCING A CHEMICAL OR METAL PRODUCT OR FOR TRANSPORT

Activity Type	Fuel / Energy Commodity	Fuel Usage	Criteria	Amount	Units	Energy Content Factor (GJ/Unit)	Energy Content (GJ)
Emissions released from combustion of gaseous fuels - Stationary energy purposes	Liquefied natural gas	combustion	AA	17.747	kL	25.3	449
Emissions released from combustion of petroleum based oils or greases	Petroleum based oils (other than petroleum based oil used as fuel)	combustion	AA	0.54	kL	38.8	21
						Total	470

ENERGY CONSUMED BY MEANS OTHER THAN COMBUSTION

Activity Type	Fuel / Energy Commodity	Fuel Usage	Criteria	Amount	Units	Energy Content Factor (GJ/Unit)	Energy Content (GJ)
Purchase of electricity from main electricity grid in a State or Territory	-	-	-	27,882,920.197	kWh	0.0036	100,379
						Total	100,379

ENERGY PRODUCED

Activity Type	Fuel / Energy Commodity	Primary/Secondary	Amount	Units	Energy Content Factor	Converted Amount (GJ)
Energy content of fuel produced	Coking coal	Primary	333,614	tonnes	30	10,008,420
					Total	10,008,420

2: WONGAWILLI COAL PTY. LTD. - GROUP MEMBER

Name	Wongawilli Coal Pty. Ltd.
Australian Business Number (ABN)	77111928762
Australian Company Number (ACN)	-
Australian Registered Body Number (ARBN)	-
Trading Name	-
Street address line 1	Via Wongawilli Colliery
Street address line 2	via Wongawillli Road
Street address line 3	-
Street city/suburb	DAPTO
Street state	New South Wales
Street postcode	2530
Street country	AUSTRALIA

The following tables summarise total greenhouse gas emissions and energy data for all facilities that were under the operational control of this group member during the reporting period.

GREENHOUSE GAS EMISSIONS (t CO2-e)		
Scope 1	**Scope 2**	**Total of Scope 1 and Scope 2**
1,029	1,993	3,022

ENERGY PRODUCED AND ENERGY CONSUMED (GJ)		
Energy Consumed Total	**Energy Consumed Net**	**Energy Produced**
9,670	9,670	600,180

GREENHOUSE GAS SCOPE 1 EMISSIONS BY GAS (t CO2-e)						
Carbon Dioxide CO2	**Methane CH4**	**Nitrous Oxide N2O**	**Perfluorocarbons PFCs**	**Hydro Fluoro Carbons HFCs**	**Sulphur Hexafluoride SF6**	**Total**
1,028	-	1	-	-	-	1,029

3: WONGAWILLI MINE - FACILITY

Name	Wongawilli mine
Facility Street Address	Jersey Farm Road Via Wongawilli Road WEST DAPTO New South Wales 2530 AUSTRALIA
Geographic Coordinates	Latitude 34.498S / Longitude 150.779E
Facility location	-
Activity location	New South Wales
Location description	-
Activity description	-
ANZSIC Code	060 - Coal mining
Operational Control	Wongawilli Coal Pty. Ltd.
Number of Days with Operational Control	Full Year
Operational Control Dates	01/07/2014 - 30/06/2015

The following tables summarise total greenhouse gas emissions from operation of this facility during the period that it was under the operational control of Wongawilli Coal Pty. Ltd..

GREENHOUSE GAS EMISSIONS (t CO2-e)

Scope 1	Scope 2	Total of Scope 1 and Scope 2
1,029	1,993	3,022

ENERGY PRODUCED AND ENERGY CONSUMED (GJ)

Energy Consumed Total	Energy Consumed Net	Energy Produced
9,670	9,670	600,180

GREENHOUSE GAS SCOPE 1 EMISSIONS BY GAS (t CO2-e)

Carbon Dioxide CO2	Methane CH4	Nitrous Oxide N2O	Perfluorocarbons PFCs	Hydro Fluoro Carbons HFCs	Sulphur Hexafluoride SF6	Total
1,028	-	1	-	-	-	1,029

SCOPE 1 EMISSIONS

EC = Energy Content Factor, Z = Energy Content, EF = Emission Factor

Source Activity	Fuel / Criteria	Quantity	Energy Values (EC & Z)	Gas / Method	Scope 1 Emissions (t CO2-e)
Source category: Fuel combustion **Source of emissions:** Stationary and Transport energy purposes (excluding electricity generation) **Activity type:** Emissions released from combustion of gaseous fuels - Stationary energy purposes	**Fuel / Energy commodity:** Liquefied natural gas **Fuel usage:** combustion **Criteria:** AA	0.141 kL	**EC (GJ/Unit):** 25.3 **Z (GJ):** 4	**Gas:** CO2 **EF (kg CO2-e / GJ):** 51.2 **Method:** Method 1	0
				Gas: CH4 **EF (kg CO2-e / GJ):** 0.1 **Method:** Method 1	0
				Gas: N2O **EF (kg CO2-e /**	0

				GJ): 0.03 **Method:** Method 1	
Source category: Fuel combustion **Source of emissions:** Stationary and Transport energy purposes (excluding electricity generation) **Activity type:** Emissions released from combustion of liquid fuels other than petroleum oils or greases - Transport energy purposes	**Fuel / Energy commodity:** Diesel oil - Transport **Fuel usage:** combustion **Criteria:** AA	28.125 kL	**EC (GJ/Unit):** 38.6 **Z (GJ):** 1,086	**Gas:** CO2 **EF (kg CO2-e / GJ):** 69.2 **Method:** Method 1	75
				Gas: CH4 **EF (kg CO2-e / GJ):** 0.2 **Method:** Method 1	0
				Gas: N2O **EF (kg CO2-e / GJ):** 0.5 **Method:** Method 1	1
Source category: Fuel combustion **Source of emissions:** Stationary and Transport energy purposes (excluding electricity generation) **Activity type:** Emissions released from combustion of liquid fuels other than petroleum oils or greases - Transport energy purposes	**Fuel / Energy commodity:** Diesel oil - Transport **Fuel usage:** combustion **Criteria:** AA	6.149 kL	**EC (GJ/Unit):** 38.6 **Z (GJ):** 237	**Gas:** CO2 **EF (kg CO2-e / GJ):** 69.2 **Method:** Method 1	16
				Gas: CH4 **EF (kg CO2-e / GJ):** 0.2 **Method:** Method 1	0
				Gas: N2O **EF (kg CO2-e / GJ):** 0.5 **Method:** Method 1	0
					0

LEX-24805

Source category: Fuel combustion **Source of emissions:** Stationary and Transport energy purposes (excluding electricity generation) **Activity type:** Emissions released from combustion of petroleum based oils or greases	**Fuel / Energy commodity:** Petroleum based oils (other than petroleum based oil used as fuel) **Fuel usage:** combustion **Criteria:** AA	0.04 kL	**EC (GJ/Unit):** 38.8 **Z (GJ):** 2	**Gas:** CO2 **EF (kg CO2-e / GJ):** 27.9 **Method:** Method 1	
		Source Total	1,329		92
Source category: Fuel combustion **Source of emissions:** Emissions released from fuel use by certain industries (including electricity generation) **Activity type:** Chemical and metal product - Gaseous fuels	**Fuel / Energy commodity:** Gaseous fossil fuels other than those mentioned in items 17 to 26 **Fuel usage:** combustion **Criteria:** AA	0.108 m3	**EC (GJ/Unit):** 0.0393 **Z (GJ):** -	**Gas:** CO2 **EF (kg CO2-e / GJ):** 51.2 **Method:** Method 1	0
				Gas: CH4 **EF (kg CO2-e / GJ):** 0.1 **Method:** Method 1	0
				Gas: N2O **EF (kg CO2-e / GJ):** 0.03 **Method:** Method 1	0
		Source Total	-		-
Source category: Fugitive emissions **Source of emissions:** Underground mines **Activity type:** Fugitive emissions from extraction of coal	-	-	-	**Gas:** CO2 **EF (kg CO2-e / GJ):** - **Method:** Method 4	937
				Gas: CH4 **EF (kg CO2-e / GJ):** - **Method:** Method 4	0
		Source Total	-		937
		Total	1,329		1,029

MATTERS TO BE IDENTIFIED (MTBI) PER SOURCE

Source of Emissions	MTBI	Methods	Activity	Activity Value	Unit
Underground mines	the tonnes of raw coal produced	Method 4	Fugitive emissions from extraction of coal	1,586	tonnes
	the tonnes of carbon dioxide captured for energy production on site	Method 4	Fugitive emissions from extraction of coal	0	tonnes (CO2-e)
	the tonnes of methane (CO2-e) captured for energy production on site	Method 4	Fugitive emissions from extraction of coal	0	tonnes (CO2-e)
	the tonnes of carbon dioxide captured and transferred off site	Method 4	Fugitive emissions from extraction of coal	0	tonnes (CO2-e)
	the tonnes of methane (CO2-e) captured and transferred off site	Method 4	Fugitive emissions from extraction of coal	0	tonnes (CO2-e)
	the tonnes of carbon dioxide flared	Method 4	Fugitive emissions from extraction of coal	0	tonnes (CO2-e)
	the tonnes of methane (CO2-e) flared	Method 4	Fugitive emissions from extraction of coal	0	tonnes (CO2-e)

SCOPE 2 EMISSIONS

Activity Type	Amount	Units	Emission Factor (kg CO2-e / unit)	Scope 2 Emissions (t CO2-e)
Purchase of electricity from main electricity grid in a State or Territory	2,317,000.5	kWh	0.86	1,993
			Total	1,993

LEX-24805

ENERGY CONSUMED BY MEANS OF COMBUSTION FOR PRODUCING A CHEMICAL OR METAL PRODUCT

Activity Type	Fuel / Energy Commodity	Fuel Usage	Criteria	Amount	Units	Energy Content Factor (GJ/Unit)	Energy Content (GJ)
Chemical and metal product - Gaseous fuels	Gaseous fossil fuels other than those mentioned in items 17 to 26	combustion	AA	0.108	m3	0.0393	0
						Total	-

ENERGY CONSUMED BY MEANS OF COMBUSTION FOR TRANSPORT

Activity Type	Fuel / Energy Commodity	Fuel Usage	Criteria	Amount	Units	Energy Content Factor (GJ/Unit)	Energy Content (GJ)
Emissions released from combustion of liquid fuels other than petroleum oils or greases - Transport energy purposes	Diesel oil - Transport	combustion	AA	28.125	kL	38.6	1,086
Emissions released from combustion of liquid fuels other than petroleum oils or greases - Transport energy purposes	Diesel oil - Transport	combustion	AA	6.149	kL	38.6	237
						Total	1,323

ENERGY CONSUMED BY MEANS OF COMBUSTION FOR PURPOSES OTHER THAN PRODUCING ELECTRICITY, PRODUCING A CHEMICAL OR METAL PRODUCT OR FOR TRANSPORT

Activity Type	Fuel / Energy Commodity	Fuel Usage	Criteria	Amount	Units	Energy Content Factor (GJ/Unit)	Energy Content (GJ)
Emissions released from combustion of gaseous fuels - Stationary energy purposes	Liquefied natural gas	combustion	AA	0.141	kL	25.3	4
Emissions released from combustion of petroleum based oils or greases	Petroleum based oils (other than petroleum based oil used as fuel)	combustion	AA	0.04	kL	38.8	2
						Total	6

ENERGY CONSUMED BY MEANS OTHER THAN COMBUSTION

Activity Type	Fuel / Energy Commodity	Fuel Usage	Criteria	Amount	Units	Energy Content Factor (GJ/Unit)	Energy Content (GJ)
Purchase of electricity from main electricity grid in a State or Territory	-	-	-	2,317,000.5	kWh	0.0036	8,341
						Total	8,341

ENERGY PRODUCED

Activity Type	Fuel / Energy Commodity	Primary/Secondary	Amount	Units	Energy Content Factor	Converted Amount (GJ)
Energy content of fuel produced	Coking coal	Primary	20,006	tonnes	30	600,180
					Total	600,180

LEX-24805

CORPORATE GROUP THRESHOLD MET

The corporate group of Wollongong Coal Limited has met a corporate group threshold prescribed in sections 13 (1)(a), (b), or (c) of the NGER Act during the reporting year and is reporting under Divisions 4.3 to 4.5 of the NGER Regulations (regulation 4.03).

PRIVACY STATEMENT

Protection of Information

The Clean Energy Regulator is bound by the secrecy provisions of Part 3 of the *Clean Energy Regulator Act 2011* (CER Act) in regard to information it collects in relation to this report and also by the *Privacy Act 1988* in regard to personal information it collects.

Privacy Notice

'Personal information' is defined in the Privacy Act 1988 to mean information or an opinion about an identified individual, or an individual who is reasonably identifiable:

(a) whether the information or opinion is true or not; and
(b) whether the information or opinion is recorded in a material form or not.

The collection of personal information relating to this report is authorised by the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) and the National Greenhouse and Energy Reporting Regulations 2008.

Personal information collected in relation to this report will be used for the purposes of assessing the report content, auditing compliance, enforcement of relevant laws and regulations, the performance of our statutory functions and for related purposes. We will also use the personal information which you provide for our administrative purposes, for example, to pre-populate other Clean Energy Regulator forms which you wish to fill out online in the future, and for improving our service delivery to you. We cannot process the application if we do not collect relevant personal information.

The Clean Energy Regulator's Privacy Policy contains information about the agency's procedures for handling personal information including how a person can access their personal information held by the agency, and how to seek correction of such information. The Privacy Policy also contains information about how to complain about a breach of the Australian Privacy Principles. The Clean Energy Regulator's Privacy Policy can be found at www.cleanenergyregulator.gov.au.

Disclosure of Information

The Clean Energy Regulator is only able to disclose information relating to this report (including personal information) in accordance with the CER Act, the NGER Act, the Privacy Act 1988 or as otherwise required by law.

The circumstances in which such information may be disclosed include:

- Disclosure to the Secretary or authorised officer of a Department for the purpose of administering a program or collecting statistics relating to greenhouse gas emissions, energy consumption or energy production;
- Disclosure to certain agencies, bodies or persons where the Regulator is satisfied that disclosure will enable or assist those agencies, bodies or persons to perform or exercise their functions or powers, including the Australian Securities and Investments Commission, the Australian Competition and Consumer Commission and the Commissioner of Taxation;
- Disclosure for the purposes of law enforcement;
- Disclosure to States and Territories in accordance with the NGER Act; and
- Disclosure for the purposes of a climate change law or for the purposes of the performance of our functions under a climate change law.

DECLARATION

The Executive Officer (or equivalent), as described in the National Greenhouse and Energy Reporting Act 2007 (NGER Act), should read the following declaration below before electronically submitting the report

It is the responsibility of the reporting entity to ensure that the information provided in the Report is prepared in accordance with the requirements set out in the NGER Act and the *National Greenhouse and Energy Reporting Regulations 2008* (the NGER Regulations) and that the data it contains is based on methods prescribed in the *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (the Measurement Determination).

Under the NGER Act and the NGER Regulations, the reporting entity remains responsible for the truth and accuracy of the contents of the report despite the assistance, if any, of a third party in its preparation.

Section 19 of the NGER Act includes a civil penalty provision, a breach of which may attract a pecuniary penalty of up to 2,000 penalty units. The *Crimes Act 1914* provides that one penalty unit is $170.

In accordance with section 22 of the NGER Act, a reporting entity is required to keep records of the activities of the members of its group that, inter alia, allow it to report accurately under the NGER Act. Records must be retained for a period of 5 years from the end of the year in which the activities took place. Section 22 includes a civil penalty provision, a breach of which may attract a pecuniary penalty of up to 1,000 penalty units.

By electronically submitting, the signatory declares that:

- they have read and understood the penalties that apply for breaching the *National Greenhouse and Energy Reporting Act 2007*;
- the information provided in this report (including any attachments) is true and correct, and that they understand that the provision of false or misleading information is a serious offence under the *Criminal Code 1995* and may have consequences under the *National Greenhouse and Energy Reporting Act 2007*;
- the information provided in this Report has been prepared and supplied in accordance with the requirements set out in the *National Greenhouse and Energy Reporting Act 2007*, the *National Greenhouse and Energy Reporting Regulations 2008* and the *National Greenhouse and Energy Reporting (Measurement) Determination 2008*;
- they are duly authorised to act, including submitting this report, on behalf of the reporting entity;
- the Clean Energy Regulator may compel or conduct an audit of the information contained in this report or in relation to compliance with the *National Greenhouse and Energy Reporting Act 2007* or the *National Greenhouse and Energy Reporting Regulations 2008*; and
- the Clean Energy Regulator may request further clarification or documentation to verify the information supplied in this Report.

Emissions scope (GHG Emissions from the project over a five year period)	Source	Calculated emissions (t CO_2-e)				
		2014-2015 (Longwall Extraction)	2014-15 LOM equivalent (5 years)	Average annual value for UEP	UEP LOM (5 Years)	% Reduction due to change in mining method
Production -tonnes		**333,614**	**1,668,070**		**3,700,000**	55%
Scope 1 (direct)	**Diesel use**	2,009	10,045	1,219	6,097	39%
	Fugitive emissions	305,432	1,527,160	282580	1412900	7%
Scope 2 (indirect)	**Electricity**	23,979	119,895	20700	103500	14%
Scope 3		3,365,236	16,826,180	1925000	9623427	43%
Total GHG Emissions for Project		3,696,656	18,483,280	304,499	11,145,924	40%

The figures in this table were confirmed by WCL as correct via e-mail on 20 August 21 at 5.31pm.

Note: Not adjusted for stated 40% reduction in rib emissions of 20 August 3.46 pm that is expected to occur should WCL implement its commitment to seal the pillars

The total production in 2014 - 20125 was 333,614 tonnes.

If this is extrapolated over a five year period the toal production would be about 1,668,070 tonnes.

Even with 50% production of the bord and pillar UEP project (3.7million tionnes) the emissions-Scope 1 and scope 2, are 8% higher

From: s. 22(1)(a)(ii)
To:
Subject: Confirmation of figures in Appendix 6 of response to DAWE RFI of 12 August 21 [SEC=OFFICIAL]
Date: Sunday, 29 August 2021 3:33:20 PM
Attachments: Copy of Appendix 6- Scope 1 2 Comparison.xlsx

s. 22(1)(a)(ii)

To clarify, while Devendra (on 20 August 21) cleared the figures in the revised appendix 6 that I sent him.
I note two things that I concluded after I received Devendra's clearance of the figures:

1. The scope 1 fugitive emissions are not updated to reflect the 40% reduction due to WCL's commitment to seal the pillars.
2. The values in cells F9 and G9 were erroneous as they didn't include scope 3.

In relation to the attached I have:

A. Noted that scope 1 figures are **not** adjusted for the proposed sealing of the pillars (to respond to point 1 above)
B. Updated the values in cells F9 and G9 to include scope 3 (to respond point 2 above).

s. 22(1)(a)(ii)

From: Devendra Vyas <devendra.vyas@jindalsteel.com>
Sent: Friday, 20 August 2021 5:31 PM
To: s. 22(1)(a)(ii) @awe.gov.au>
Cc: Louise Vickery <Louise.Vickery@environment.gov.au>; Milind Oza <milind.oza@jindalsteel.com>; s. 22(1)(a)(ii) @environment.gov.au>; Warwick Lidbury <wlidbury@wcl.net.au>
Subject: Re: Follow Up RFI [SEC=OFFICIAL]

Hi s. 22(1)(a)(ii)
Thanks very much. Yes the numbers you mentioned are correct.
Appreciate your efforts.
Regards
Devendra

On Fri, 20 Aug 2021 at 4:53 pm, s. 22(1)(a)(ii) @awe.gov.au> wrote:

> Hi Devendra
> Thanks for that – based on the information below and in appendix 7 of your response of 13 August 21, I have updated appendix 6 of your response of 13 August 21.
> Please review the revised appendix 6 attached to confirm you're happy with the figures (I land at a 43% reduction in scope 3 over the life of the project).
> Thanks
>
> s. 22(1)(a)(ii)
>
> ---
>
> **From:** Devendra Vyas <devendra.vyas@jindalsteel.com>
> **Sent:** Friday, 20 August 2021 4:00 PM
> **To:** s. 22(1)(a)(ii) @awe.gov.au>; Warwick Lidbury <wlidbury@wcl.net.au>

Cc: s. 22(1)(a)(ii) @environment.gov.au>; Louise Vickery <Louise.Vickery@environment.gov.au>; Milind Oza <milind.oza@jindalsteel.com>
Subject: RE: Follow Up RFI [SEC=OFFICIAL]

Hi s. 22(1)(a)(ii)

I just missed one point, the scope 3 emissions longwall vs Bord and Pillar

The scope 3 emissions due to longwall mining were estimated at 3,365,236 million tonnes $CO2_e$ per annum which equates **to 16, 826,180 million tonnes $CO2_e$ over a five year project life**. With the current mining method the estimated scope 3 emissions are **9,623,427 million tonnes $CO2_e$ which is a reduction of 57%**

Hope this assists.

Regards,
Devendra

From: s. 22(1)(a)(ii) @awe.gov.au>
Sent: Friday, 20 August 2021 3:56 PM
To: Devendra Vyas <devendra.vyas@jindalsteel.com>; s. 22(1)(a)(ii) s. 22(1)(a)(ii) @awe.gov.au>; Warwick Lidbury <wlidbury@wcl.net.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; Louise Vickery <Louise.Vickery@environment.gov.au>; Milind Oza <milind.oza@jindalsteel.com>
Subject: RE: Follow Up RFI [SEC=OFFICIAL]

Thanks Devendra – I'll look now.
Cheers
s. 22(1)(a)(ii)

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Cc: s. 22(1)(a)(ii) @environment.gov.au>; Louise Vickery <Louise.Vickery@environment.gov.au>; Milind Oza <milind.oza@jindalsteel.com>
Subject: RE: Follow Up RFI [SEC=OFFICIAL]

Hi s. 22(1)(a)(ii)

Please find attached the response to the RFI. Also attached is a document highlighting the reduction in the gas emissions

- Due to sealing of workings- about 40%
- Change over from longwall to Bord and Pillar- 89%

I will forward the information from JSPL as soon as we receive it.

Have a great week end.

Regards,
Devendra

From: s. 22(1)(a)(ii) @awe.gov.au>
Sent: Friday, 20 August 2021 10:06 AM
To: Devendra Vyas <devendra.vyas@jindalsteel.com>; Warwick Lidbury <wlidbury@wcl.net.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; Louise Vickery <Louise.Vickery@environment.gov.au>
Subject: FW: Follow Up RFI [SEC=OFFICIAL]

Dear Devendra and Warwick
Further to my last, please use the attached instead – minor typographical errors have been fixed.
Thanks
s. 22(1)(a)(ii)

From: s. 22(1)(a)(ii)
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To: Devendra Vyas <devendra.vyas@jindalsteel.com>; Warwick Lidbury <wlidbury@wcl.net.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; Louise Vickery <Louise.Vickery@environment.gov.au>
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s. 22(1)(a)(ii) and I more than happy to discuss on teams.
Thanking you in advance for a speedy response,
Regards

s. 22(1)(a)(ii)

Director | ACT Assessments | s. 22(1)(a)(ii)
Environment Assessments (NSW, ACT)
Environment Approvals Division

Department of Agriculture, Water and the Environment
PO Box 787, CANBERRA, ACT 2601
s. 22(1)(a)(ii) @awe.gov.au | awe.gov.au

The Department acknowledges the traditional owners of country throughout Australia and their continuing connection to land, sea and community. We pay our respects to them and their cultures and to their elders both past and present.

Hope this assists.

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22(1)(a)(ii)
Director | ACT Assessments | s. 22(1)(a)(ii)
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Environment Approvals Division

Department of Agriculture, Water and the Environment
PO Box 787, CANBERRA, ACT 2601
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The Department acknowledges the traditional owners of country throughout Australia and their continuing connection to land, sea and community. We pay our respects to them and their cultures and to their elders both past and present.

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Associate Vice President Jindal Steel & Power (Australia) Pty Ltd (M). s. 47F(1)

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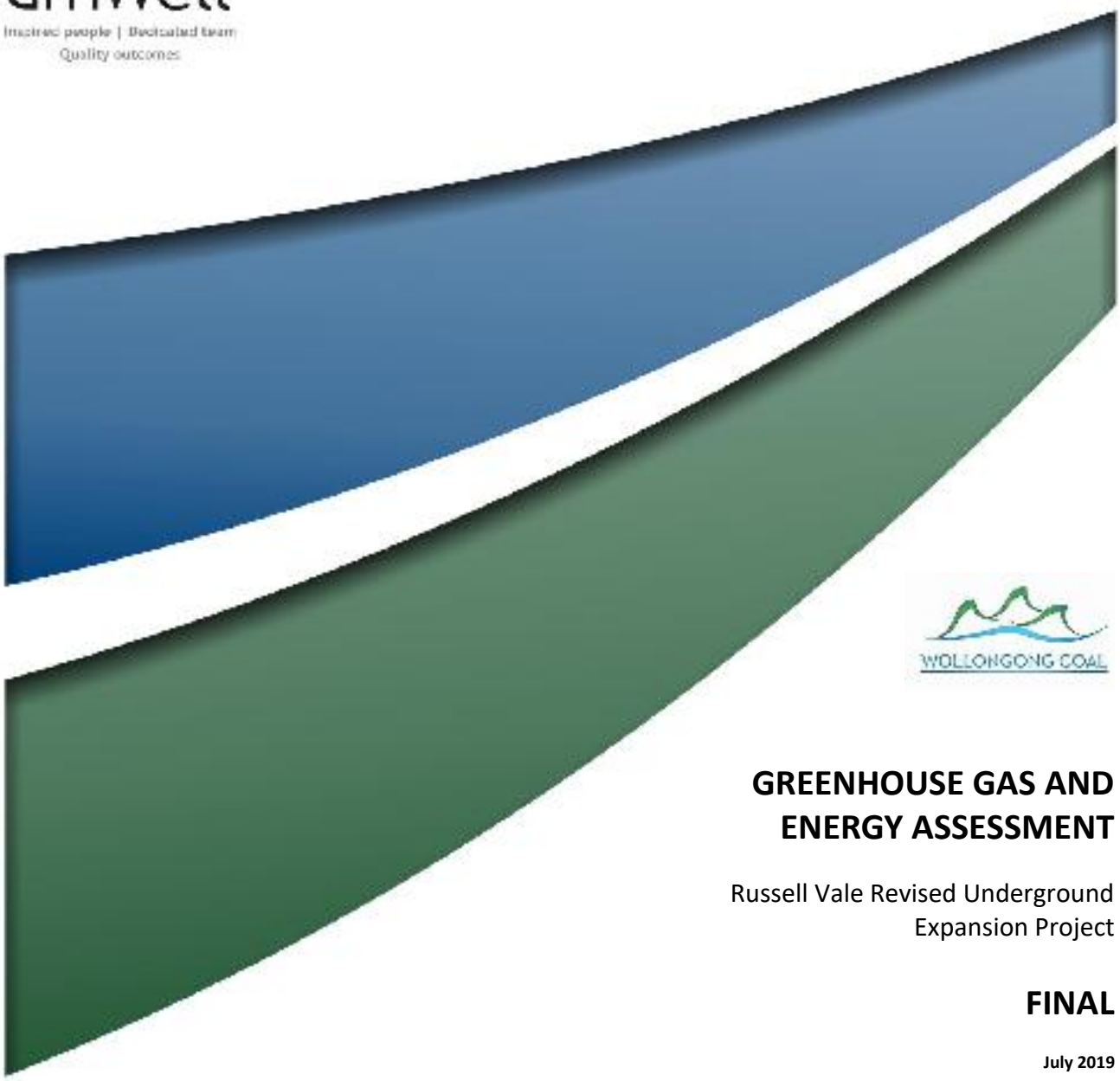

WOLLONGONG COAL

GREENHOUSE GAS AND ENERGY ASSESSMENT

Russell Vale Revised Underground Expansion Project

FINAL

July 2019

GREENHOUSE GAS AND ENERGY ASSESSMENT

Russell Vale Revised Underground Expansion Project

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Wollongong Coal Limited

Project Director:	Barbara Crossley
Project Manager:	Gabrielle Allan
Report No.	3687/R08
Date:	July 2019

Newcastle

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Teralba NSW 2284

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This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	Malcolm Sedgwick	17 July 2019	Barbara Crossley	17 July 2019

Table of Contents

Figures

Tables

Appendices

1.0 Introduction

Wollongong Coal Limited (WCL) is proposing amendments to the Russell Vale Underground Expansion Project (UEP) in response to concern raised by government agencies, the Planning Assessment Commission (PAC) and the community. WCL has revised the UEP to address potential subsidence, biodiversity and water impacts within the Cataract Reservoir catchment and noise and traffic impacts associated with surface operations (Revised Preferred Project). The following Greenhouse Gas and Energy Assessment (GHGEA) quantifies the potential greenhouse gas (GHG) and energy impacts of the Revised Preferred Project (referred to herein as the Revised Project).

2.0 Assessment Framework

2.1 Objectives

The objective of this assessment is to evaluate the GHG and energy use implications of the Revised Project, as part of WCL's response to issues raised in the PAC Second Review Report.

2.2 Scope

The scope of the GHGEA includes:

- estimating direct and indirect (Scope 1, 2 and 3) GHG emissions associated with the Revised Project
- estimating energy use directly associated with the Revised Project.

2.3 Definitions

Table 2.1 contains concepts and a glossary of terms relevant to this GHGEA.

Table 2.1 Glossary of Terms[1]

Concept	Definition
Greenhouse gases	The GHG covered by the Kyoto Protocol and referred to in this GHGEA include: • Carbon dioxide; • Methane; • Nitrous oxide; • Hydrofluorocarbons; • Perfluorocarbons; and • Sulphur hexafluoride.
Scope 1 emissions	Direct emissions occur from sources that are owned or controlled by the Revised Project (in this case, the proponent, WCL) (e.g. fuel use, fugitive emissions). Scope 1 emissions are emissions over which the Revised Project has a high level of control.
Scope 2 emissions	Emissions from the generation of purchased electricity consumed by the Revised Project.
Scope 3 emissions	Indirect emissions that are a consequence of the activities of the Revised Project, but occur at sources owned or controlled by other entities (e.g. outsourced services). Scope 3 emissions can include emissions generated upstream of the Revised Project by providers of energy, materials and transport. Scope 3 emissions can also include emissions generated downstream of the Revised Project by transport providers and product use.

2.4 Impact Assessment Methodology

The GHGEA framework is based on the methodologies and emission factors contained in the National Greenhouse Accounts (NGA) Factors 2017. The assessment framework also incorporates the principles of The Greenhouse Gas Protocol 2004 (GHG Protocol).

[1] The GHG Protocol 2004

The GHG Protocol provides an internationally accepted approach to GHG accounting. The GHG Protocol provides guidance on setting reporting boundaries, defining emission sources and dealing with issues such as data quality and materiality.

Scope 1 and 2 emissions were calculated based on the methodologies and emission factors contained in the NGA Factors 2017 (DoEE 2017). Fugitive emissions have been calculated using the Method 1 approach, as described in the National Greenhouse Accounts (NGA) Factors 2017 (DoEE 2017).

Scope 3 emissions associated with product transport were calculated based on emission factors contained in the National Greenhouse Gas Inventory: Analysis of Recent Trends and Greenhouse Gas Indicators (AGO 2007). Other Scope 3 emissions were calculated using methodologies and emission factors contained in the NGA Factors 2017 (DoEE 2017).

2.5 Data Sources

The calculations in this report are based on activity data developed by WCL during the mine planning process. **Table 2.2** contains the source of activity data.

Table 2.2 Source of Activity Data Used for the Assessment

Activity data	Source
On-site fuel consumption	WCL - forecast diesel consumption
Electricity consumption	WCL - forecast electricity consumption
Fugitive emissions	WCL – Historical NGER data
Product transport	WCL - haulage distances

A detailed description of activity data and calculations are provided in **Appendix A**.

2.6 Assessment Boundary

The GHGEA boundary was developed to include all significant Scope 1, 2 and 3 emissions.

The GHG Protocol requires inventory data and methodologies to be relevant, consistent, complete, transparent and accurate. The relevance principle states that the GHG inventory should appropriately reflect GHG emissions and serve the decision-making needs of users – both internal and external [to the Revised Project] (GHG Protocol 2004).

An underground coal mine has a number of potential emission sources, however, the dominant emission sources, often targeted by mitigation measures and stakeholders can be summarised as:

- diesel use
- fugitive emissions
- electricity use
- product transport
- waste/reject transport
- product use.

The completeness principle states that all relevant emission sources within the chosen inventory boundary need to be accounted for so that a comprehensive and meaningful inventory is compiled (GHG Protocol 2004).

The emission sources listed in **Table 2.3** have been excluded from the GHGEA as activity data is not readily available, and modelling activity data is unlikely to generate sufficient emissions to materially change impacts or influence the decision making outcomes of stakeholders.

Table 2.3 Data Exclusions

Emissions source	Scope	Description
Combustion of fuel for energy	Scope 1	• Small quantities of fuels such as petrol and LPG.
Industrial processes	Scope 1	• Sulphur hexafluoride (high voltage switch gear). • Hydrofluorocarbon (commercial and industrial refrigeration).
Waste water handling (industrial)	Scope 1	• Methane emissions from waste water management.
Materials transport	Scope 3	• Delivery of diesel and other materials to site.
Solid waste	Scope 3	• Solid waste to landfill.
Business travel	Scope 3	• Employees travelling for business purposes.
Employee travel	Scope 3	• Employees travelling between their place of residence and the Russell Vale site.

3.0 Impact Assessment Results

GHG and energy use estimates have only been calculated for the operational stage of the Revised Preferred Project.

The following information and key assessment assumptions were used to estimate the GHG emissions from the operational stage of the Revised Project:

- Approximately 3.7 million tonne (Mt) of run-of-mine (ROM) coal will be recovered.
- The ventilation system will extract a flat rate of 270,000 t CO_2-e of fugitive emissions per annum (historical average).
- The mine will be classified as a "Gassy Mine" and generate post mining emissions from stockpiled ROM coal.
- Diesel use will average approximately 450 kL per annum.
- Electricity use will average approximately 90,000 GJ per annum (no longwall).
- Onsite ROM coal processing will generate 10% waste materials.
- Up to 80% of waste materials (coarse reject) will be transported off site as fill material.
- Waste materials will be transported an average of 15 kilometres (km).
- All product transport will be outsourced.
- Product transport will average 15 km.
- Product will be transported using road registered 19 metre (m) articulated vehicles such as semi-trailer or truck and dog trailers.
- All product will be exported to either India or China.
- All coal will be used to produce coke for steel production.

3.1 Greenhouse Gas Emissions

The Revised Project's GHG emissions are summarised in **Table 3.1**. Forecast GHG emissions are based on the Revised Project recovering approximately 3,700,000 ROM tonnes and extending the life of mine by 5 years.

The Revised Project is forecast to generate approximately 1,419,000 t CO_2-e of Scope 1 emissions from combusting diesel and releasing fugitive emissions. Approximately 284,000 t CO_2-e per annum of Scope 1 emissions are expected to be generated the Revised Project. Annual average Scope 1 emission estimates should not be used to benchmark annual performance, as annual emissions will vary significantly due to normal variations in annual activity.

The Revised Project is forecast to be associated with approximately 104,000 t CO_2-e of Scope 2 emissions from consuming electricity. Approximately 21,000 t CO_2-e per annum of Scope 2 emissions are expected to be associated with the Revised Project.

The Revised Project is forecast to be associated with approximately 9,624,000 t CO_2-e of Scope 3 emissions. Scope 3 emissions will be generated by third parties who transport and consume coal products. Approximately 1,925,000 t CO_2-e per annum of Scope 3 emissions are expected to be associated with the Revised Project.

Figure 3.1 demonstrates that the Revised Project's GHG inventory is dominated by Scope 3 emissions. Approximately 86% of the Revised Project's GHG emissions occur downstream of the project. Approximately 14% of the GHG associated with the Revised Project is related to on-site energy use and fugitive emissions (Scope 1 and 2 emissions).

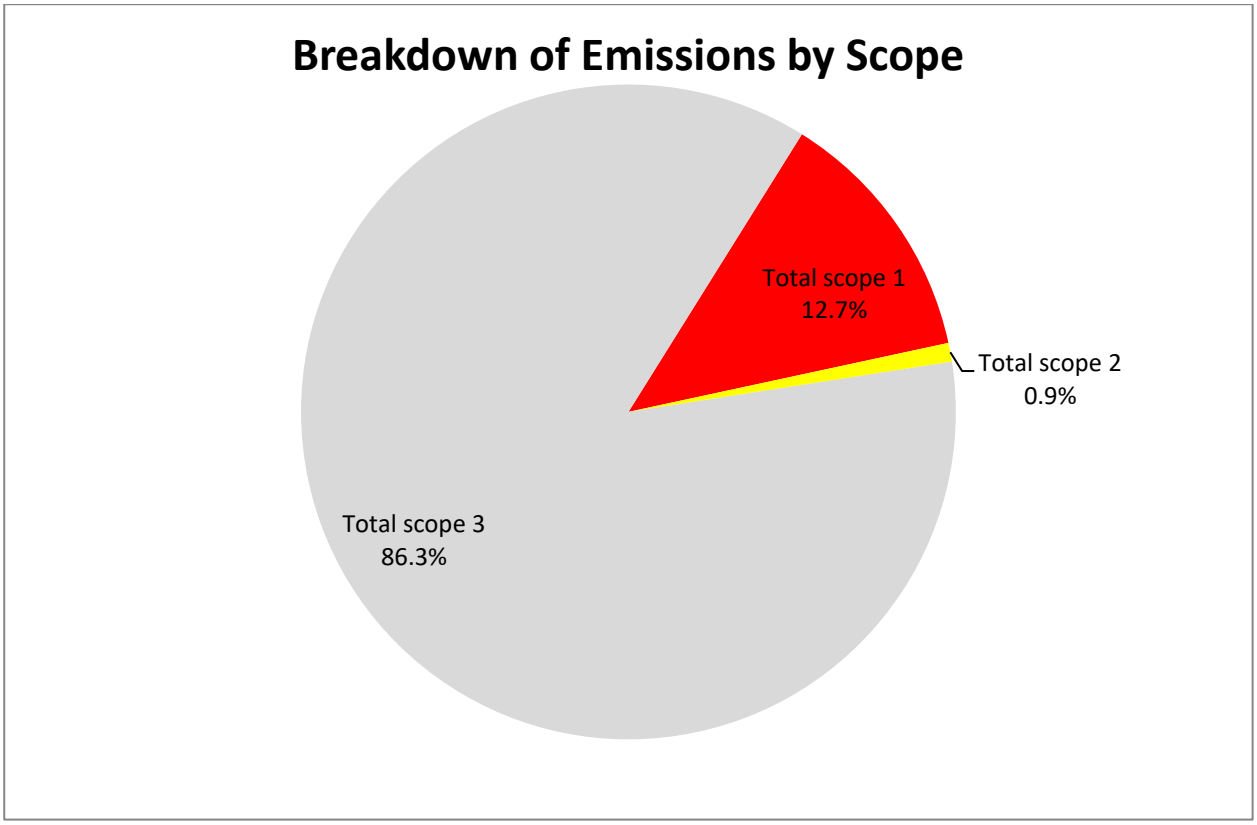

Figure 3.1 Breakdown of Emissions by Scope

Scope 2 and 3 emissions have been included in the GHGEA to demonstrate the potential upstream and downstream impacts of the Revised Project. All Scope 2 and 3 emissions identified in the GHGEA are attributable to, and may be reported by, other sectors.

3.2 Energy Use

The Revised Project is forecast to require approximately 537,000 GJ of energy from diesel and grid electricity. The Revised Project is expected to use approximately 108,000 GJ per annum.

The industry average energy use for underground coal mines in Australia ranges between 140 and 490 Megajoules (MJ)/Product tonne (Energetics 2009). The Revised Project is forecast to operate with an average energy use intensity of approximately 162 MJ/Product Tonne. The forecast energy use intensity of the Revised Project is within the normal operating range for Australian underground coal mines.

Table 3.1 GHG Emission Summary for the Revised Preferred Project

Stage	Scope	Source	Source Totals (t CO_2-e)	Scope Totals (t CO_2-e)
Life of Mine	Scope 1 (Direct)	Diesel use	6,097	1,418,997
		Fugitive emissions	1,412,900	
	Scope 2 (Indirect)	Electricity	103,500	103,500
	Scope 3 (Indirect)	Product use	9,192,798	9,623,427
		Associated with energy extraction and distribution	15,163	
		Product transport	415,117	
		Waste transport	349	
Total GHG Emissions for Operations				**11,145,924**

(refer to **Appendix A** for further detail)

4.0 Impact Assessment Summary

The GHG emissions generated by the Revised Project have the potential to impact the physical environment, and the GHG reduction objectives of national and international governing bodies. The following assessment makes the distinction between environment impacts and impacts on policy objectives.

4.1 Impact on the Environment

The Revised Project's GHG emissions will be highly mobile and generated across multiple policy jurisdictions along the product value chain. The accumulation of GHG or carbon in 'carbon sinks' is the primary impact of GHG emissions. Anthropogenic GHG emissions have accumulated in three major carbon sinks - the ocean (30%), terrestrial plants (30%) and the atmosphere (40%) (BOM and CSIRO, 2014).

The accumulation of GHG in the atmosphere is an important driver of global warming, sea level rise and climate change (IPCC 2013). Sea level rise and climate change may have many ramifications for the natural and built environment. The accumulation of GHG in the ocean is also an important driver of ocean acidification (IPCC 2013).

The Revised Project's direct emissions (Scope 1) are forecast to be approximately 284,000 t CO_2 –e per annum.

To put the Revised Project's emissions into perspective, under current policy settings, global GHG emissions are forecast to reach 56,200,000,000 t CO_2-e per annum by 2025 (UNEP 2016). During operation, the Revised Project will contribute approximately 0.0005% to global emissions per annum (based on its projected Scope 1 emissions). The relative environmental impact of the Revised Project is likely to be relative to its proportion of global GHG emissions.

4.2 Impact on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) define climate change as a change in the state of the climate that can be identified by changes in the mean and/or variability of its properties, and persists for an extended period, typically decades or longer (IPCC 2007).

Climate change is caused by changes in the energy balance of the climate system. The energy balance of the climate system is driven by atmospheric concentrations of GHG and aerosols, land cover and solar radiation (IPCC 2007).

Climate change models forecast many different climate change impacts, which are influenced by future GHG emission scenarios. Climate change forecasts also vary significantly from region to region.

A qualitative assessment of climate change requires a regional reference and future emission trajectory assumptions. The Revised Project, in isolation, is unlikely to influence global emission trajectories. Future emission trajectories will largely be influenced by global scale issues such as; technology, population growth and GHG mitigation policy. NSW climate change projections have been modelled by the NSW and ACT Regional Climate Modelling (NARCliM) project. NARCliM has modelled climate change projections for 2030 and 2070, using the IPCC high emissions A2 emission trajectory scenario. The A2 scenario assumes (IPCC 2000):

- relatively slow demographic transition and relatively slow convergence in regional fertility patterns
- relatively slow convergence in inter-regional GDP per capita differences

- relatively slow end-use and supply-side energy efficiency improvements (compared to other storylines)
- delayed development of renewable energy
- no barriers to the use of nuclear energy.

The proposed Revised Project is consistent with the A2 emissions trajectory scenario, therefore the climate change projections developed by NARCliM seem a reasonable basis for a qualitative climate change impact assessment. NARCliM makes the following climate change projections for NSW (Adapt NSW 2016):

- maximum temperatures are projected to increase
- minimum temperatures are projected to increase
- the number of hot days will increase
- the number of cold nights will decrease
- rainfall is projected to decrease in spring and winter
- rainfall is projected to increase in summer and autumn
- average fire weather is projected to increase in summer and spring
- number of days with severe fire danger is projected to increase in summer and spring.

The extent to which global emissions and atmospheric concentrations of GHG have a demonstrable impact on climate change will be largely driven by the global response to reducing total global emissions that includes all major emission sources and sinks.

4.3 Impact on Policy Objectives

The United Nations Framework Convention on Climate Change (UNFCCC) is the leading international forum for setting climate change targets and objectives. The UNFCCC has been responsible for developing internationally accepted GHG emission reporting methodologies, and has led the development of:

- the Kyoto Protocol
- the Paris Agreement
- specific directives and guidance to improve the implementation of the UNFCCC.

The Kyoto Protocol became international policy in 2005, and it committed the European Union (EU) plus 37 other member states to manage GHG emissions between 2008 and 2012. A second round of the Kyoto Protocol (the Doha Amendment) committed the EU plus 191 other member states to manage GHG emissions between 2013 and 2020. Australia was a signatory to both rounds of the Kyoto Protocol and Australia will meet its obligations under the Kyoto Protocol in 2020 (DoEE 2018).

In 2015 the UNFCCC successfully negotiated an international climate change agreement between 195 countries (the Paris Agreement). The Paris Agreement aims to:

- hold the increase in the global average temperature to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels

- increase the ability [of nations] to adapt to the adverse impacts of climate change and foster climate resilience and low GHG emissions development, in a manner that does not threaten food production
- make finance flows consistent with a pathway towards low GHG emissions and climate-resilient development.

The Paris Agreement seeks to meet its objectives by developing programs and mechanisms that:

- require participating Parties to prepare and communicate GHG mitigation contributions. Parties are expected to set mitigation targets for 2020, and then develop new targets every 5 years. Each successive target is expected to represent a larger mitigation effort than the previous target
- promote climate change resilience and adaptation
- provide mitigation and adaptation funding to developing countries
- foster mitigation and adaptation technology transfer between Parties
- require participating Parties to report progress towards their mitigation contributions on an annual basis.

Australia signed the Paris Agreement on 22 April 2016, and Australia's obligations under the Paris Agreement will drive national GHG policy between 2020 and 2030. Under the Paris Agreement, Australia is obliged to:

- prepare, communicate and maintain a Nationally Determined Contribution (NDC). An NDC outlines the size and type of mitigation contribution each member state will make to the international effort
- pursue domestic mitigation measures, with the aim of achieving the objectives of its NDC
- communicate an NDC every 5 years
- quantify its NDC in accordance with IPCC methodologies, which promote transparency and avoid double counting.

4.3.1 Australian Targets

Australia's commitment to the Paris Agreement includes reducing GHG emissions by 26 - 28 %, on 2005 levels, by 2030 (Commonwealth of Australia, 2015). To meet the requirements of the Paris Agreement, Australia will also have to develop interim targets for 2020 and 2025. Australia's NDC is summarised in **Table 4.1**.

Table 4.1 A summary of Australia's NDC

Emissions reduction target	Economy-wide target to reduce greenhouse gas emissions by 26 – 28% below 2005 levels by 2030
Coverage	Economy-wide
Scope	Energy Industrial processes and product use Agriculture Land-use, land-use change and forestry Waste
Gases	CO2, CH4, N2O, HFCs, PFCs, SF6, NF3

Australia's NDC prescribes an unconditional economy-wide target to reduce GHG emissions, and states that future policies will target emissions generated from:

- energy use
- industrial processes
- agriculture, land-use, land-use change and forestry
- waste.

Australia's NDC does not contain sector or state based targets, nor does it make any reference to the mining sector.

Australia's current national GHG mitigation policy framework caps facility level emissions via the Safeguard Mechanism, and funds mitigation projects through the Emissions Reduction Fund. The DoEE forecasts that the current national GHG policy will not be enough to achieve the level of mitigation contribution prescribed in Australia's NDC (DoEE 2018). **Table 4.2** is based on data produced by the DoEE in December 2018 (DoEE 2018). The table includes 2005 baseline emissions and a current forecast of 2030 emissions (using current policy settings).

Table 4.2 Forecast impact of current mitigation efforts (DEE 2018)

Sector	2005 GHG emissions (t CO2-e pa)	Current 2030 forecast (t CO2-e pa)
Electricity	197,000,000	163,000,000
Direct combustion	82,000,000	107,000,000
Transport	82,000,000	111,000,000
Fugitives	39,000,000	62,000,000
Industrial processes	32,000,000	33,000,000
Agriculture	76,000,000	78,000,000
Waste	14,000,000	9,000,000
LULUCF	82,000,000	-1,000,000
Total	605,000,000	563,000,000
% of 2005	100	93%

Table 4.2 demonstrates that current policy settings are expected to reduce emissions from the electricity generation and waste sectors, and achieve an overall 7% reduction from 2005 emissions by 2030.
If Australia is to achieve its 28% mitigation commitment under the Paris Agreement, annual national emissions must reach 447,700,000 t CO_2-e by 2030. Reducing the current 2030 forecast of 563,000,000 t CO_2-e to 447,700,000 t CO_2-e will require Australia to set a more aggressive mitigation trajectory between 2020 and 2030. To achieve the 28% 2030 Paris Agreement target, the DoEE estimates that the Australian economy must set a mitigation trajectory which will save approximately 762,000,000 t CO_2-e between 2021 and 2030.

The GHG emissions modelling completed by the DoEE anticipates growth in the Australian economy, and the DoEE forecasts an increase in emissions generated from direct consumption, transport and fugitive emissions (presumably from additional projects like the Revised Project). It is difficult to determine whether the Revised Project's emissions are included in the 2030 projections (i.e. the DoEE has assumed a certain number of new coal projects will be developed) or whether the Revised Project's emissions will inflate 2030 projections.

If as a worst case, it is assumed that the none of the Revised Project's Scope 1 emissions have been included in DoEE's forecast (and all other assumptions hold true), then the Revised Project's cumulative Scope 1 emissions (1,419,000 t CO_2-e) will increase the required national mitigation effort by approximately 0.19%.

The Revised Project may increase the national effort required to reach Australia's 2030 GHG mitigation target, however, the Revised Project in isolation is unlikely to affect Australia achieving its national mitigation targets in any material way. Small fluctuations in the performance of the electricity generation and transport sectors offer a far greater potential to influence the achievement of national targets than single facilities.

The Revised Project's Scope 2 and 3 emissions will be generated by Australian facilities and/or in international jurisdictions with environmental approval to generate GHG emissions.

4.3.2 NSW Policy

The NSW Government has developed its NSW Climate Change Policy Framework, which aims to deliver net-zero emissions by 2050, and a State that is more resilient and responsive to climate change (OEH 2016).

Under the NSW Climate Change Policy Framework, NSW has committed to both follow the Paris Agreement and to work to complement national action. The key policy directions under the NSW Climate Change Policy Framework are summarised in the **Table 4.3**.

Table 4.3 A summary of the NSW Climate Change Policy Framework

Policy Direction	Rationale/Goals
Creating an investment environment that manages the emissions reduction transition	Energy will be transformed and investment/job opportunities will be created in emerging industries of advanced energy, transport and carbon farming and environmental services
Boost energy productivity and put downward pressure on energy bills	Boosting energy and resource productivity will help reduce prices and the cost of transitions to net-zero emissions
Grow new industries and capitalise on competitive advantages	Capitalising on the competitive advantage and growth of industries in professional services, advanced energy technology, property management and financial services
Reduce risks and damage to public and private assets arising from climate change	Embed climate change considerations into asset and risk management as well as support the private sector by providing information and supportive regulatory frameworks for adaptation
Reduce climate change impacts on health and wellbeing	Recognise the increased demand for health and emergency services due to climate change and identify ways to better support more vulnerable communities to health impacts
Manage impacts on natural resources and communities	Coordinate efforts to increase resilience of primary industries and rural communities as climate change impacts water availability, water quality, habitats, weeds and air pollution

The policy framework is being delivered through:

- the Climate Change Fund
- developing an economic appraisal methodology to value GHG emissions mitigation

- embedding climate change mitigation and adaptation across government operations
- building on NSW's expansion of renewable energy
- developing action plans and strategies.

The Revised Project is unlikely to affect the objectives of the NSW Climate Change Policy Framework in a material way.

5.0 Conclusion

The Revised Project is a small scale coal operation that will produce energy commodities over 5 years. The Revised Project's forecast energy use intensity is considered to fall within the normal operating range for an Australian underground coal mine, and expected to generate approximately 1,523,000 t CO_2-e of Scope 1 and 2 emissions.

The Revised Project is also forecast to be associated with approximately 9,624,000 t CO_2-e of Scope 3 emissions. The Revised Project's Scope 3 emissions are beyond the operational control of WCL, and the majority of Scope 3 emissions will be generated downstream of the Revised Project, when coal products are combusted to produce coke.

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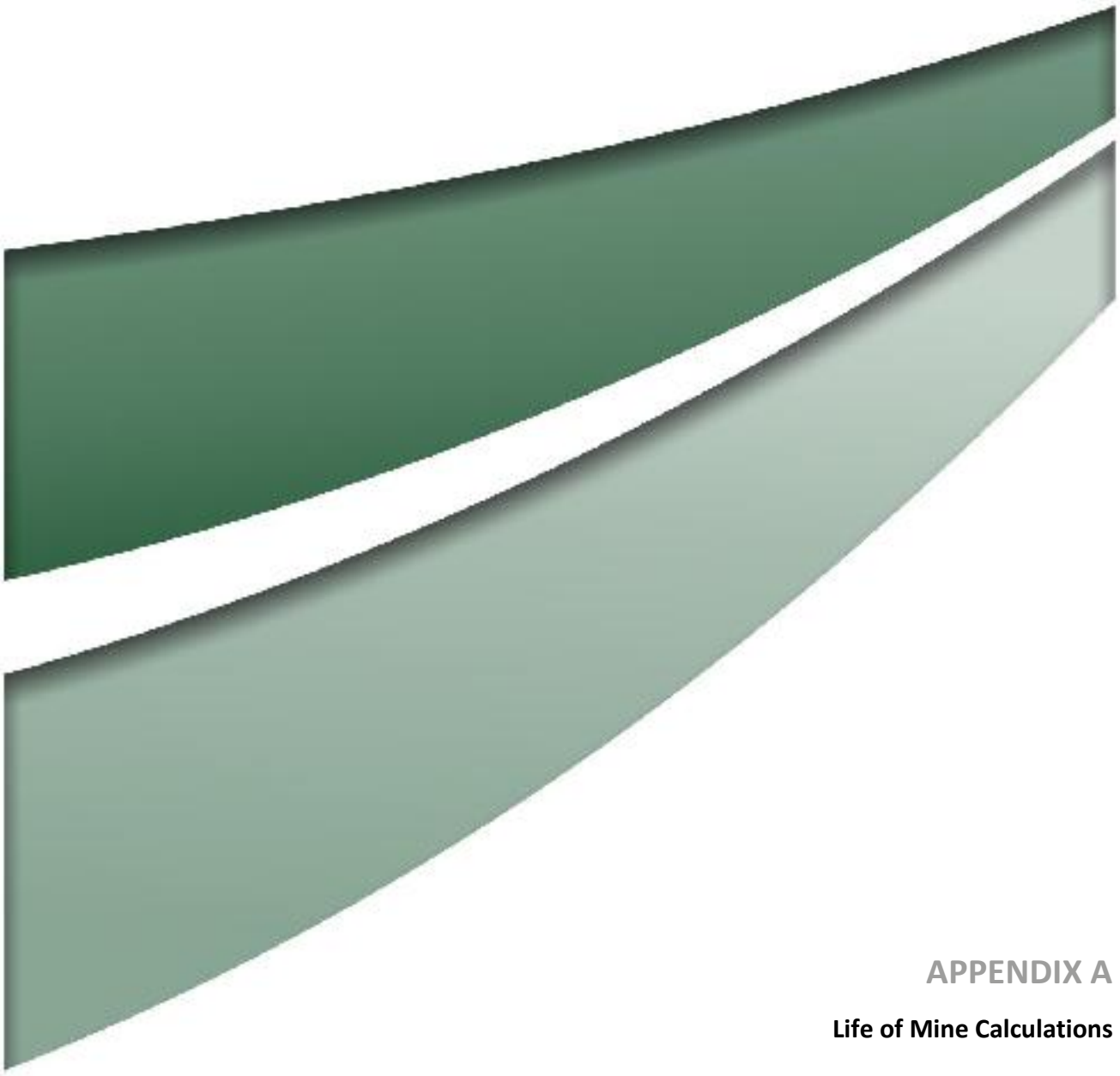


APPENDIX A

Life of Mine Calculations

Stationary Diesel Use

Activity Data	Energy Use		Emission Factors		
			CO_2	CH_4	N_20
kL	GJ/kL	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
2,250	38.6	86,850	69.9	0.1	0.2
			t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)			6,071	9	17
				Total GHG Emissions (t CO_2-e)	6,097

Fugitive Emissions

Activity Data	Emission Factors		
	CO_2	CH_4	N_20
ROM (t)	kg CO_2-e/ROM t	kg CO_2-e/ROM t	kg CO_2-e/ROM t
3,700,000 – VAM	N/A	365	N/A
3,700,000 – Post mining	N/A	17	N/A
	t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)	N/A	1,412,900	N/A
		Total GHG Emissions (t CO_2-e)	1,412,900

Electricity use

Activity Data	Energy Use	Emission Factors		
		CO_2	CH_4	N_20
GJ	GJ	kg CO_2-e / GJ	kg CO_2-e / GJ	kg CO_2-e / GJ
450,000	450,000	230	N/A	N/A
		t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)		103,500	N/A	N/A
			Total GHG Emissions (t CO_2-e)	103,500

Product Use

Activity Data		Energy Production		Emission Factors		
				CO_2	CH_4	N_20
Product	Product (t)	GJ/Product t	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Thermal coal	0	27.0	0	90	0.03	0.2
Coking coal	3,330,000	30.0	99,900,000	91.8	0.02	0.2
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				9,170,820	1,998	19,980
					Total GHG Emissions (t CO_2-e)	9,192,798

Extraction, Production and Distribution of Energy Purchased

Activity Data		Emission Factors		
		CO_2	CH_4	N_20
Purchased energy	**GJ**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**
Diesel	86,850	3.6	N/A	N/A
Electricity	450,000	33	N/A	N/A
		t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)		15,163	N/A	N/A
			Total GHG Emissions (t CO_2-e)	**15,163**

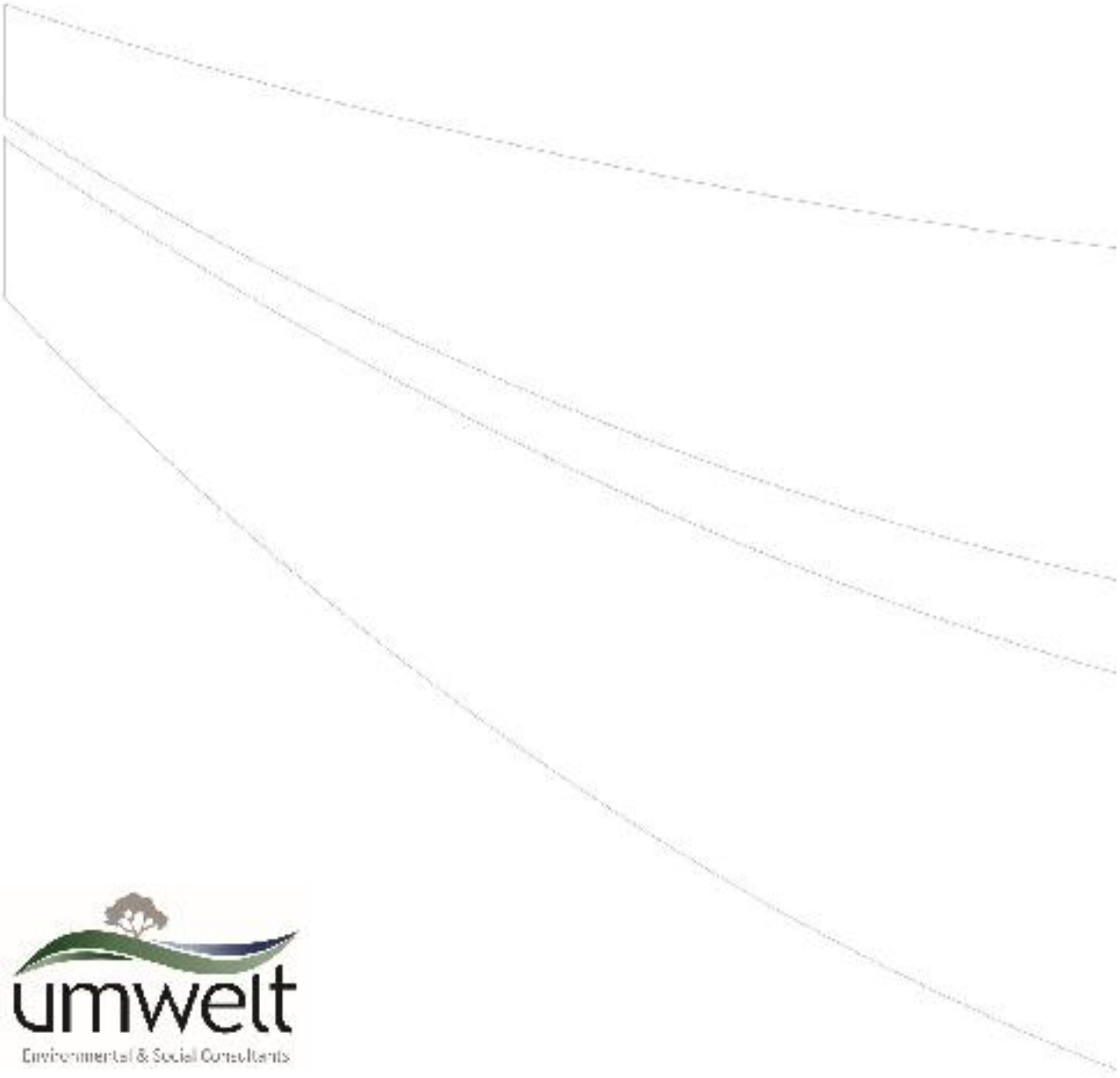
Product Transport

Activity Data				Emission Factors		
				CO_2	CH_4	N_20
Transport mode	**Product (t)**	**Distance (km)**	**Tonne km (tkm)**	**kg CO_2-e/tkm**	**kg CO_2-e/tkm**	**kg CO_2-e/tkm**
Ship	3,330,000	9,800	32,634,000,000	0.0126	N/A	N/A
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				411,188	N/A	N/A
					Total GHG Emissions (t CO_2-e)	**411,188**

Activity Data				Emission Factors		
				CO_2	CH_4	N_20
Transport mode	**Product (t)**	**Return Distance (km)**	**Diesel use (kL)**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**
Truck	3,330,000	30	1,374	73.5	0.1	0.5
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				3,897	5	27
					Total GHG Emissions (t CO_2-e)	**3,929**

Waste Transport

Activity Data				Emission Factors		
				CO_2	CH_4	N_20
Transport mode	**Product (t)**	**Return Distance (km)**	**Diesel use (kL)**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**
Truck	296,000	30	122	73.5	0.1	0.5
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				346	0	3
					Total GHG Emissions (t CO_2-e)	**349**



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RUSSELL VALE COLLIERY

NATIONAL GREENHOUSE & ENERGY REPORTING (NGER) "BASIS OF PREPARATION"

Table of Contents

Glossary of Terms and Abbreviations

Abbreviation	Definition
C&M	Care and Maintenance
CER	Clean Energy Regulator
CH_4	Methane
CO_2	Carbon Dioxide
GHG	Greenhouse Gas
Kg	Kilogram
KL	Kilolitre
kWh	Kilowatt hours
L	Litre
LPG	Liquefied Petroleum Gas
LW	Longwall
Mt	Mega Tonne
NGER	National Greenhouse and Energy Reporting
NGER Act 2007	National Greenhouse and Energy Reporting Act 2007
NGER Regulations 2008	National Greenhouse and Energy Reporting Regulations 2008
NSW	New South Wales
PEM	Periodic Emission Monitoring
RTM	Real-Time Monitors
RVC	Russell Vale Colliery
SAP	SAP Accounting Software
Scope 1 Emissions	The release of greenhouse gas into the atmosphere as a direct result of an activity at RVC.
Scope 2 Emissions	The release of greenhouse gas into the atmosphere as a direct result of one or more activities that generate electricity, heating, cooling or steam that is consumed by RVC but that do not form part of RVC.

Abbreviation	Definition
Scope 3 Emissions	Not reported under NGER scheme - Indirect greenhouse gas emissions other than scope 2 emissions that are generated in the wider economy
SF_6	Sulphur Hexafluoride contained in electrical switching gear
t CO_2-e	Tonnes of carbon dioxide equivalent
The Determination	National Greenhouse and Energy Reporting (Measurement) Determination 2008
VO	Ventilation Officer
WCL	Wollongong Coal Limited
WO	Work Order

1. INTRODUCTION

Wollongong Coal Limited (**WCL**) is a listed entity under the Australian Government's National Greenhouse and Energy Reporting (**NGER**) legislation. It has reported the Green House Gas (**GHG**) emissions from the Russell Vale Colliery (formally known as NRE No. 1 Colliery) since the financial year 2008/09 as required under the legislation. Similarly since the financial year 2011/12 the reporting under NGER has been audited and since 2012/13 this has been used to determine carbon tax liabilities for the company. Broadly speaking the NGER Act 2007 determines who should report, the NGER Regulations 2008 determine what to report, and the NGER (Measurement) Determination 2008 determines how to report.

In 2019 the CER conducted an audit of the 2018/19 FY reporting and identified a number of deficiencies in regards to data collection and reporting. The audit finding from the 2018/19 FY Audit is covered in the CER audit report (Pengolan, 2020). This basis of preparation was updated to rectify the deficiencies identified in the CER Audit.

2. OPERATIONAL BACKGROUND

WCL owns and operates the Russell Vale Colliery (**RVC**) located within the Southern Coalfields of New South Wales, approximately 10 kilometres north of Wollongong. The mine has a long history of extraction of coking coal by underground mining methods dating from the 1880's. Mining operations have progressed from the eastern sub-crop of the Bulli and Balgownie coal seams in the vicinity of the Russell Vale/Bellambi townships, to the west at a distance of approximately 20 kilometres and a depth of cover of about 440 metres. Mining has also occurred more recently within the Wongawilli coal seam, in the Russell Vale East domain (also known as the Wonga East Domain), with a number of longwall panels (4, 5 & 6) being extracted up to 2015. Current mining in the Russell Vale East domain utilises the board and pillar mining method to extract coal with minimal subsidence or impacts to surface features.

It is commonly recognised that there is the potential for the coal seams within the Southern Coalfields to contain significant quantities of coal seam gasses and GHG's (methane and carbon dioxide), which increases with depth of cover and distance from exposure (or sub-crop). Hence there exists the potential for specific parts of the mine to contain significant quantities of GHG's which are liberated during mining and released through the mines ventilation system.

Over the years the colliery has gone through a number of significant operational changes which have had an impact on the production of GHG generated by RVC. The table below outlines a brief summary of the recent changes.

Table 1 – History of Significant Operational Changes at RVC

Date	Nature of the change
July 2015	The mine ceased LW mining in the Wongawilli seam, ceased the production of coal, and went into C&M.
Dec 2019	WCL received a prohibition notice (NTCE0004383) from the resource regulator, dated 16 December 2019, prohibiting the powering of the HT cable and transformers in the Bulli seam. Due to this the mine was unable to maintain pumping underground in the Bulli Seam resulting

Date	Nature of the change
	in the connecting airways between 4 and 5 shaft being at risk of flooding (as water is no longer pumped from the down dip workings). This flooding posed a risk to adequate ventilation of the mine and access to the mine was restricted for safety reasons.
April 2020	Following a decision by the company to close the Bulli Seam workings, the main ventilation fans for the Bulli Seam located at Fan Shaft 5 were turned off and forced ventilation of the Bulli Mine Workings ceased.
July 2020	Following the closure of the Bulli seam and cessation of ventilation, Shafts 4 & 5 were mothballed and mains power from the grid to the shafts was disconnected, reducing RVC's power consumption. A 21.8 kW solar power and battery storage system was commissioned and operational from July 2020 to power monitoring, alarms and communications systems.

3. SCOPE 1 GHG EMISSIONS DIRECTLY FROM MINING OPERATIONS

The following table outlines the Scope 1 emissions which are produced at RVC and reported under the NGERs Act 2007 in line with The Determination to the CER.

Table 2 - Scope 1 Emission Sources for RVC

GHG Emission Source	Data required to be collected (Data Source)	Measurement Method	Person Responsible	Frequency
Fugitive gas emissions from the Wongawilli Seam Ventilation system	CO_2 and CH_4 concentrations and quantities at the return, Barometric Pressure and Temperature from the statutory ventilation officer reports	NGER Determination 1.27, 3.6 - Method 4; (PEM) Refer to ***Section 3.1***	Ventilation Officer	Monthly
Fugitive emissions from the closed/ decommissioned unventilated Bulli Seam	Estimated emissions from the last 12 months of records of ventilation data for the Bulli Seam	NGER Determination 3.32 - Method 1 – Fugitive emissions estimation Refer to ***Section 3.3***	Ventilation Officer	Annually

GHG Emission Source	Data required to be collected (Data Source)	Measurement Method	Person Responsible	Frequency
Diesel fuel used underground for mining	Diesel consumption underground (Litres) from the usage logs at the fuel bowser and figures from SAP Fuel invoices / Estimation of vehicle use underground	Not applicable – Captured in the ventilation measurements Refer to ***Section 3.4***	Engineering Manager	Monthly
Diesel fuel used on the surface for transport energy purposes (Light Vehicles)	Diesel consumption aboveground (Litres) from the usage logs at the fuel bowser, figures from SAP and odometer readings from vehicles	NGER Determination 2.41 – Method 1 Refer to ***Section 3.4***	Engineering Manager	Monthly
Diesel fuel used on the surface for stationary energy purposes (Surface Plant and equipment i.e. pumping, forklifts, bobcat)	Diesel consumption aboveground (Litres) from the usage logs at the fuel bowser and figures from SAP From Fuel invoices / Estimation of vehicle use aboveground	NGER Determination 2.41 – Method 1 Refer to ***Section 3.4***	Engineering Manager	Monthly
Diesel fuel used on the surface for energy production - Electricity Generation	Diesel consumption aboveground (Litres) from the usage logs at the fuel bowser and figures from SAP	NGER Determination 2.41 – Method 1 Refer to ***Section 3.4***	Electrical Engineering Manager	Monthly
Diesel fuel used on the surface for stationary energy purposes – Bitz contractor plant and equipment (Excavators, Front End Loaders, Water Carts, Backhoe)	Diesel consumption above ground (Litres) Based on usage provided by contracting company	NGER Determination 2.41 – Method 1 Refer to ***Section 3.4***	Logistics Manager	Monthly
Petroleum (E10) fuel used for transport	Based on odometer readings and fuel	NGER Determination 2.41 – Method 1	Accounts Payable	Monthly

GHG Emission Source	Data required to be collected (Data Source)	Measurement Method	Person Responsible	Frequency
(corporate light vehicles) and handheld tools and mowing equipment	consumption rating (L/km) for corporate vehicles and petrol receipts for lawn mowing.	Refer to ***Section 3.5***		
Workshop oils and greases – Oils	Quantity of Oils used in KL (SAP usage logs)	NGER Determination 2.48A – Method 1 Refer to ***Section 3.6***	Procurement Officer and Storeman	Annually
Workshop oils and greases – Grease	Quantity of Greases used in KL (SAP usage logs)	NGER Determination 2.48A – Method 1 Refer to ***Section 3.6***	Procurement Officer and Storeman	Annually
LPG used for bath house hot water heating	Delivery logs from SAP	NGER Determination 2.41 – Method 1 Refer to ***Section 3.7***	Procurement Officer and Storeman	Annually
Acetylene Gas (Welding)	Delivery logs from SAP	NGER Determination 2.20 – Method 1 Refer to ***Section 3.8***	Procurement Officer and Storeman	Annually
SF_6 usage in electrical circuit breakers & Switching gear	Maintenance records for SF6 containing circuit breakers and switching gear	NGER Determination 4.101 – Method 1 Refer to ***Section 3.9***	Electrical Engineering Manager	Annually

It is necessary to report the amount of fuel consumed where the thresholds detailed in **Table 3** are met or exceeded (see sections 2.2, 2.18, 2.39 and 2.68 of the NGER Measurement Determination).

Table 3 - Thresholds for fuel production and consumption

Fuel Type	Fuel produced	Fuel consumed by combustion (applied to separate instance of a source)	Fuel consumed without combustion (applied to each individual fuel type)
Solid fuel	No threshold	1 tonne	20 tonnes
Liquid fuel	No threshold	1 kilolitre; or 5 kilolitres for petroleum based oils (other than petroleum based oil use	15 kilolitres

Fuel Type	Fuel produced	Fuel consumed by combustion (applied to separate instance of a source)	Fuel consumed without combustion (applied to each individual fuel type)
		as fuel) and petroleum based greases	
Gaseous fuel	No threshold	1,000 cubic metres	13,000 cubic metres

3.1 Fugitive gas emissions from the Wongawilli Seam Ventilation

The Wongawilli seam mine workings at RVC utilises an extracted ventilation system created by two exhaust fans (fan 15 and 16) located at A-Portal on the pit top surface. A-Portal is the return airway for the mine (known as the Wonga Mains return) and exhausts all the air circulated through the mine. This means that the quantity of air exhausted from the mine via A-Portal is equal to the quantity of air entering into the mine. By measuring the quantity of air exhausted from the mine, and the concentrations of GHG's present in the mines return air, the fugitive GHG emissions directly attributable to the mining operations can be calculated. The tonnes of fugitive GHG emissions created underground by the mining operation for the reporting period is reported in the NGERs Report.

Data collected

- Statutory Ventilation Surveys and Reports
- Return airway RTM gas logs
- Anemometer calibration certificates
- XAM5000 gas monitor calibration certificates
- RTM calibration certificates

RVC utilises Method 4; Periodic Emission Monitoring (PEM) in line with the requirements of the Determination to estimate fugitive emissions from the Wongawilli seam mine workings.

The air flow through the mine is measured in compliance with the requirements of the NSW Work Health and Safety (Mines and Petroleum Sites) Regulation 2014, and is recorded and reported in the mines statutory ventilation reports (VO Reports). This involves the direct measurement of air flow velocities at predetermined specific locations of a known cross sectional area and the calculation of volumetric flow of the air exhausted from the mine, measured at ambient conditions. The air flow velocity is measured using a handheld Lambrecht anemometer accurate to ±0.01 m/s, and the CO_2 and CH_4 concentrations (V/V %) in the return air are measured using a handheld XAM 5000 gas analyser accurate to ±100 ppm (or 0.01%v/v), to determine concentrations of GHG's within the air. This is in line with industry standards for measuring underground coal mines air ventilation and in completed as per the **RVC MIN SWP 004 Ventilation Measurements** and **RVC MIN SWP 045 Ventilation Report Procedure**. The concentration of gases in the mines return air is also monitored in real time using an RTM gas monitor which logs the data and is accurate to ±100 ppm (or 0.01%v/v). Instruments used to measure air flow velocity and gas concentrations are regularly calibrated as per the equipment's OEM specifications to ensure accurate readings are recorded.

The information taken from the VO Statutory Reports which is utilised for NGERs reporting is the Wonga Mains Return Flow, A heading return between 0 to 1 line, and includes:

- Total Mine Return air flow (m^3/s);
- Methane gas concentration (%v/v);
- Carbon Dioxide gas concentration (%v/v);
- Wet and Dry bulb temperatures (°C); and
- Barometric Pressure (hPa).

The total fugitive GHG emissions for the mine in the reporting period are estimated by summing the net GHG emissions estimated for each month. The net GHG emissions for each month are estimated by calculating the t CO_2-e for CH_4 & CO_2 in the mines return air and subtracting the t CO_2-e that occur naturally within fresh ambient air for the equivalent volume of air entering into the mine. This is represented by the equation below:

$$\text{Net GHG Emissions} = [(AF_m \times GHG_R \times GWP) - (AF_m \times GHG_A \times GWP)]$$

Table 4 - GHG Emission Variables

Variable	Variable Description
Net GHG Emissions	Net fugitive GHG emissions form the mine workings for each month (t CO_2-e)
GHG_R	Mine Return air GHG concentrations for the month. This is the monthly average concentration of CH_4 and CO_2 taken from the tube bundle system RTM, cross checked with the hand held XAM 5000 readings form the VO reports.
GWP	Global Warming Potential for each GHG presented as the carbon dioxide equivalence in t CO_2-e. GWP for each gas are taken from Section 2.02 of the NGER regulations as updated annually.
GHG_A	GHG Concentration in ambient air. The concentrations of GHG's in ambient air are taken from the Earth System Research Laboratories – global trends in atmospheric CO_2 and CH_4 as updated annually. https://www.esrl.noaa.gov/gmd/ccgg/trends/global.html
AF_m	Total mine return air flow for the month (m^3/month)

$$AF_m = AF_s \times \text{Days/month} \times 86{,}400 \text{ seconds/day}$$

Table 5 - Mine Airflow Variables

Variable	Variable Description
AF_m	Total mine return air flow for the month (m^3/month)
AF_s	Total mine return air flow from VO Statutory Reports (m^3/s)
Days/month	Number of days in each month

3.2 Fugitive emissions from the decommissioned unventilated Bulli Seam

In December 2019 WCL received a prohibition notice (NTCE0004383) from the resource regulator prohibiting the powering of the HT cable and transformers in the Bulli seam. Due to this the mine was unable to maintain pumping underground in the Bulli Seam and, as a result, the connecting airways between 4 and 5 shaft were at risk of flooding (as water was no longer pumped from the down dip workings). This flooding posed a risk to the adequate ventilation of the mine and access to the mine was restricted for safety reasons. The company subsequently made the decision to close the Bulli Seam and ceased forced ventilation in July 2020. As a result the closed Bulli seam workings are classed as "Decommissioned Underground Mines" under the NGERs determination and NGERs Act 2007; and the fugitive GHG emissions from these workings, naturally released to the atmosphere, are estimated and reported to the CER via the NGERs report in line with the NGERs Act 2007.

Data collected

- Mine Void Space and flooding Map (Appendix A)
- Number of months the mine has been decommissioned at the end of the reporting period (from 1 May 2020)

The void space left by the past extraction of coal in the underground workings for the Bulli Seam (along with the known areas of flooding at the time of closure) are depicted in Appendix A. The following calculation, as per the NGERs determination 3.32 – Method 1, is used to estimate emissions from the decommissioned underground workings:

$$E_{dm} = E_{tdm} \times EF_{dm} \times (1 - F_{dm})$$

Table 6 - Bulli Seam Decommissioned Workings Calculation

Variable	Variable Description	Value
E_{dm}	Emissions for the Decommissioned Mine - The fugitive emissions of methane from the mine during the year measured in CO2-e tonnes, reported annually. Refer to NGERs calculation spreadsheet, "Decommissioned Fugitive" tab.	Variable (to be calculated annually)
E_{tdm}	The emissions from the mine for the last 12 month period before the mine became a decommissioned underground coal mine, measured in CO2-e tonnes (Emissions from 1 April 2019 – 30 March 2020)	93,176.39 t CO2-e
EF_{dm}	Emission Factor for the mine calculated under section 3.33 of the determination. Refer to NGERs calculation spreadsheet, "Decommissioned Fugitive" tab.	Variable (to be calculated annually)
F_{dm}	The proportion of the mine flooded at the end of the year, as estimated under section 3.34 of the determination. Based on	Variable (to be calculated annually)

Variable	Variable Description	Value
	the total void space of the mine (86,322,972m³) minus the known volume of flooding prior to closure (being 2,555,354m³ of water) and a water inflow rate of 913,000 m³/year. Refer to NGERs calculation spreadsheet, "Decommissioned Fugitive" tab.	

3.3 Diesel fuel usage both stationary and transport

RVC uses a significant quantity of diesel fuel for transport and stationary purposes, both on the surface and underground. This includes use for the operation of underground mining equipment, transport underground, surface light vehicles, diesel pumps, forklift etc. RVC also has a 1,000 kVA diesel generator located at No 4 Shaft which is maintained and tested routinely but, due to No.4 shaft being mothballed in mid-2020, is not used to generate power. There are no permanent diesel powered electric generators located at RVC Pit Top, however, during planned power outages generators are hired from time to time to run critical infrastructure.

The contracting company (Bitz), used to conduct earth moving operations on site such as moving and loading coal from stockpiles and cleaning out sumps etc., is classified as under the operational control of WCL as defined under section 11 of the NGER Act 2007. The fuel usage from Bitz equipment for the reporting period is provided by Bitz and is included in the NGERs report.

The GHG emissions generated form the combustion of this diesel fuel during the reporting period is reported to the CER, via the NGER report, in line with the NGER Act 2007 as outlined below.

Data collected

- Diesel Usage Figures from Fuel Register
- Diesel Usage from SAP
- Bitz Contractor diesel consumption (under operational control)
- Electric Generator run hours or fuel consumption

Diesel usage at RVC site is recorded, along with the date of fuel usage and machine number, on the diesel usage register located at the diesel bowser. This data is cross referenced with invoices, the usage figures in SAP, and the operating time for each piece of machinery. Diesel Fuel usage is then grouped into the following categories based on the fuel consumption purpose:

- Diesel Usage (kL) for Surface Transport Energy Purposes (all surface Light Vehicles and Utes);
- Diesel Usage (kL) for Surface Stationary Energy Purposes (Forklifts, Bobcat, Diesel Pumps, etc.); and
- Diesel Usage (kL) for Underground Transport & Stationary Energy Purposes (JUG's, SMV's, EIMCO, Fuel pods)
- Diesel Usage (kL) for Surface Stationary Energy Purposes – contractor (excavators, front end loaders, backhoes, graders, etc.)
- Diesel Usage (kL) for Electricity Power Generation;

The fuel usage categorised as Underground Transport and Stationary Energy Purposes is excluded from the NGERs report as the emissions from this equipment is captured in the mines ventilation data, to avoid accounting for the same emissions twice. The diesel usage in generators for electric power generation is combined with and reported as "Diesel Usage (kL) for Surface Stationary Energy Purposes" if it is below the reporting threshold to be reported separately as electricity production.

3.4 Petrol (E10) usage both stationary and transport

RVC uses minor quantities of unleaded petroleum fuel in a number of corporate vehicles, lawn mowers, brush cutters and some other hand tools. The GHG emissions generated form the combustion of this fuel during the reporting period are reported to the CER, via the NGERs report, in line with the NGERs Act 2007.

Data collected

- Receipts and invoices for petrol purchases
- Odometer readings for unleaded petrol vehicles

Petrol is purchased offsite from local petrol stations using either petty cash or the company credit card. Petrol usage is calculated from petty cash & credit card receipts; and vehicle odometer readings taken at the start and end of the reporting period are used to calculate petrol consumption for the year using the vehicles manufacturers' fuel consumption rate.

3.5 Workshop Oils and Greases

RVC uses a variety of oil and grease products for the maintenance and operation of mechanical equipment, as well as in the mining process. The energy content, and GHG emissions from the combustion of the oils and greases during the reporting period are reported to the CER, via the NGERs report, in line with the NGERs Act 2007 as outlined below.

The consumption of oils and greases as lubricants (other than used as a fuel) needs to be reported at a facility if one or more separate instances of the source combusts more than 5 kilolitres (kL) of oil or grease. The methods for reporting oils and greases used as lubricants are listed under section 2.40A of the NGER Determination.

Data collected

- Oil and grease usage from SAP

Oil and grease usage is tracked in the SAP system as they are booked out of the store and used. Usage of oil and grease consumables are calculated separately using the SAP figures for the reporting period based on the products description as an oil or a grease.

3.6 LPG usage for hot water heating in the bathhouse

RVC uses LPG for hot water heating in the bath house showers sourced from a 5-10,000L tank located onsite. The tank is filled from a tanker when required and invoices are issued to WCL for the purchase of LPG. The GHG emissions generated form the combustion of this fuel during the reporting period are reported to the CER, via the NGERs report, in line with the NGERs Act 2007.

Part 2.3 of the NGER Measurement Determination applies to emissions released from the combustion of gaseous fuels in relation to a separate instance of a source if the amount of gaseous fuel combusted in relation to the separate instance of the source is more than 1000 cubic metres.

Reporting of emissions and energy associated with the combustion of a gaseous fuel is optional if the quantity of gaseous fuel combusted in a separate instance of a source is 1000 cubic metres or less.

Data collected

- LPG Invoices

Invoices for the purchase of LPG are used to calculate usage during the reporting period. LPG usage is not metered at the tank.

3.7 Acetylene gas usage for welding

RVC uses acetylene gas for welding in the workshop and around site. The GHG emissions generated form the combustion of this fuel during the reporting period are reported to the CER, via the NGERs report, in line with the NGERs Act 2007.

Part 2.3 of the NGER Measurement Determination applies to emissions released from the combustion of gaseous fuels in relation to a separate instance of a source if the amount of gaseous fuel combusted in relation to the separate instance of the source is more than 1000 cubic metres.

Reporting of emissions and energy associated with the combustion of a gaseous fuel is optional if the quantity of gaseous fuel combusted in a separate instance of a source is 1000 cubic metres or less.

Data collected

- Acetylene gas Invoices

The usage of acetylene gas is tracked using the SAP system when they are purchased and booked out of the store. Invoices for the purchase of acetylene gas, cross referenced with records from the SAP system, are used to calculate usage during the reporting period.

3.8 Fugitive SF_6 emissions from electrical switching gear

RVC has approximately 1kg of SF_6 gas on site used as an insulator for approximately 20 individual circuit breakers. This gas is housed within the sealed circuit breakers and switching gear, and is released to the atmosphere via leakage over time. The GHG emissions generated form the fugitive emissions of SF_6 during the reporting period are reported to the CER, via the NGERs report, in line with the NGERs Act 2007.

Data collected

- Maintenance WO and records for SF_6 containing circuit breakers and switching gear.
- Stocktake of on-site switchgear and circuit breakers.

Emissions from sulphur hexafluoride (SF_6) – if an on-site reticulation system exists, some emissions from leakage of SF_6 may occur (if switchgear or circuit breakers with SF6 are applied). Part 4.5 of the NGER Measurement Determination must be used to estimate SF6 emissions. There is no minimum reporting threshold for this emissions source. Method 1 in section 4.102 of the NGER Measurement Determination may be used.

4. SCOPE 2 GHG EMISSIONS

The following table outlines the Scope 2 emissions for RVC reportable under the NGERs Act 2007 in line with The Determination to the CER.

Table 7 - Scope 2 GHG emissions sources

GHG Emission Source	Data required to be collected (Data Source)	Measurement Method	Person/ Dept Responsible for collecting data	Frequency
Electricity consumed from the grid	Electricity consumed (kWh) (original monthly invoices from the electricity provider)	NGER Determination 7.2 - Method 1 Refer to ***Section 4.1***	Accounts Department	Monthly

4.1 Electricity consumption from the grid

RVC uses a significant quantity of electricity purchased from the grid for the operation of the mine. The consumption of this electricity is reportable to the CER, via the NGERs report, under the NGERs Regulations 2008. Scope 2 emissions must be reported if the amount of purchased electricity consumed from the operation of a facility during a year exceeds 20,000 kWh.

Data collected

- Monthly electricity Invoices from the electricity provider

The consumption of electricity from the grid for the reporting period is calculated from the monthly kWh figures provided by the electricity provider.

5. REPORTING ENERGY PRODUCTION

The following table outlines the sources of energy production at RVC, reportable under the NGERs Act 2007 in line with The Determination to the CER. All energy from fuel production must be reported. There is no minimum threshold for reporting energy from fuel production (see NGER Regulation 4.19).

Table 8 - Energy Production Sources

GHG Emission Source	Data required to be collected (Data Source)	Measurement Method	Person Responsible	Frequency
Energy Content of ROM Coking Coal produced	Production Figures from survey dept. Coal Quality from geology department	NGER Determination 6.2 Refer to ***Section 5.1***	Mine Surveyor Production Geologist	Monthly
Energy Content of ROM Thermal Coal produced	Production Figures from survey dept. Coal Quality from geology department	NGER Determination 6.2 Refer to ***Section 5.1***	Mine Surveyor Production Geologist	Monthly
Energy production from the generation of electricity by diesel generators	Diesel consumption aboveground (Litres) from the usage logs at the fuel bowser and figures from SAP	NGER Determination 2.41 – Method 1 Refer to ***Section 5.2***	Electrical Engineering Manager	Monthly
Energy production from solar panels	Electricity generation (kWh) from solar system data portal	NGER Determination 6.3 Refer to ***Section 5.3***	Electrical Engineering Manager	Annually

5.1 Production of ROM Coal

RVC produces hard coking coal for the export market and on occasion minor amounts of coal is sold as thermal coal, depending on the ash content of the coal (high ash coal). The energy content of all coal produced during the reporting period is reported as energy production in the NGERs report. There is no minimum reporting threshold for the reporting of energy from production of a fuel (see NGER Regulation 4.19).

Data collected

- Production tonnages
- Coal sales schedule
- Coal quality analysis certificates
- Tonnages of rejects materials removed from coal tonnages (if any)

Production tonnages are calculated by the survey department based on the mining void space created during the mining of coal (roadway width, cutting height and chainage) and multiplied by the specific gravity of the coal (calculated by the ash analyser on the belt). These figures are cross referenced with sales figures of shipments to determine the proportion of thermal to coking coal. Coal quality analysis certificates for each shipment of coal are used to confirm the coal quality at sale.

Opening stock, closing stock, shipment and transit losses, and coal stockpiles (produced during the reporting period but not yet sold) at the time of reporting is also reconciled against production figures.

Occasionally, if production is running behind schedule for a shipment, some coal is purchased from neighbouring coal mines and on sold by WCL to meet contractual sales deadlines for shipments. This coal which is purchased and on sold, but not produced by the RVC is not counted in the NGERs data to avoid accounting for it twice as it is captured by the producing mines NGERs reporting.

5.2 Energy production from diesel generators

RVC has a 1,000 kVA diesel generator located at No 4 Shaft which is maintained and tested routinely but, due to No.4 shaft being mothballed in mid-2020, is not used to generate power. There are no permanent diesel powered electric generators located at RVC Pit Top, however, during planned power outages generators are hired from time to time to run critical infrastructure. The energy produced and consumed onsite, through the use of diesel generators, is reported when the generating capacity of the unit is greater than 0.5 megawatts and the unit generates greater than 100,000 kilowatt hours of electricity during the reporting period, as per the NGER Regulations 4.19 and 4.20.

Data collected

- Diesel Usage Figures from Fuel Register
- Diesel Usage from SAP
- Electric Generator run hours or fuel consumption
- Energy rating of generator

The energy production, and subsequent consumption, from diesel generators is calculated by multiplying the capacity (kVA) of the diesel generator by the power factor of the generator (typically 90%) and the run time in hours (calculated using the fuel consumption rate of the

generator). The diesel usage of the generator is recorded and calculated as described in **section 3.3** above. The reporting of the energy production from diesel generators is currently optional until the reporting threshold is exceeded.

5.3 Energy production from solar system

RVC has a 21.8 kW solar power and battery storage system was commissioned and operational from July 2020 to power monitoring, alarms and communications systems at Shaft 4.

Where on-site electricity production occurs, it must be reported as energy production as per the NGER Regulations 4.19 and 4.20. The applicable reporting threshold is where the generating capacity of the unit is greater than 0.5 megawatts and the unit generates greater than 100,000 kilowatt hours of electricity in the reporting year. The reporting of the current solar energy system is currently optional until the reporting threshold is exceeded.

Data collected

- Electricity generation from solar system data portal

The generation of electricity is monitored in real time and stored on the cloud. This data is accessed through the app or the solar power web portal administered by the electrical department. The total generation of power for the reporting period is downloaded and reported input into the NGER report.

6. RECORDING AND REPORTING OF GREENHOUSE GAS EMISSIONS

6.1 GHG emission records

Records of all items identified under the "Data Collected" sub-headings in sections 3.1-3.9 and Section 4.1 are stored electronically on the WCL server and retained for a minimum of 7 years. Data collected, calculations and final reports are all stored in the following server location:

K:\1. Wollongong Coal\10.WCL Environment\WCL\G013 Green House Gas Emissions and Carbon Tax

6.2 Equipment Failure Reporting Requirements:

Under section 1.19 of the Determination (2008); if equipment used to monitor emissions is down for greater then six weeks in a year then, within six weeks of the day when down time exceeds six weeks, the registered controlling corporation or responsible emitter must inform the CER in writing of the following:

- The reason why down time is more than six weeks;
- How the reporter plans to minimise down time; and
- How emissions have been estimated during the down time.

If the down time in a year is 6 weeks (42 days) or less, each day of the down time can be estimated consistent with the principles of section 1.13 of the NGER Measurement Determination. Note: for continuous emissions monitoring (CEM) to be applicable, the down time cannot exceed 10% of the year (36.5 or 36.6 days) – i.e. maximum 5 weeks and 1 day (excluding down time for calibration), as per subsection 1.26(4) (CER, 2020a).

6.3 Annual EERS Reporting Requirements:

If the GHG emissions produced by RVC exceeds any of the Scope 1 emissions thresholds, which is 25,000 t CO2-e per year, for the facility, the company is required to submit the following reports through the Emissions and Energy Reporting System (EERS) (accessed via the Client Portal):

- ***Section 19: Energy and emissions report*** - Scope 1 and Scope 2 emissions and energy production and consumption data reported to the Clean Energy Regulator under section 19 of the NGER Act
- ***Section 22A: Emissions number report -*** Final emissions report under s22A of the NGER Act which includes information about the covered emissions from facilities the liable entity is responsible for
- ***Section 22AA: interim emissions number report -*** Interim emissions number or numbers which is/are estimated to be 75% of the total Scope 1 covered emission for the entity for the financial year, are reported by midnight, AEST, 15 June (or where this date falls on a weekend or public holiday, by the following business day)

Table 9: NGER Reporting Timeline

Timeframe / Deadline	Task	Person Responsible
1 July to 30 June annually The reporting period	Collection and recording of NGER data as per **Table 2** & **Table 6.**	Environmental Coordinator to receive collected data from persons responsible for data collection identified in **Table 2** & **Table 6**
30 June – 17 October Annually End of reporting period	Compile all the data from the reporting period and enter the data into the EERS Online Reporting System for review	Environmental Coordinator
17 October Annually Two weeks before report submission deadline	Internal review of NGER data and approval	Environmental Manager
31 October Annually Annual Report submission due	Submit approved NGER's Report to the CER via the EERS Online Reporting Portal	Company Secretary

7. UNCERTAINTY CALCULATIONS

Greenhouse gas quantification is subject to uncertainty because of such things as estimates made in quantifying inputs, including activity data and emission factors that are used by mathematical models to calculate emissions, and the inability of those models to precisely characterize under all circumstances the relationships between various inputs and the resultant emissions. Uncertainty calculations are incorporated within the NGERs annual estimations of GHG emissions for the mine as per the online reporting requirements and regulations.

Actions have been taken by WCL to reduce these uncertainties as far as practicable following the year 2013-14.

Part 8.3 of the NGER Measurement Determination provides default statistical uncertainty levels which can be used to calculate the uncertainty for emissions estimated using method 1. Default uncertainty levels in the NGER Measurement Determination are either aggregated uncertainty levels or uncertainty levels for parameters needed to calculate the emissions, such as energy content or emission factor. The EERS reporting system provides the option to use these default uncertainty levels when providing emissions calculated using method 1.

Part 8.4 of the NGER Measurement Determination sets out how to assess uncertainty where method 2, 3 or 4 is used to estimate scope 1 emissions. This requires uncertainty to be assessed in accordance with the uncertainty protocol. The uncertainty for each source (i.e. fugitive emissions, decommissioned underground mines) can be calculated using the GHG uncertainty protocol methodology. The basic procedure is as follows:

1. Determine the parameter uncertainty for activity data using calibration certificates or statistical methods provided in the GHG uncertainty protocol. Activity data can include gas concentration, temperature, and pressure measurement.
2. Aggregate the measurement uncertainty by multiplying the uncertainty levels for a particular source. E.g. fugitive emissions from the Bulli seam has parameter uncertainties from the gas concentration measurement, flow measurement, temperature measurement and pressure measurement. These parameter uncertainties should be multiplied to determine the source uncertainty.
3. Aggregating multiple uncertainties for a single source type, e.g. combining the uncertainties from multiple ventilation shafts to determine the total uncertainty for the fugitive emissions source.

Regulations 4.08 and 4.17A of the NGER Regulations detail the thresholds for reporting uncertainty associated with estimated scope 1 emissions from combustion of fuel type, or from a source other than combustion, at a facility. Uncertainty must be reported for a facility if the scope 1 emissions from the combustion of an energy type or for a source are 25,000 t CO2-e or more in a reporting year.

8. REFERENCES

CER 2020, Estimating emissions and energy from coal mining guideline

CER 2020, Estimating emissions and energy from Fuel Combustion Guideline

CER 2020, Reporting uncertainty guideline

NSW Work Health and Safety (Mines and Petroleum Sites) Regulation 2014

National Greenhouse and Energy Reporting Act 2007

National Greenhouse and Energy Reporting Regulations 2008

National Greenhouse and Energy Reporting (Measurement) Determination 2008

RVC MIN SWP 004 Ventilation Measurements

RVC MIN SWP 045 Ventilation Report Procedure

Pangolin Associates 2020, FY 2018/19 NGERS Reasonable Assurance for Wollongong Coal Limited – Russell Vale Colliery and Wongawilli Mine

NOAA, Earth System Research Laboratories https://www.esrl.noaa.gov/gmd/ccgg/trends/global.html

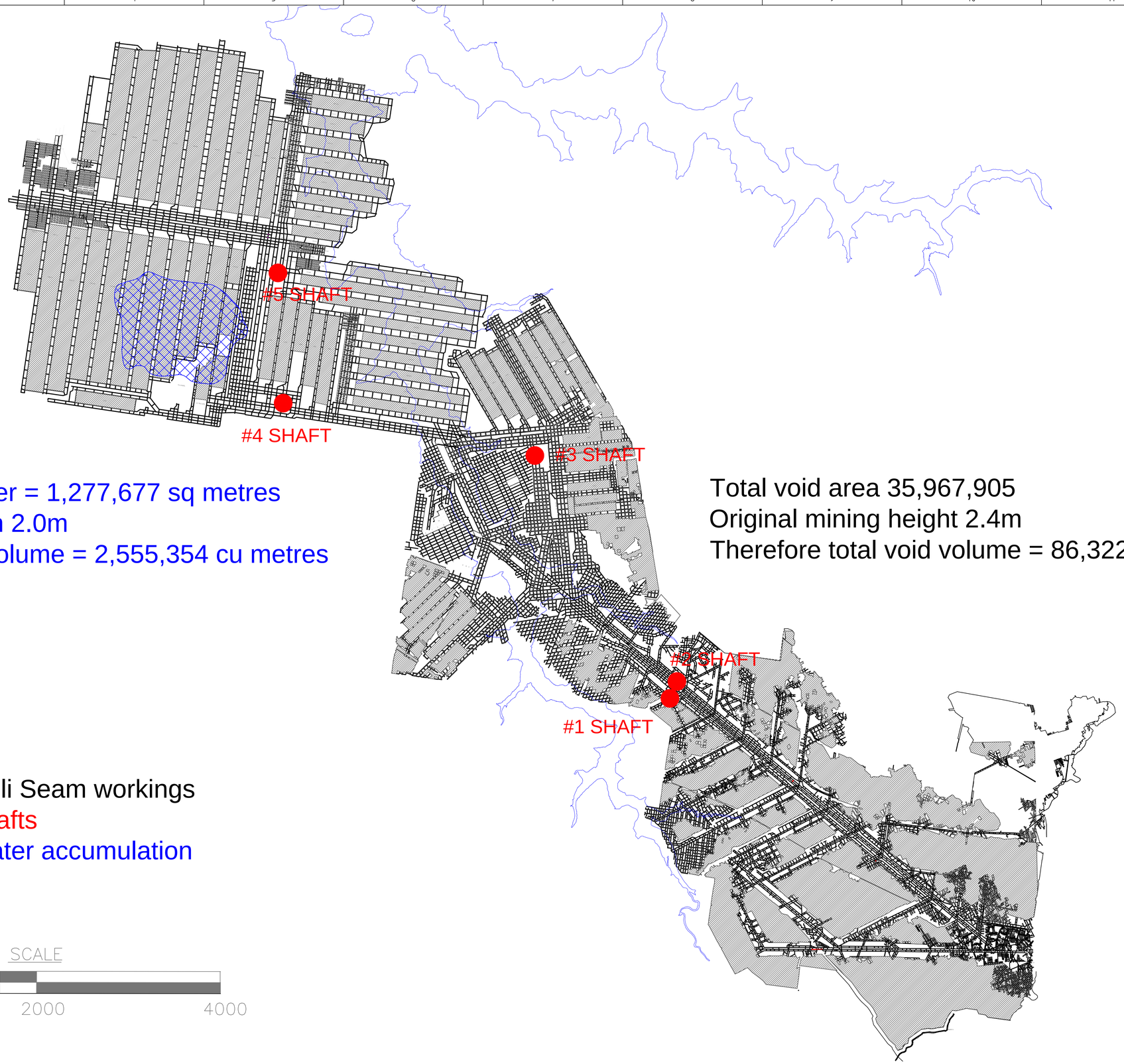
9. CONTROL AND REVISION HISTORY

PROPERTY	VALUE
Approved by	Environmental Manager
Document Owner	Environmental Coordinator
Effective Date	15/02/2021

Revisions

VERSION	DATE REVIEWED	REVIEW TEAM (CONSULTATION)	NATURE OF THE AMENDMENT
V101	23/05/2014	Author: Chris Harvey	Initial Document
V2	13/06/2017	Kamlesh Prajapati	Convert to WCL Format and update persons responsible for gas data collection, processing and calculation at Russell Vale Colliery.
V3	01/02/2021	Robert Faddy-Vrouwe Patrick (Advitech)	Reformat document, add in items following 2019 CER Audit finding including tabulate sources of emissions, update responsible persons, update measurement methodologies & review against current Determination, relevant guidelines and Legislation.

APPENDIX A – BULLI SEAM MINE WORKINGS VOID SPACE AND FLOODING MAP



Area of water = 1,277,677 sq metres
Water depth 2.0m
Therefore volume = 2,555,354 cu metres

Total void area 35,967,905
Original mining height 2.4m
Therefore total void volume = 86,322,972

Bulli Seam workings
Shafts
Water accumulation

SCALE
0 2000 4000

REV	DESCRIPTION	DATE	DRN	CKD	REV	DESCRIPTION	DATE	DRN	CKD

WOLLONGONG COAL
RUSSELL VALE COLLIERY

	Name	Date
DRN	GCH	09/12/2019
CKD		
APP		
SCALE	AS SHOWN	

Title: BULLI SEAM WATER ESTIMATE
DRAWING NUMBER: RV-01-0089
REV: 1

Follow up Request for Information (RFI) based on:

- Department of Agriculture, Water and the Environment's (DAWE) RFI of 12 August 2021,
- Wollongong Coal Limited's (WCL) reply of 13 August to DAWE's RFI of 12 August 2021,
- Jindal Steel and Power (JSPL) reply of 18 August to DAWE's RFI of 12 August 2021, and
- Discussion between DAWE and WCL on 18 August on clarifications and further information required.

RFI of 12 August 2021	Follow Up RFI	Response
1. <u>Proposed mitigation measures to reduce carbon emissions</u> The department notes that certain carbon emissions reduction measures proposed in the WCL *Sustainability and Emission Reduction Strategy* (June 2021) and the *Draft Air Quality and Greenhouse Gas Management Plan* have already been implemented. Please provide a table that sets out all the mitigation measures to reduce carbon emissions. The table should: - clearly identify what measures have already been implemented, and when they were implemented; - outline the proposed additional measures and timing for implementation of those additional measures; for each of the mitigation measures (both implemented and proposed) provide the expected carbon emission reduction for Scope 1 and 2 (t CO_2-e).	For the purpose of this exercise, we consider this RFI closed.	
2. <u>Measure to reduce emissions associated with combustion of diesel</u> The draft *Air Quality and Greenhouse Gas Management Plan* notes that measures will be implemented to reduce emissions associated with the combustion of diesel (see page 46).	For the purpose of this exercise, we consider this RFI closed.	

Please provide the emissions reduction for Scope 1 and 2 - i.e. predicted emissions once these measures have been implemented (t CO_2-e). Please also provide the expected timeframe for implementing the measures.		
3. <u>Scheduled monitoring and real time monitoring</u> The draft *Air Quality and Greenhouse Gas Management Plan* notes that the monitoring data will be used to investigate and implement reasonable measures for minimising GHG emissions in accordance with the Development Consent (see page 43, second bullet point under the heading "9.5 Greenhouse Gas monitoring and reporting"). Please describe what these measures will include, and what the predicted emissions reduction would be from implementing these measures (t CO_2-e) and when emission reductions will be achieved.	For the purpose of this exercise, we consider this RFI closed.	
4. <u>Change in mining method from longwall to Bord & Pillar</u> You stated in your letter of 5 July 2021 to Ms Vickery that the proposed extraction method will be utilising continuous miners which has an extraction of 40 to 50 per cent less than longwall extraction techniques. Please quantify the amount of coal that will remain in the ground if the bord and pillar technique is utilised, as compared to the longwall technique. Please also provide Scope 1, 2 and 3 emissions estimates (t CO_2-e) for the initially proposed longwall extraction technique and for the now proposed bord and pillar extraction technique.	As discussed on 19 August, please provide scope 3 emissions for the longwall extraction technique. This will allow us to compare all the emissions associated with longwall with bord and pillar. Please also provide in the response section of this table a statement about your latest decision to reduce emissions further by sealing off the pillars. Accordingly, please update Appendix 6 of your response of 13 August 21 so that it includes the additional emissions reduced from sealing the pillars.	
5. <u>Tree planting at Wongawilli and Russell Vale collieries</u> The WCL *Sustainability and Emissions Reduction Strategy* (June 2021) notes that you plan to increase the number of	At our discussion on 19 August 21, WCL advised that the trees planted at Wongawilli will remain under the care and	Yes this statement is correct. It will be under the care and control of WCL

eucalypt trees by a further 1000 trees at the Wongawilli and Russel Vale collieries (see page 21). For the two collieries, please provide a map showing the distribution and number of trees at specific locations, along with a statement of the predicted total emissions (t CO_2-e) that will be sequestered per annum and in cumulative total reduction and the period over which the emissions sequestration will be achieved.	control of WCL as long as WCL owns the site the trees planted will remain. Please provide in the response section of this table a statement confirming the above is correct or a statement that more accurately reflects the situation.	
6. <u>Offsetting Scope 1 and 2 emissions by 4% per annum cumulative commencing 2021 with intent of being carbon neutral by 2050</u> Please provide: - further explanation of how this commitment is consistent with the Paris Agreement; - details on how the 4% offset was calculated and will be achieved; the time sequence for implementing the offset to meet net zero by 2050.	With regard to the rationale for 4% year on year for the life of the Russell Vale project, we note that WCL advised: • It is cost prohibitive to be fully offset over the life of the project, however consistent with the Paris Agreement, to remain well below 2 degrees warming, requires a net-zero emissions economy by 2050. • For the Russell Vale project, this means achieving net zero (emissions) by 2050, requires a trajectory of abatement and sequestration of CO2e equivalent to 4% cumulative per annum between 2022 – 2050. This is equivalent to abating and sequestering 20% of emissions by 2027, 50% of emissions by 2035, 100% of emissions by 2048. • Net zero cannot be achieved overnight and cannot be achieved by a single company or mine. Net zero by 2050 recognises that countries, companies, their customers and suppliers will need to each play their	Yes WCL agrees to the commitments however, About the requirement stated as below, please see our response… • By January 2023 50% of Wollongong Coal's suppliers – Telstra, Energy supplier, Lyn Fox -Transport will have a clear and published plan for achieving net zero by 2050. By January 2025 100% of Wollongong Coal's suppliers with have a clear and published plan for achieving net zero emissions by 2050." Whereas, WCL will actively seek and solicit the suppliers that follow the abovementioned guidelines, unless such guidelines are mandated by law and has legal enforcement provision, WCL may not be in a position to enforce the same on its suppliers and prevail. Thus, WCL requests that such a provision may please be instituted in a provision of the

	part in abating and sequestering increasing levels of emissions over the next 30 years. • WCL is hiring a greenhouse and sustainability expert to develop a Sustainability and Net Zero by 2050 plan by within six months of an EPBC Act approval. This plan will be approved by the board of WCL and published on its website by March 2022. Annual public reporting on achievement against this plan will be provided in Wollongong Coal's Ergos Report each year. • This plan will cover all the emissions resulting from the Russell Vale project. This plan will cover emissions directly under the control of Wollongong Coal (Scope 1 &2) and the influence WCL can have over the emissions generated by Wollongong Coal's customers and suppliers (Scope 2 and 3). • The plan will include and expand on WCL's sequester the emissions directly under their control (Scope 1 &2) by not less than 4% in 2022, by 8% in 2023, by 12% in 2024, by 16% in 2025, by 20% in 2026, and by 24% in 2027. It will do this by purchasing and installing solar energy, improved energy efficiency of equipment and lighting needed to operate its mine,	governing laws, whereby WCL will be expected and entitled as well to have its suppliers abide by such provisions and guidelines legally mandated by the law. Yes agreed Yes agreed Yes agreed. However the technology such as electric trucks can only be implemented by WCL once it is permitted under the law by the Australian government for heavy coal haulage trucks

	converting to electric trucks, capturing more of the methane from the underground, planting 1000 trees, purchasing Australian Carbon Credit Unit (ACCU's) and other nationally and internationally accredited carbon markets. • The plan will state that by January 2023 Wollongong Coal will only export to Paris signatories or customers (steel companies) that have a clear plan for achieving net zero by 2050 (or the equivalent target agreed to at Glasgow COP 2021). • By January 2023 50% of Wollongong Coal's suppliers – Telstra, Energy supplier, Lyn Fox -Transport will have a clear and published plan for achieving net zero by 2050. By January 2025 100% of Wollongong Coal's suppliers with have a clear and published plan for achieving net zero emissions by 2050. • This is in addition to and over and above the reduction of Scope 1,2 & 3 emissions that has been achieved through changing from a long wall mining operation to a bord and pillar approach. Changing this mining approach will not only reduce the chance of subsidence of important and protected swamp lands, but also	Whereas, WCL will actively seek to work towards these guidelines, unless such guidelines are mandated by law and has legal enforcement provision, WCL may not be in a position to enforce the same . About the requirement stated as below, please see our response… • By January 2023 50% of Wollongong Coal's suppliers – Telstra, Energy supplier, Lyn Fox -Transport will have a clear and published plan for achieving net zero by 2050. By January 2025 100% of Wollongong Coal's suppliers with have a clear and published plan for achieving net zero emissions by 2050." Whereas, WCL will actively seek and solicit the suppliers that follow the abovementioned guidelines, unless such guidelines are mandated by law and has legal enforcement provision, WCL may not be in a position to enforce the same on its suppliers and prevail.

	result in xx tonnes of carbon and XX Co2E remaining the ground. Please provide in the response section of this table a statement confirming the above is correct or a statement that more accurately reflects the situation.	Thus, WCL requests that such a provision may please be instituted in a provision of the governing laws, whereby WCL will be expected and entitled as well to have its suppliers abide by such provisions and guidelines legally mandated by the law. The details on carbon reduction or remaining in the ground due to sealing and also between longwall and bord and pillar is attached as a separate document.
7. Tree planting initiative (https://www.jindalsteelpower.com/sustainability-jspl.html) Please provide details of the tree planting undertaken by Jindal Steel and Power Limited (**Jindal Steel and Power**)* including the emission reduction to date and forecast reduction (t CO_2-e). i.e., emissions sequestered from the tree planting for each of the last 3 years (2018, 2019, 2020) and the predicted volume of emissions to be abated for the next 5 years (2021, 2022, 2023, 2024, 2025). Please indicate if this sequestration of C02 have been measured, verified and credited as part of any international, national, state or company credit scheme? *note only include the trees planted by the company, not the trees distributed to the community.	• At our discussion on 19 August 21, WCL advised that the trees planted at JSPL sites in India will remain under the care and control of JSPL as long as JSPL owns the site the trees planted will remain. • Please provide in the response section of this table a statement confirming the above is correct or a statement that more accurately reflects the situation. • Please provide an estimate for emissions sequestered from all trees planted to date, this would provide useful context as to the extent of the initiative to date.	• Yes the trees planted JSPL sites in India will remain under the care and control of JSPL as long as JSPL owns the site the trees planted will remain.
8. Carbon reduction for steel making The International Energy Agency's *Net Zero 2050* report sets out several measures that companies can do to	• As discussed on 19 August 21, please confirm whether coal from Russell Vale UEP will be used at either plant at Angul and Raigarh.	Yes coal from Russell Vale colliery will be used at Angul and Raigarh.

transition to net zero steel making including: material/energy/resource efficiency, greater steel recycling, renewable electric arc furnace, molten oxide electrolysis, and renewable hydrogen. The Jindal Steel and Power *Business Sustainability* report states that the company is using energy efficient technology in its Angul and Raigarh steel plants. Please confirm whether any coal from the Russell Vale project is going to either of these steel processing plants. Please also state what are the emissions reductions (t CO_2-e) as a result of using this energy efficient technology enhancement when compared to those steel plants without this technology. Please provide or outline any management plans Jindal Steel and Power has to decarbonise its iron and steel making operations. If no plan is currently available, please provide details of any other initiatives in place, or planned, to reduce emissions: - For those initiatives in place please provide the amount of emissions reduction (CO_2 /annum and total) or sequestration to date and predicted for the next five years (2021 – 2025 inclusive) For those planned initiatives please provide timing for when the initiative is expected to be in place and the yearly projected emissions reductions (CO_2 /annum and total).	• As discussed on 19 August 21, please absolute tonnes of emissions reduction for Angul as done for Raigrah for consistency and to allow meaningful comparison. • As discussed on 19 August 21, please confirm the Indian states in which the Angul and Raigarh steel plants are located. • We note in JSPL's advice of 18 August 21, that under of Odisha's Renewable Energy Policy approximately 50MW of JSPL's energy needs are met by its own cogeneration plants – please indicate how many t-CO_2e is saved annually from the 50MWof cogeneration.	Requested from JSPL Angul – Odisha state. Raigarh – Chhattisgarh state Requested from JSPL
9. Sustainability membership Please provide confirmation of Jindal Steel and Power's memberships of the World Steel Sustainable Development	• As discussed on 19 August 21, please provide evidence of JSPL's memberships of of the World Steel Sustainable Development Charter	Requested from JSPL

Charter 2015, and as a climate action member to the World Steel Association. Please also provide any details of membership of other global/sectoral agreements to achieve net zero steel by 2050.	2015, and as a climate action member to the World Steel Association.	
10. National and State policies The department notes that India has a National Environment Policy 2006 (**NEP**), and the National Action Plan on Climate Change (**NAPCC**), and Odisha has a Renewable Energy Policy (**REP**). Please provide details on how Jindal Steel and Power Limited is factoring in these policies into its operations and what has been the emission reductions as a result.	For the purpose of this exercise, we consider this RFI closed.	
11. Other potential sources of supply Please confirm where Jindal Steel would likely source its coal from if not from WCL. Please specify which countries the coal is likely to come from and specific mines, if known.	For the purpose of this exercise, we consider this RFI closed.	
12. Other potential customers for Russell Vale UEP coal Please identify the likely consumers/customers of the coal extracted from the Russell Vale project, other than Jindal Steel. Please specify the country location and specific consumers, if known.	For the purpose of this exercise, we consider this RFI closed.	
13. Methodologies for calculating emissions Please provide details on the methodology for calculating carbon emissions reductions for the statements made in documents already provided (in particular WCL *Sustainability and Emission Reduction Strategy* (June 2021), the *Draft Air Quality and Greenhouse Gas Management Plan and the* Jindal Power and Steel *Sustainability report* as well as for the emissions calculated in response to this information request. In doing so, please	• For the purpose of this exercise, we consider this RFI closed.	

provide any references to publicly available guidelines used in the methodology as well as any evidence that the methodology (and/or calculations) was independently verified/assured		

s. 22(1)(a)(ii)

From: Devendra Vyas <devendra.vyas@jindalsteel.com>
Sent: Monday, 23 August 2021 10:11 AM
To: s. 22(1)(a)(ii) @awe.gov.au>
Cc: Louise Vickery <Louise.Vickery@environment.gov.au>; Milind Oza <milind.oza@jindalsteel.com>; s. 22(1)(a)(ii) @environment.gov.au>; Warwick Lidbury <wlidbury@wcl.net.au>
Subject: RE: Follow Up RFI [SEC=OFFICIAL]

Hi s. 22(1)(a)(ii)
Yes you are correct, it is 199,584 tonnes. In India they use a different convention.

Regards,
Devendra

From: s. 22(1)(a)(ii) @awe.gov.au>
Sent: Monday, 23 August 2021 10:07 AM
To: Devendra Vyas <devendra.vyas@jindalsteel.com>; s. 22(1)(a)(ii) <s. 22(1)(a)(ii) @awe.gov.au>
Cc: Louise Vickery <Louise.Vickery@environment.gov.au>; Milind Oza <milind.oza@jindalsteel.com>; s. 22(1)(a)(ii) @environment.gov.au>; Warwick Lidbury <wlidbury@wcl.net.au>
Subject: RE: Follow Up RFI [SEC=OFFICIAL]

Good Morning
Thank you for the additional information and consolidating JSPL's responses with WCLs.
I only have one further question.
For RFI 8 (carbon reduction in steel) the annual tonnes of CO2 reduced due to cogen is provided as: 1,99,584

This does not quite make sense (the commas denoting multiple of thousands don't appear to be in the right place).
Is it supposed to be:

- 199,584 tonnes
- 1,995,84X tonnes (ie is there a number missing?)?

Most grateful if you can confirm the correct figure.
Thanks
s. 22(1)(a)(ii)

From: Devendra Vyas <devendra.vyas@jindalsteel.com>
Sent: Saturday, 21 August 2021 7:21 PM
To: s. 22(1)(a)(ii) @awe.gov.au>
Cc: Louise Vickery <Louise.Vickery@environment.gov.au>; Milind Oza <milind.oza@jindalsteel.com>; s. 22(1)(a)(ii) @environment.gov.au>; Warwick Lidbury <wlidbury@wcl.net.au>
Subject: RE: Follow Up RFI [SEC=OFFICIAL]

Hi s. 22(1)(a)(ii)

Please find attached the response from JSPL. I have highlighted the response from JSPL in yellow. Also the invoice towards the payment made to World Steel by JSPL is also attached as evidence of membership.

Regards,
Devendra

From: Devendra Vyas <devendra.vyas@jindalsteel.com>
Sent: Friday, 20 August 2021 5:31 PM
To: s. 22(1)(a)(ii) @awe.gov.au>
Cc: Louise Vickery <Louise.Vickery@environment.gov.au>; Milind Oza <milind.oza@jindalsteel.com>; s. 22(1)(a)(ii) @environment.gov.au>; Warwick Lidbury <wlidbury@wcl.net.au>
Subject: Re: Follow Up RFI [SEC=OFFICIAL]

Hi s. 22(1)(a)(ii)
Thanks very much. Yes the numbers you mentioned are correct.
Appreciate your efforts.
Regards
Devendra

On Fri, 20 Aug 2021 at 4:53 pm, s. 22(1)(a)(ii) @awe.gov.au> wrote:

> Hi Devendra
> Thanks for that – based on the information below and in appendix 7 of your response of 13 August 21, I have updated appendix 6 of your response of 13 August 21.
> Please review the revised appendix 6 attached to confirm you're happy with the figures (I land at a 43% reduction in scope 3 over the life of the project).
> Thanks
> s. 22(1)(a)(ii)
>
> ---
>
> **From:** Devendra Vyas <devendra.vyas@jindalsteel.com>
> **Sent:** Friday, 20 August 2021 4:00 PM
> **To:** s. 22(1)(a)(ii) @awe.gov.au>; Warwick Lidbury <wlidbury@wcl.net.au>
> **Cc:** s. 22(1)(a)(ii) @environment.gov.au>; Louise Vickery

<Louise.Vickery@environment.gov.au>; Milind Oza <milind.oza@jindalsteel.com>
Subject: RE: Follow Up RFI [SEC=OFFICIAL]

Hi s. 22(1)(a)(ii)

I just missed one point, the scope 3 emissions longwall vs Bord and Pillar

The scope 3 emissions due to longwall mining were estimated at 3,365,236 million tonnes $CO2_e$ per annum which equates **to 16, 826,180 million tonnes $CO2_e$ over a five year project life**. With the current mining method the estimated scope 3 emissions are **9,623,427 million tonnes $CO2_e$ which is a reduction of 57%**

Hope this assists.

Regards,
Devendra

From: s. 22(1)(a)(ii) @awe.gov.au>
Sent: Friday, 20 August 2021 3:56 PM
To: Devendra Vyas <devendra.vyas@jindalsteel.com>; s. 22(1)(a)(ii) s. 22(1)(a)(ii) @awe.gov.au>; Warwick Lidbury <wlidbury@wcl.net.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; Louise Vickery <Louise.Vickery@environment.gov.au>; Milind Oza <milind.oza@jindalsteel.com>
Subject: RE: Follow Up RFI [SEC=OFFICIAL]

Thanks Devendra – I'll look now.
Cheers
s. 22(1)(a)(ii)

From: Devendra Vyas <devendra.vyas@jindalsteel.com>
Sent: Friday, 20 August 2021 3:46 PM
To: s. 22(1)(a)(ii) @awe.gov.au>; Warwick Lidbury <wlidbury@wcl.net.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; Louise Vickery <Louise.Vickery@environment.gov.au>; Milind Oza <milind.oza@jindalsteel.com>
Subject: RE: Follow Up RFI [SEC=OFFICIAL]

Hi s. 22(1)(a)(ii)

Please find attached the response to the RFI. Also attached is a document highlighting the reduction in the gas emissions

- Due to sealing of workings- about 40%
- Change over from longwall to Bord and Pillar- 89%

I will forward the information from JSPL as soon as we receive it.

Have a great week end.

Regards,
Devendra

From: s. 22(1)(a)(ii) @awe.gov.au>
Sent: Friday, 20 August 2021 10:06 AM
To: Devendra Vyas <devendra.vyas@jindalsteel.com>; Warwick Lidbury <wlidbury@wcl.net.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; Louise Vickery <Louise.Vickery@environment.gov.au>
Subject: FW: Follow Up RFI [SEC=OFFICIAL]

Dear Devendra and Warwick
Further to my last, please use the attached instead – minor typographical errors have been fixed.
Thanks
s. 22(1)(a)(ii)

From: s. 22(1)(a)(ii)
Sent: Friday, 20 August 2021 9:40 AM
To: Devendra Vyas <devendra.vyas@jindalsteel.com>; Warwick Lidbury <wlidbury@wcl.net.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; Louise Vickery <Louise.Vickery@environment.gov.au>
Subject: Follow Up RFI [SEC=OFFICIAL]

Hello Devendra and Warwick
Thank you for your time yesterday – as discussed at that meeting – please find attached our follow up RFI based on the previous information provided.
s. 22(1)(a)(ii) and I more than happy to discuss on teams.
Thanking you in advance for a speedy response,
Regards

s. 22(1)(a)(ii)

Director | ACT Assessments | s. 22(1)(a)(ii)
Environment Assessments (NSW, ACT)
Environment Approvals Division

Department of Agriculture, Water and the Environment
PO Box 787, CANBERRA, ACT 2601
s. 22(1)(a)(ii) @awe.gov.au | awe.gov.au

The Department acknowledges the traditional owners of country throughout Australia and their continuing connection to land, sea and community. We pay our respects to them and their cultures and to their elders both past and present.

Follow up Request for Information (RFI) based on:

- Department of Agriculture, Water and the Environment's (DAWE) RFI of 12 August 2021,
- Wollongong Coal Limited's (WCL) reply of 13 August to DAWE's RFI of 12 August 2021,
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- Discussion between DAWE and WCL on 18 August on clarifications and further information required.

RFI of 12 August 2021	Follow Up RFI	Response
1. <u>Proposed mitigation measures to reduce carbon emissions</u> The department notes that certain carbon emissions reduction measures proposed in the WCL *Sustainability and Emission Reduction Strategy* (June 2021) and the *Draft Air Quality and Greenhouse Gas Management Plan* have already been implemented. Please provide a table that sets out all the mitigation measures to reduce carbon emissions. The table should: - clearly identify what measures have already been implemented, and when they were implemented; - outline the proposed additional measures and timing for implementation of those additional measures; for each of the mitigation measures (both implemented and proposed) provide the expected carbon emission reduction for Scope 1 and 2 (t CO_2-e).	For the purpose of this exercise, we consider this RFI closed.	
2. <u>Measure to reduce emissions associated with combustion of diesel</u> The draft *Air Quality and Greenhouse Gas Management Plan* notes that measures will be implemented to	For the purpose of this exercise, we consider this RFI closed.	

reduce emissions associated with the combustion of diesel (see page 46). Please provide the emissions reduction for Scope 1 and 2 -i.e. predicted emissions once these measures have been implemented (t CO_2-e). Please also provide the expected timeframe for implementing the measures.		
3. <u>Scheduled monitoring and real time monitoring</u> The draft *Air Quality and Greenhouse Gas Management Plan* notes that the monitoring data will be used to investigate and implement reasonable measures for minimising GHG emissions in accordance with the Development Consent (see page 43, second bullet point under the heading "9.5 Greenhouse Gas monitoring and reporting"). Please describe what these measures will include, and what the predicted emissions reduction would be from implementing these measures (t CO_2-e) and when emission reductions will be achieved.	For the purpose of this exercise, we consider this RFI closed.	
4. <u>Change in mining method from longwall to Bord & Pillar</u> You stated in your letter of 5 July 2021 to Ms Vickery that the proposed extraction method will be utilising continuous miners which has an extraction of 40 to 50 per cent less than longwall extraction techniques. Please quantify the amount of coal that will remain in the ground if the bord and pillar technique is utilised, as compared to the longwall technique. Please also provide Scope 1, 2 and 3 emissions estimates (t CO_2-e) for the initially proposed longwall extraction technique and for the now proposed bord and pillar extraction technique.	As discussed on 19 August, please provide scope 3 emissions for the longwall extraction technique. This will allow us to compare all the emissions associated with longwall with bord and pillar. Please also provide in the response section of this table a statement about your latest decision to reduce emissions further by sealing off the pillars. Accordingly, please update	

	Appendix 6 of your response of 13 August 21 so that it includes the additional emissions reduced from sealing the pillars.	
5. <u>Tree planting at Wongawilli and Russell Vale collieries</u> The WCL *Sustainability and Emissions Reduction Strategy* (June 2021) notes that you plan to increase the number of eucalypt trees by a further 1000 trees at the Wongawilli and Russel Vale collieries (see page 21). For the two collieries, please provide a map showing the distribution and number of trees at specific locations, along with a statement of the predicted total emissions (t CO_2-e) that will be sequestered per annum and in cumulative total reduction and the period over which the emissions sequestration will be achieved.	At our discussion on 19 August 21, WCL advised that the trees planted at Wongawilli will remain under the care and control of WCL as long as WCL owns the site the trees planted will remain. Please provide in the response section of this table a statement confirming the above is correct or a statement that more accurately reflects the situation.	Yes this statement is correct. It will be under the care and control of WCL
6. <u>Offsetting Scope 1 and 2 emissions by 4% per annum cumulative commencing 2021 with intent of being carbon neutral by 2050</u> Please provide: - further explanation of how this commitment is consistent with the Paris Agreement; - details on how the 4% offset was calculated and will be achieved; the time sequence for implementing the offset to meet net zero by 2050.	With regard to the rationale for 4% year on year for the life of the Russell Vale project, we note that WCL advised: • It is cost prohibitive to be fully offset over the life of the project, however consistent with the Paris Agreement, to remain well below 2 degrees warming, requires a net-zero	Yes WCL agrees to the commitments however, About the requirement stated as below, please see our response… • By January 2023 50% of Wollongong Coal's suppliers – Telstra, Energy supplier, Lyn Fox -Transport will have a clear and published plan for achieving net zero by 2050. By January 2025 100% of Wollongong Coal's suppliers with have a clear and published plan for achieving net zero emissions by 2050."

	emissions economy by 2050. • For the Russell Vale project, this means achieving net zero (emissions) by 2050, requires a trajectory of abatement and sequestration of CO2e equivalent to 4% cumulative per annum between 2022 – 2050. This is equivalent to abating and sequestering 20% of emissions by 2027, 50% of emissions by 2035, 100% of emissions by 2048. • Net zero cannot be achieved overnight and cannot be achieved by a single company or mine. Net zero by 2050 recognises that countries, companies, their customers and suppliers will need to each play their part in abating and sequestering increasing levels of emissions over the next 30 years.	Whereas, WCL will actively seek and solicit the suppliers that follow the abovementioned guidelines, unless such guidelines are mandated by law and has legal enforcement provision, WCL may not be in a position to enforce the same on its suppliers and prevail. Thus, WCL requests that such a provision may please be instituted in a provision of the governing laws, whereby WCL will be expected and entitled as well to have its suppliers abide by such provisions and guidelines legally mandated by the law. Yes agreed Yes agreed

	• WCL is hiring a greenhouse and sustainability expert to develop a Sustainability and Net Zero by 2050 plan by within six months of an EPBC Act approval. This plan will be approved by the board of WCL and published on its website by March 2022. Annual public reporting on achievement against this plan will be provided in Wollongong Coal's Ergos Report each year. • This plan will cover all the emissions resulting from the Russell Vale project. This plan will cover emissions directly under the control of Wollongong Coal (Scope 1 &2) and the influence WCL can have over the emissions generated by Wollongong Coal's customers and suppliers (Scope 2 and 3). • The plan will include and expand on WCL's sequester the emissions	Yes agreed. However the technology such as electric trucks can only be implemented by WCL once it is permitted under the law by the Australian government for heavy coal haulage trucks Whereas, WCL will actively seek to work towards these guidelines, unless such guidelines are mandated by law and has legal enforcement provision, WCL may not be in a position to enforce the same . About the requirement stated as below, please see our response… • By January 2023 50% of Wollongong Coal's suppliers – Telstra, Energy supplier, Lyn Fox -Transport will have a clear and published plan for achieving net zero by 2050. By January 2025 100% of Wollongong Coal's suppliers with have a clear and published plan for achieving net zero emissions by 2050." Whereas, WCL will actively seek and solicit the suppliers that follow the abovementioned guidelines, unless such guidelines are mandated by law and has legal enforcement provision, WCL

	directly under their control (Scope 1 &2) by not less than 4% in 2022, by 8% in 2023, by 12% in 2024, by 16% in 2025, by 20% in 2026, and by 24% in 2027. It will do this by purchasing and installing solar energy, improved energy efficiency of equipment and lighting needed to operate its mine, converting to electric trucks, capturing more of the methane from the underground, planting 1000 trees, purchasing Australian Carbon Credit Unit (ACCU's) and other nationally and internationally accredited carbon markets. • The plan will state that by January 2023 Wollongong Coal will only export to Paris signatories or customers (steel companies) that have a clear plan for achieving net zero by 2050 (or the equivalent	may not be in a position to enforce the same on its suppliers and prevail. Thus, WCL requests that such a provision may please be instituted in a provision of the governing laws, whereby WCL will be expected and entitled as well to have its suppliers abide by such provisions and guidelines legally mandated by the law. The details on carbon reduction or remaining in the ground due to sealing and also between longwall and bord and pillar is attached as a separate document.

	target agreed to at Glasgow COP 2021). • By January 2023 50% of Wollongong Coal's suppliers – Telstra, Energy supplier, Lyn Fox -Transport will have a clear and published plan for achieving net zero by 2050. By January 2025 100% of Wollongong Coal's suppliers with have a clear and published plan for achieving net zero emissions by 2050. • This is in addition to and over and above the reduction of Scope 1,2 & 3 emissions that has been achieved through changing from a long wall mining operation to a bord and pillar approach. Changing this mining approach will not only reduce the chance of subsidence of important and protected swamp lands, but also result in xx tonnes of	

	carbon and XX Co2E remaining the ground. Please provide in the response section of this table a statement confirming the above is correct or a statement that more accurately reflects the situation.	
7. Tree planting initiative (https://www.jindalsteelpower.com/sustainability-jspl.html) Please provide details of the tree planting undertaken by Jindal Steel and Power Limited (**Jindal Steel and Power**)* including the emission reduction to date and forecast reduction (t CO_2-e). i.e., emissions sequestered from the tree planting for each of the last 3 years (2018, 2019, 2020) and the predicted volume of emissions to be abated for the next 5 years (2021, 2022, 2023, 2024, 2025). Please indicate if this sequestration of C02 have been measured, verified and credited as part of any international, national, state or company credit scheme? *note only include the trees planted by the company, not the trees distributed to the community.	• At our discussion on 19 August 21, WCL advised that the trees planted at JSPL sites in India will remain under the care and control of JSPL as long as JSPL owns the site the trees planted will remain. • Please provide in the response section of this table a statement confirming the above is correct or a statement that more accurately reflects the situation. • Please provide an estimate for emissions sequestered from all trees planted to date, this would provide useful context as to the	• Yes the trees planted JSPL sites in India will remain under the care and control of JSPL as long as JSPL owns the site the trees planted will remain.

	extent of the initiative to date.	
8. Carbon reduction for steel making The International Energy Agency's *Net Zero 2050* report sets out several measures that companies can do to transition to net zero steel making including: material/energy/resource efficiency, greater steel recycling, renewable electric arc furnace, molten oxide electrolysis, and renewable hydrogen. The Jindal Steel and Power *Business Sustainability* report states that the company is using energy efficient technology in its Angul and Raigarh steel plants. Please confirm whether any coal from the Russell Vale project is going to either of these steel processing plants. Please also state what are the emissions reductions (t CO_2-e) as a result of using this energy efficient technology enhancement when compared to those steel plants without this technology. Please provide or outline any management plans Jindal Steel and Power has to decarbonise its iron and steel making operations. If no plan is currently available, please provide details of any other initiatives in place, or planned, to reduce emissions: - For those initiatives in place please provide the amount of emissions reduction (CO_2 /annum and total) or sequestration to date and predicted for the next five years (2021 – 2025 inclusive) For those planned initiatives please provide timing for when the initiative is expected to be in place and the	• As discussed on 19 August 21, please confirm whether coal from Russell Vale UEP will be used at either plant at Angul and Raigarh. • As discussed on 19 August 21, please absolute tonnes of emissions reduction for Angul as done for Raigrah for consistency and to allow meaningful comparison. • As discussed on 19 August 21, please confirm the Indian states in which the Angul and Raigarh steel plants are located. • We note in JSPL's advice of 18 August 21, that under of Odisha's Renewable Energy Policy approximately 50MW of JSPL's energy needs are met by its own cogeneration plants – please indicate how many t-CO_2e is saved	Yes coal from Russell Vale colliery will be used at Angul and Raigarh. As Regards absolute reduction for Angul CO2 Emission in FY 2020-21 as compared to FY 2018-19 (baseline production 2,453,879 " Amounts to 2,453,879 x (2.64 3 - 2.506) = 336,181 Tonnes of CO2 Angul – Odisha state. Raigarh – Chhattisgarh state 50 MWx 24 Hrs x 330 days x 0.504 (tons of CO2/MW as per WSA CO2 Calculation sheet) amounts to saving of CO2 equivalent of 1,99,584 Tons of CO2 Annually

yearly projected emissions reductions (CO_2 /annum and total).	annually from the 50MWof cogeneration.	
9. Sustainability membership Please provide confirmation of Jindal Steel and Power's memberships of the World Steel Sustainable Development Charter 2015, and as a climate action member to the World Steel Association. Please also provide any details of membership of other global/sectoral agreements to achieve net zero steel by 2050.	• As discussed on 19 August 21, please provide evidence of JSPL's memberships of of the World Steel Sustainable Development Charter 2015, and as a climate action member to the World Steel Association.	The invoice towards payments made to World Steel Sustainable Development Charter 2015 is attached
10. National and State policies The department notes that India has a National Environment Policy 2006 (**NEP**), and the National Action Plan on Climate Change (**NAPCC**), and Odisha has a Renewable Energy Policy (**REP**). Please provide details on how Jindal Steel and Power Limited is factoring in these policies into its operations and what has been the emission reductions as a result.	For the purpose of this exercise, we consider this RFI closed.	
11. Other potential sources of supply Please confirm where Jindal Steel would likely source its coal from if not from WCL. Please specify which countries the coal is likely to come from and specific mines, if known.	For the purpose of this exercise, we consider this RFI closed.	
12. Other potential customers for Russell Vale UEP coal Please identify the likely consumers/customers of the coal extracted from the Russell Vale project, other than Jindal Steel. Please specify the country location and specific consumers, if known.	For the purpose of this exercise, we consider this RFI closed.	

13. <u>Methodologies for calculating emissions</u> Please provide details on the methodology for calculating carbon emissions reductions for the statements made in documents already provided (in particular WCL *Sustainability and Emission Reduction Strategy* (June 2021), the *Draft Air Quality and Greenhouse Gas Management Plan and the* Jindal Power and Steel *Sustainability report* as well as for the emissions calculated in response to this information request. In doing so, please provide any references to publicly available guidelines used in the methodology as well as any evidence that the methodology (and/or calculations) was independently verified/assured	• For the purpose of this exercise, we consider this RFI closed.	

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Associate Vice President Jindal Steel & Power (Australia) Pty Ltd (M). s. 47F(1)

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From: Devendra Vyas
To: s. 22(1)(a)(ii)
Cc: Louise Vickery; s. 22(1)(a)(ii) Warwick Lidbury; Milind Oza
Subject: RE: PBC 2020-8702 Russell Vale Underground Mine Extension- further information. [SEC=UNOFFICIAL]
Date: Wednesday, 18 August 2021 12:00:47 PM
Attachments: JSPL Response to RFI-EPBC.docx

Hi s. 22(1)(a)(ii)

Please find attached the response from JSPL in response to the RFI.

Regards,
Devendra

From: s. 22(1)(a)(ii) @awe.gov.au>
Sent: Tuesday, 17 August 2021 7:10 PM
To: Devendra Vyas <devendra.vyas@jindalsteel.com>
Cc: Louise Vickery <Louise.Vickery@environment.gov.au>; s. 22(1)(a)(ii)
s. 22(1)(a)(ii) @environment.gov.au>; s. 22(1)(a)(ii) @environment.gov.au>
Subject: RE: PBC 2020-8702 Russell Vale Underground Mine Extension- further information. [SEC=UNOFFICIAL]

Hi Devendra

We're happy to meet on the 19th.

s. 22(1)(a)(ii) please arrange, I've spoken with Louise.

Thanks
s. 22(1)(a)(ii)

From: Devendra Vyas <devendra.vyas@jindalsteel.com>
Sent: Tuesday, 17 August 2021 4:52 PM
To: s. 22(1)(a)(ii) @awe.gov.au>
Subject: RE: PBC 2020-8702 Russell Vale Underground Mine Extension- further information. [SEC=UNOFFICIAL]

Hi s. 22(1)(a)(ii)

Thanks for providing the update.

Is it possible to have a virtual meeting on 19th just to catch up and discuss the information provided.
Else please suggest an alternative day and time convenient to you and the team.

Regards,
Devendra

From: s. 22(1)(a)(ii) @awe.gov.au>

Sent: Monday, 16 August 2021 6:05 PM
To: Devendra Vyas <devendra.vyas@jindalsteel.com>; s. 22(1)(a)(ii)
s. 22(1)(a)(ii) @awe.gov.au>
Cc: Milind Oza <milind.oza@jindalsteel.com>; Warwick Lidbury <wlidbury@wcl.net.au>; Louise Vickery <Louise.Vickery@environment.gov.au>
Subject: RE: PBC 2020-8702 Russell Vale Underground Mine Extension- further information. [SEC=UNOFFICIAL]

Thank you Devendra for such a prompt reply. We have started to review the information provided and look forward to receiving the information on Jindal Power and Steel.
If we have any specific questions, we will get in touch.
Many thanks
s. 22(1)(a)(ii)

From: Devendra Vyas <devendra.vyas@jindalsteel.com>
Sent: Friday, 13 August 2021 7:13 PM
To: s. 22(1)(a)(ii) @awe.gov.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; Milind Oza <milind.oza@jindalsteel.com>; Warwick Lidbury <wlidbury@wcl.net.au>; Louise Vickery <Louise.Vickery@environment.gov.au>
Subject: RE: PBC 2020-8702 Russell Vale Underground Mine Extension- further information. [SEC=UNOFFICIAL]

Hi s. 22(1)(a)(ii)

Please find attached the WCL response to the RFI. The RFI for JSPL information is being compiled and will be sent through shortly.
Have a great weekend.

Kind regards,
Devendra

From: s. 22(1)(a)(ii) @awe.gov.au>
Sent: Thursday, 12 August 2021 1:08 PM
To: Devendra Vyas <devendra.vyas@jindalsteel.com>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; milind.oza@jindalsteel.com; Warwick Lidbury <wlidbury@wcl.net.au>; Louise Vickery <Louise.Vickery@environment.gov.au>
Subject: PBC 2020-8702 Russell Vale Underground Mine Extension- further information. [SEC=UNOFFICIAL]

Hi Devendra

As discussed, please find attached the department's request for further information.

If you have any question please contact me on the details below.

Regards

s. 22(1)(a)(ii)

Assistant Director
Environment Assessments NSW (South) and ACT
Department of Agriculture, Water and the Environment
E: s. 22(1)(a)(ii) @awe.gov.au

From: Devendra Vyas <devendra.vyas@jindalsteel.com>
Sent: Tuesday, 10 August 2021 11:37 AM
To: s. 22(1)(a)(ii) @awe.gov.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>
Subject: RFI

Good morning s. 22(1)(a)(ii)

Hope you are well and safe.
Just following up on the RFI we discussed on Friday. Once we have the RFI, we will work towards getting it back to you ASAP.

Regards,
Devendra

A Vice President
Jindal Steel and Power (Australia) Pty Ltd
s. 47F(1)
devendra.vyas@jindalsteel.com

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Table 1 – Request for additional information.

Action	Information required	
Wollongong Coal Limited (WCL)		
1. Proposed mitigation measures to reduce carbon emissions	The department notes that certain carbon emissions reduction measures proposed in the WCL*Sustainability and Emission Reduction Strategy* (June 2021) and the *Draft Air Quality and Greenhouse Gas Management Plan* have already been implemented. Please provide a table that sets out all the mitigation measures to reduce carbon emissions.The table should: - clearly identify what measures have already been implemented, and when they wereimplemented; - outline the proposed additional measures and timing for implementation of thoseadditional measures; - for each of the mitigation measures (both implemented and proposed) provide the expected carbon emission reduction for Scope 1 and 2 (t CO_2-e).	Details provided earlier
2. Measure to reduce emissions associated with combustion of diesel	The draft *Air Quality and Greenhouse Gas Management Plan* notes that measures will be implemented to reduce emissions associated with the combustion of diesel (see page 46). Please provide the emissions reduction for Scope 1 and 2 -i.e. predicted emissions once these Measures have been implemented (t CO_2-e). Please also provide the expected timeframe forimplementing the measures.	
3. Scheduled monitoring and real time monitoring.	The draft *Air Quality and Greenhouse Gas Management Plan* notes that the monitoring data willbe used to investigate and implement reasonable measures for minimizing GHG emissions in accordance with the Development Consent (see page 43, second bullet point under the heading"9.5 Greenhouse Gas monitoring and reporting"). Please describe what these measures will include, and what the predicted emissions reduction Would be from implementing these measures (t CO_2-e) and when emission reductions will be achieved.	

4. Change in mining method from long wall to Board & Pillar	You stated in your letter of 5 July 2021 to Ms Vickery that the proposed extraction method willbe utilizing continuous miners which has an extraction of 40 to 50 per cent less than long wall Extraction techniques. Please quantify the amount of coal that will remain in the ground if the	
	bord and pillar technique is utilised, as compared to the longwall technique. Please also provide Scope 1, 2 and 3 emissions estimates (t CO_2-e) for the initially proposed longwall extractiontechnique and for the now proposed bord and pillar extraction technique.	
5. Tree planting at Wonga wile and Russell Vale collieries	The WCL *Sustainability and Emissions Reduction Strategy* (June 2021) notes that you plan to increase the number of eucalypt trees by a further 1000 trees at the Wongawilli and Russell Valecollieries (see page 21). For the two collieries, please provide a map showing the distribution and number of trees at specific locations, along with a statement of the predicted total emissions (t CO_2-e) that will besequestered per annum and in cumulative total reduction and the period over which the Emissions sequestration will be achieved.	
6. Offsetting Scope 1 and 2 emissions by 4% per annum cumulative commencing 2021 with intent of being carbon neutral by 2050.	Please provide: - further explanation of how this commitment is consistent with the Paris Agreement; - details on how the 4% offset was calculated and will be achieved; - The time sequence for implementing the offset to meet net zero by 2050.	
Jindal Steel and Power Limited (WCL parent Company) commitments		
7. Tree planting initiative (https://www.jindalsteelpower.com/sustainability-jspl.html)	Please provide details of the tree planting undertaken by Jindal Steel and Power Limited (**Jindal Steel and Power**)* including the emission reduction to date and forecast reduction (t CO_2-e). i.e.,emissions sequestered from the tree planting for each of the last 3 years (2018, 2019, 2020) and the predicted volume of emissions to be abated for the next 5 years (2021, 2022, 2023, 2024, 2025). Please indicate if this sequestration of C02 have been measured, verified and credited as part ofany international,	At Jindal Steel & Power Ltd. (JSPL) tree plantation, greenbelt development and afforestation activities in and around various plant locations are given top priority. The Company has planted more than 5.0 million trees till date across all its units in India. During the last 3 years the no. of trees planted and estimated amount of CO2 sequestered on account of planting trees are given below:

	national, state or company credit scheme? *note only include the trees planted by the company, not the trees distributed to the community.	**S No.** / **Year** / **No. of trees planted** / **Estimated CO2 sequestered** 1. / 2018-19 / 69575 / 0.00807 million tones 2. / 2019-20 / 64851 / 0.00206 million tones 3. / 2020-21 / 57532 / 0.00038 Million tones **Note-** The above figures of CO2 sequestered are approximate and based on estimation undertaken considering published literature on the subject.
8. Carbon reduction for steel making	The International Energy Agency's *Net Zero 2050* report sets out several measures that companies can do to transition to net zero steel making including: material/energy/resource efficiency, greater steel recycling, renewable electric arc furnace, molten oxide electrolysis, andrenewable hydrogen. The Jindal Steel and Power *Business Sustainability* report states that the company is using energy efficient technology in its Angul and Raigarh steel plants. Please confirm whether any coal from the Russell Vale project is going to either of these steel processing plants. Please also State what are the emissions reductions (t CO_2-e) as a result of using this energy efficienttechnology enhancement when compared to those steel plants without this technology?	Raigarh: Under the provisions of the Energy Conservation Act, 2001 (ECA), Ministry of Power, Government of India has issued Notification S.O. 687(E) dated 30th March 2012 stating the specific energy consumption (SEC) to be achieved by the end of a three-year cycle and, by certain plants, named as designated consumers, in eight different sectors including steel and thermal power plants. Ministry of Power has also issued Notification G.S.R. 269(E) dated 30th March 2012 regarding the rules and procedures in this regard. The issue of this notification marks the initiation under "Perform, Achieve and Trade" (PAT) scheme of the government, being implemented under the National Mission for Enhanced Energy Efficiency (NMEEE), which is one of the missions under the National Action Plan on Climate Change (NAPCC). The PAT scheme is being administered by the Bureau of Energy Efficiency (BEE), under the Ministry of Power. Under PAT (Perform, Achieve & Trade Mechanism) scheme JSPL, Raigarh reduced specific Energy consumption by 6.5% in PAT cycle-I and 7.46% in PAT cycle-II. In PAT-I cycle CO_2 emission reduced from 3.3 ton/TCS to 2.95 ton/TCS. In absolute 5,78,857 tonnes of CO_2 emission reduction were achieved. In PAT-II cycle CO_2 emission reduced from 2.95 ton/TCS to 2.65 ton/TCS. In absolute terms, 8,04,982 tonnes of CO_2 emission reduction were achieved. Target for Next PAT cycle is still awaited from Ministry of Power, GOI Under REP our obligation of approximately 50MW is met by our own cogeneration plants, so we do not purchase power from non-renewable source. Angul: In PAT cycle-4, Angul plant has been given Energy reduction target of 6% to be achieved by 2020-21 against the Base year 2016-17. The target has been achieved & M & V audit is in process.

		We have reduced CO2 from 3.3 t/TCs to 2.59 as on Fy 20-21. The Other steel companies not having implemented these schemes would be about 3.3 to 3.6 t/TCS or even more t / TCS of CO2 with similar setup and route of production. *** Regarding coal from the Russell Vale it is to inform that JSPL Raigarh had used this 3 years back and at present it's not in use at Raigarh. Further CMG group may confirm the present status.
	Please provide or outline any management plans Jindal Steel and Power has to decarbonize in and steel making operations. If no plan is currently available, please provide details of any other initiatives in place, or planned, to reduce emissions: - For those initiatives in place please provide the amount of emissions reduction (CO2 /annum and total) or sequestration to date and predicted for the next five years(2021 – 2025 inclusive) - For those planned initiatives please provide timing for when the initiative is expected tobe in place and the yearly projected emissions reductions (CO2 /annum and total).	Following strategies are under consideration to further reduce the CO2 emission. • Installation of CDQ (Coke Dry Quenching) system in recovery type coke oven plant) • Installation of BF Gas Fired Boiler (2 x 20 TPH) to improve utilization of BF Gas. • Installation of Steam driven Exhauster in Coke Oven Plant. • Installation of Low Pressure Compressor for Casters • Modification & installation of new gas (BF+PG) route • Installation of process boiler to avoid power loss in PRDS • Converting EAF to NEOF to reduce • Hear recovery from EAF /NEOF) • We have plans to shelf our CPP Coal Based TPP and take energy from available Solar plants or from the GRID . • We intent to have PPA with solar plants through GRID in the long run. • We also intent to install Solar Power plants and Wind Farms in the coming years to reduce our dependency on Coal for energy needs. • We also intend to take up large scale plantation in association with the local state government Forest departments. • We will explore the possibility of using Hydrogen as a fuel to decarbonize steel; making process as an alternate and promising fuel for future, but the feasibility risk, safety and its applicability in steel industry is yet to be established. • The next 10 years are critical from Climate change point of view and we will go with the directives of GOI INDC in this regard.

9. Sustainability membership	Please provide confirmation of Jindal Steel and Power's memberships of the World Steel Sustainable Development Charter 2015, and as a climate action member to the World SteelAssociate. Please also provide any details of membership of other global/sectoral agreements to achievenet zero steel by 2050.	We are members of WSA and ISA and MOS GOI JSPL is a signatory to the World Steel Sustainable Development Charter 2015, and is also a Climate Action Member with World Steel Association, There policy reflect the purpose and intent of UNGC , WSSDC, GRI guidelines and as per the international Standard such as ISO 14001, OSHAS 18001, and ISO 9001. JSPL also looks forward to implement the ISO 50001standard across all its plants in India, few of them have already implemented as on date.
10. The department notes that India has a National Environment Policy 2006 (**NEP**), and the National Action Plan on Climate Change (**NAPCC**), and Odisha has a Renewable Energy Policy (**REP**). Please provide details on how Jindal Steel and Power Limited is factoring in these policies into its operations and what has been the emission reductions as a result. For example, the REP sets out a number of schemes to reduce carbon emissions including, requiring anyone who purchases power from a plant that has capacity of 1MW or greater to source a percentage of the power from renewable energy resources, and invest in solar, wind and hydro projects		Raigarh: Under the provisions of the Energy Conservation Act, 2001 (ECA), Ministry of Power, Government of India has issued Notification S.O. 687(E) dated 30th March 2012 stating the specific energy consumption (SEC) to be achieved by the end of a three-year cycle and, by certain plants, named as designated consumers, in eight different sectors including steel and thermal power plants. Ministry of Power has also issued Notification G.S.R. 269(E) dated 30th March 2012 regarding the rules and procedures in this regard. The issue of this notification marks the initiation under "Perform, Achieve and Trade" (PAT) scheme of the government, being implemented under the National Mission for Enhanced Energy Efficiency (NMEEE), which is one of the missions under the National Action Plan on Climate Change (NAPCC). The PAT scheme is being administered by the Bureau of Energy Efficiency (BEE), under the Ministry of Power. Under PAT (Perform, Achieve & Trade Mechanism) scheme JSPL, Raigarh reduced specific Energy consumption by 6.5% in PAT cycle-I and 7.46% in PAT cycle-II. In PAT-I cycle CO_2 emission reduced from 3.3 ton/TCS to 2.95 ton/TCS. In absolute 5,78,857 tonnes of CO_2 emission reduction were achieved. In PAT-II cycle CO_2 emission reduced from 2.95 ton/TCS to 2.65 ton/TCS. In absolute terms, 8,04,982 tons of CO_2 emission reduction were achieved. Target for Next PAT cycle is still

	awaited from Ministry of Power, GOI Angul: In PAT cycle-4, Angul plant has been given Energy reduction target of 6% to be achieved by 2020-21 against the Base year 2016-17. The target has been achieved & M & V audit is in process. We have reduced CO2 from 3.3 t/TCs to 2.59 as on Fy 20-21. The Other steel companies not having implemented these schemes would be about 3.3 to 3.6 t/TCS or even more t / TCS of CO2 with similar setup and route of production (An estimation based on . Under REP our obligation of approximately 50MW is met by our own cogeneration plants, so we do not purchase power from non-renewable source.
General	
11. Please confirm where Jindal Steel would likely source its coal from if not from WCL. Please specify which countries the coal is likely to come from andspecific mines, if known. 12. Please identify the likely consumers/customers of the coal extracted from the Russell Vale project, other than Jindal Steel. Please specify the countrylocation and specific consumers, if known.	11.Most likely to get its requirements met from South Africa , Australia and Indian Coal mines for Coking and Non coking Coal needs. 12. JSPL is the only customer at this stage.
13. Please provide details on the methodology for calculating carbon emissions reductions for the statements made in documents already provided (in particular WCL *Sustainability and Emission Reduction Strategy* (June 2021), the *Draft Air Quality and Greenhouse Gas Management Plan and the* JindalPower and Steel *Sustainability report* as well as for the emissions calculated in response to this information request. In doing so, please provide any references to publicly available guidelines used in the methodology as well as any evidence that the methodology (and/or calculations) was independently verified/assured.	It's based on publically available document for CO2 reduction as per WSA methodology.

Table 1 – Request for additional information.

Action	Information required	
Wollongong Coal Limited (WCL)		
1. Proposed mitigation measures to reduce carbon emissions	The department notes that certain carbon emissions reduction measures proposed in the WCL*Sustainability and Emission Reduction Strategy* (June 2021) and the *Draft Air Quality and Greenhouse Gas Management Plan* have already been implemented. Please provide a table that sets out all the mitigation measures to reduce carbon emissions.The table should: - clearly identify what measures have already been implemented, and when they wereimplemented; - outline the proposed additional measures and timing for implementation of thoseadditional measures; - for each of the mitigation measures (both implemented and proposed) provide the expected carbon emission reduction for Scope 1 and 2 (t CO_2-e).	Details provided earlier
2. Measure to reduce emissions associated with combustion of diesel	The draft *Air Quality and Greenhouse Gas Management Plan* notes that measures will be implemented to reduce emissions associated with the combustion of diesel (see page 46). Please provide the emissions reduction for Scope 1 and 2 -i.e. predicted emissions once these Measures have been implemented (t CO_2-e). Please also provide the expected timeframe forimplementing the measures.	
3. Scheduled monitoring and real time monitoring.	The draft *Air Quality and Greenhouse Gas Management Plan* notes that the monitoring data willbe used to investigate and implement reasonable measures for minimizing GHG emissions in accordance with the Development Consent (see page 43, second bullet point under the heading"9.5 Greenhouse Gas monitoring and reporting"). Please describe what these measures will include, and what the predicted emissions reduction Would be from implementing these measures (t CO_2-e) and when emission reductions will be achieved.	

4. Change in mining method from long wall to Board & Pillar	You stated in your letter of 5 July 2021 to Ms Vickery that the proposed extraction method willbe utilizing continuous miners which has an extraction of 40 to 50 per cent less than long wall Extraction techniques. Please quantify the amount of coal that will remain in the ground if the	
	bord and pillar technique is utilised, as compared to the longwall technique. Please also provide Scope 1, 2 and 3 emissions estimates (t CO_2-e) for the initially proposed longwall extractiontechnique and for the now proposed bord and pillar extraction technique.	
5. Tree planting at Wonga wile and Russell Vale collieries	The WCL *Sustainability and Emissions Reduction Strategy* (June 2021) notes that you plan to increase the number of eucalypt trees by a further 1000 trees at the Wongawilli and Russell Valecollieries (see page 21). For the two collieries, please provide a map showing the distribution and number of trees at specific locations, along with a statement of the predicted total emissions (t CO_2-e) that will besequestered per annum and in cumulative total reduction and the period over which the Emissions sequestration will be achieved.	
6. Offsetting Scope 1 and 2 emissions by 4% per annum cumulative commencing 2021 with intent of being carbon neutral by 2050.	Please provide: - further explanation of how this commitment is consistent with the Paris Agreement; - details on how the 4% offset was calculated and will be achieved; - The time sequence for implementing the offset to meet net zero by 2050.	
Jindal Steel and Power Limited (WCL parent Company) commitments		
7. Tree planting initiative (https://www.jindalsteelpower.com/sustainability-jspl.html)	Please provide details of the tree planting undertaken by Jindal Steel and Power Limited (**Jindal Steel and Power**)* including the emission reduction to date and forecast reduction (t CO_2-e). i.e.,emissions sequestered from the tree planting for each of the last 3 years (2018, 2019, 2020) and the predicted volume of emissions to be abated for the next 5 years (2021, 2022, 2023, 2024, 2025). Please indicate if this sequestration of C02 have been measured, verified and credited as part ofany international,	At Jindal Steel & Power Ltd. (JSPL) tree plantation, greenbelt development and afforestation activities in and around various plant locations are given top priority. The Company has planted more than 5.0 million trees till date across all its units in India. During the last 3 years the no. of trees planted and estimated amount of CO2 sequestered on account of planting trees are given below:

	national, state or company credit scheme? *note only include the trees planted by the company, not the trees distributed to the community.	**S No.** / **Year** / **No. of trees planted** / **Estimated CO2 sequestered** 1. / 2018-19 / 69575 / 0.00807 million tones 2. / 2019-20 / 64851 / 0.00206 million tones 3. / 2020-21 / 57532 / 0.00038 Million tones **Note-** The above figures of CO2 sequestered are approximate and based on estimation undertaken considering published literature on the subject.
8. Carbon reduction for steel making	The International Energy Agency's *Net Zero 2050* report sets out several measures that companies can do to transition to net zero steel making including: material/energy/resource efficiency, greater steel recycling, renewable electric arc furnace, molten oxide electrolysis, andrenewable hydrogen. The Jindal Steel and Power *Business Sustainability* report states that the company is using energy efficient technology in its Angul and Raigarh steel plants. Please confirm whether any coal from the Russell Vale project is going to either of these steel processing plants. Please also State what are the emissions reductions (t CO_2-e) as a result of using this energy efficienttechnology enhancement when compared to those steel plants without this technology?	Raigarh: Under the provisions of the Energy Conservation Act, 2001 (ECA), Ministry of Power, Government of India has issued Notification S.O. 687(E) dated 30th March 2012 stating the specific energy consumption (SEC) to be achieved by the end of a three-year cycle and, by certain plants, named as designated consumers, in eight different sectors including steel and thermal power plants. Ministry of Power has also issued Notification G.S.R. 269(E) dated 30th March 2012 regarding the rules and procedures in this regard. The issue of this notification marks the initiation under "Perform, Achieve and Trade" (PAT) scheme of the government, being implemented under the National Mission for Enhanced Energy Efficiency (NMEEE), which is one of the missions under the National Action Plan on Climate Change (NAPCC). The PAT scheme is being administered by the Bureau of Energy Efficiency (BEE), under the Ministry of Power. Under PAT (Perform, Achieve & Trade Mechanism) scheme JSPL, Raigarh reduced specific Energy consumption by 6.5% in PAT cycle-I and 7.46% in PAT cycle-II. In PAT-I cycle CO_2 emission reduced from 3.3 ton/TCS to 2.95 ton/TCS. In absolute 5,78,857 tonnes of CO_2 emission reduction were achieved. In PAT-II cycle CO_2 emission reduced from 2.95 ton/TCS to 2.65 ton/TCS. In absolute terms, 8,04,982 tonnes of CO_2 emission reduction were achieved. Target for Next PAT cycle is still awaited from Ministry of Power, GOI Under REP our obligation of approximately 50MW is met by our own cogeneration plants, so we do not purchase power from non-renewable source. Angul: In PAT cycle-4, Angul plant has been given Energy reduction target of 6% to be achieved by 2020-21 against the Base year 2016-17. The target has been achieved & M & V audit is in process.

		We have reduced CO2 from 3.3 t/TCs to 2.59 as on Fy 20-21. The Other steel companies not having implemented these schemes would be about 3.3 to 3.6 t/TCS or even more t / TCS of CO2 with similar setup and route of production. *** Regarding coal from the Russell Vale it is to inform that JSPL Raigarh had used this 3 years back and at present it's not in use at Raigarh. Further CMG group may confirm the present status.
	Please provide or outline any management plans Jindal Steel and Power has to decarbonize in and steel making operations. If no plan is currently available, please provide details of any other initiatives in place, or planned, to reduce emissions: - For those initiatives in place please provide the amount of emissions reduction (CO_2 /annum and total) or sequestration to date and predicted for the next five years(2021 – 2025 inclusive) - For those planned initiatives please provide timing for when the initiative is expected tobe in place and the yearly projected emissions reductions (CO_2 /annum and total).	Following strategies are under consideration to further reduce the CO2 emission. • Installation of CDQ (Coke Dry Quenching) system in recovery type coke oven plant) • Installation of BF Gas Fired Boiler (2 x 20 TPH) to improve utilization of BF Gas. • Installation of Steam driven Exhauster in Coke Oven Plant. • Installation of Low Pressure Compressor for Casters • Modification & installation of new gas (BF+PG) route • Installation of process boiler to avoid power loss in PRDS • Converting EAF to NEOF to reduce • Hear recovery from EAF /NEOF) • We have plans to shelf our CPP Coal Based TPP and take energy from available Solar plants or from the GRID . • We intent to have PPA with solar plants through GRID in the long run. • We also intent to install Solar Power plants and Wind Farms in the coming years to reduce our dependency on Coal for energy needs. • We also intend to take up large scale plantation in association with the local state government Forest departments. • We will explore the possibility of using Hydrogen as a fuel to decarbonize steel; making process as an alternate and promising fuel for future, but the feasibility risk, safety and its applicability in steel industry is yet to be established. • The next 10 years are critical from Climate change point of view and we will go with the directives of GOI INDC in this regard.

9. Sustainability membership	Please provide confirmation of Jindal Steel and Power's memberships of the World Steel Sustainable Development Charter 2015, and as a climate action member to the World SteelAssociate. Please also provide any details of membership of other global/sectoral agreements to achievenet zero steel by 2050.	We are members of WSA and ISA and MOS GOI JSPL is a signatory to the World Steel Sustainable Development Charter 2015, and is also a Climate Action Member with World Steel Association, There policy reflect the purpose and intent of UNGC , WSSDC, GRI guidelines and as per the international Standard such as ISO 14001, OSHAS 18001, and ISO 9001. JSPL also looks forward to implement the ISO 50001standard across all its plants in India, few of them have already implemented as on date.
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13. Please provide details on the methodology for calculating carbon emissions reductions for the statements made in documents already provided (in particular WCL *Sustainability and Emission Reduction Strategy* (June 2021), the *Draft Air Quality and Greenhouse Gas Management Plan and the* JindalPower and Steel *Sustainability report* as well as for the emissions calculated in response to this information request. In doing so, please provide any references to publicly available guidelines used in the methodology as well as any evidence that the methodology (and/or calculations) was independently verified/assured.	It's based on publically available document for CO2 reduction as per WSA methodology.

Wollongong Coal Ltd

Sustainability and Emission Reduction Strategy

CEO Warwick Lidbury

Mine Record

June 2021

SUSTAINABILITY AND EMISSION REDUCTION STRATEGY

1. OVERVIEW

1.1. Acknowledgement

We acknowledge the Dharawal people and local communities of the lands on which Wollongong Coal is located.

We respect and acknowledge the unique cultural and spiritual relationships that Indigenous Peoples and local communities have to the land, waters and seas, and their rich contribution to society.

In the spirit of respect and reconciliation, we will continue to support initiatives that strengthen culture and ways of life to ensure their legacy continues and extends to future generations.

1.2. From the CEO

I am pleased to present our Sustainability and Emission Reduction Strategy. At Wollongong Coal, sustainable development is at the heart of our purpose and forms an integral part of our strategy. We are committed to continually improving our sustainability performance and minimising the future impact of our operations.

Wollongong Coal Overview

Wollongong Coal Limited (ASX Code: WLC) is an Australian mining business which owns and operates Russell Vale Colliery and Wongawilli Colliery in the Southern Coalfields Region of New South Wales.

Jindal Steel and Power Limited (JSPL) has recently acquired a majority controlling stake and management control of Wollongong Coal. JSPL, listed on the Indian Stock Exchange, is an international steel and power company with operating steel capacity of about 7 Mtpa and power generation capacity of about 2500 MW. The majority of Wollongong Coal's production is sold to JSPL.

Originally known as South Bulli, Russell Vale Colliery is one of the oldest operating coal mines in Australia, its origins dating back to 1887. It is located approximately 10 km north of Wollongong and approximately 60 km south of Sydney. The mine is spread over 6,421 hectares and comprises three coal seams, the Bulli, Balgownie and Wongawilli seams.

Wongawilli Colliery is located approximately 15km south-west of Wollongong and 80 km south-west of Sydney with the mine's history dating back to 1916.

Wollongong Coal's mines are ideally situated in close proximity to the Port Kembla Coal Terminal, with Wongawilli Colliery having direct rail access to the port.

Jindal Steel and Power Limited is the major customer of Wollongong Coal.

2. OUR SUSTAINABILITY APPROACH

2.1. Jindal Steel and Power Limited

Jindal Steel and Power Limited (JSPL) is amongst India's fastest growing and largest business conglomerates with a significant presence in core infrastructure sectors including steel, power, mining, and infrastructure. The business operations span across the states of Chhattisgarh, Odisha, and Jharkhand in India, where JSPL operate some of India's most advanced steel manufacturing and power generation capacities of global scale. JSPL's global footprint spans across Asia, Africa, and Australia.

JSPL's business vision is to be a globally admired organisation that enhances the quality of life of all stakeholders through sustainable industrial and business development.

The JSPL business mission is to aspire to achieve business excellence through:

- The spirit of entrepreneurship and innovation;
- Optimum utilisation of resources;
- Sustainable environment friendly procedures and practice;
- The highest ethics and standards;
- Hiring, developing and retaining the best people;
- Maximising returns to stakeholders; and
- Positive impact on the communities JSPL touch.

JSPL operates under the following core values:

- Passion for People;
- Ownership;
- Sustainable Development;
- Sense of Belonging;
- Integrity;
- Business Excellence; and
- Loyalty.

2.2. Wollongong Coal Limited

At Wollongong Coal, we believe that, when done sustainably, the development of natural resources can change people's lives for the better. This is integral to **our mission**;

- Leverage unique locational advantage,
- Efficiently and effectively develop new coal resource areas,
- Cultivate unique partnerships,
- Create a sustainable business,
- Creation of value for our shareholders and stakeholders.

Our vision to deliver high quality and low cost premium coking coal to our customers is underpinned by a simple, yet powerful strategy which is focused on optimising the performance of our operations, unlocking their potential and identifying new opportunities.

While our strategy outlines what we do to achieve our vision; our values guide how we do it. Every day, our values shape the way we behave and the standards we set for ourselves and others.

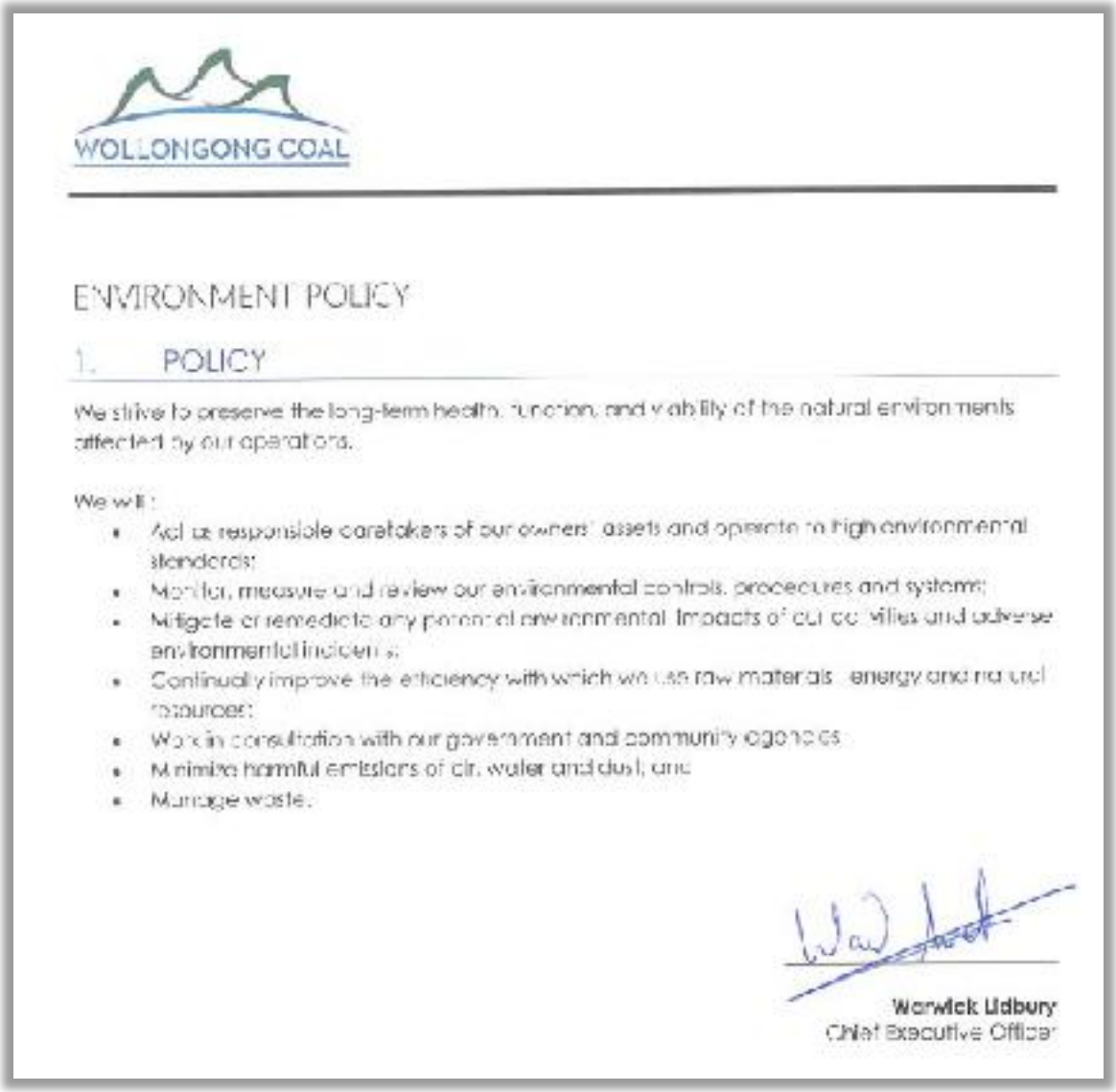
Our Core Values reflect our purpose, our priorities and the beliefs by which we seek to conduct ourselves and carry out our business activities. They define what it means to work at Wollongong Coal.

Wollongong Coal's Core Values

- Integrity – we act honestly and with integrity in all our dealings, both internally and externally. We commit to only dealing with business partners who demonstrate similar ethical and responsible business practices.
- Respect – we respect all people, their ideas and cultures and our words and actions must reflect this respect.

- Safety – we are committed to providing and maintaining a safe and non-discriminatory working environment to safeguard the health and safety of our employees, consultants, contractors, customers, suppliers and other persons who visit our workplace, or who we work with, as required by law.
- Community Standards – we act in a manner consistent with reasonable expectations of our investors and the broader community.
- Environment – we are committed to acting responsibly towards the environment. Sustainability is a fundamental element of delivering on our vision and we expect our joint venture partners, suppliers and contractors to support this.

At Wollongong Coal, we also consider our interactions with our people, the environment, communities and society. Our Environmental Policy affirms our commitment to sustainable development and outlines our commitment to governance and transparency on sustainability matters.



WOLLONGONG COAL

ENVIRONMENT POLICY

1. POLICY

We strive to preserve the long-term health, function, and viability of the natural environments affected by our operations.

We will:

- Act as responsible caretakers of our owners' assets and operate to high environmental standards;
- Monitor, measure and review our environmental controls, procedures and systems;
- Mitigate or remediate any potential environmental impacts of our activities and adverse environmental incidents;
- Continually improve the efficiency with which we use raw materials, energy and natural resources;
- Work in consultation with our government and community agencies;
- Minimise harmful emissions of air, water and dust; and
- Manage waste.

Warwick Udbury
Chief Executive Officer

This strategy is an overview of how our business-wide processes support our sustainability objectives, how we manage our most important sustainability issues and the progress we have made.

2.3. Governance and integrity

We set high standards of corporate governance and integrity which are aligned with our vision and values.

Corporate governance

At Wollongong Coal, good governance is essential to the way we work – not just in what we do, but in how we act, how we communicate and how we evaluate our behaviour.

Our Board continues to acknowledge the unique relationship connecting our company, the communities in which we operate, and the standards and expectations of our company to act lawfully, ethically and responsibly.

The Board (with input from the Audit and Risk Committee) is responsible for the overall internal control framework of the Group.

2.4. Risk management

The Group aims to use risk management systems to support its business activities and safeguard shareholder value.

Risk is defined as "exposure to the uncertainty of an event or action, which may affect the Group's ability to achieve its business objectives".

The consequences of risk may be positive or negative and risk management includes identifying and taking advantage of opportunities as well as minimising adverse impacts.

The policy of the Group is to:

- Use a proven risk management approach, ensure appropriate focus is given to the identification, evaluation, treatment, monitoring, pricing and reporting of all significant risks to the Company's board of directors (Board) or its Audit and Risk Committee;
- Ensure that managing risk is an integral part of business planning and management processes;
- Inform, skill and motivate the Group's personnel to enable them to implement effective risk management practices; and
- Maintain a cost/benefit focus when developing risk treatment strategies, such as insurance.

Audit and Risk Committee

The Audit and Risk Committee is established by the board of directors of the Company (Board) to review, evaluate and make recommendations to the Board in relation to the Group's accounting, auditing, financial reporting and risk management practices.

- The risk management strategy is designed to ensure the following solutions are in place:
- A management capability that allows efficient and effective identification, measurement and assessment of collective risks (financial / non-financial) that impact shareholder value and the quality and value added;
- A substantive link between risk analysis and strategic decision making;
- Effective management of enterprise level risks in totality via a combination of:
    - implementing operational risk management strategies, policies and assurance; and
    - purchasing insurance where appropriate; and
- An effective early warning ("red flag") reporting system.

2.5. Stakeholders and collaboration

Our stakeholders are integral to the success of Wollongong Coal. We work to build positive relationships with our stakeholders in a meaningful and respectful way. We regularly engage our stakeholders and receive information that helps us to manage risk and continuously improve. It also helps us to increase engagement among our people, communicate our positions on relevant issues, maintain our licence to operate and create enduring social, environmental and economic value. Our stakeholder groups include:

- Business partners;
- Community-based organisations;
- Customers;
- Governments and regulators;
- Industry peers and associations;
- Investment community;
- Labour unions;
- Local and Indigenous communities;
- Media;
- Non-government organisations;
- Our employees and contractors;
- Civil society partners; and
- Suppliers.

3. WORKING WITH INTEGRITY

3.1. Integrity

Our Ethics and Responsible Business Conduct Policy sets the standards for our people to act ethically, responsibly and lawfully. It applies to our people, directors, executive management, employees and contractor staff.

The Company and its subsidiaries (together, Group) are committed to and strives to act honestly and with integrity in all its dealings. This code of conduct sets out the values, commitments, ethical standards and policies of the Group and outlines the standards of conduct expected of our business and people, taking into account the Group's legal and other obligations and responsibilities.

Anti-bribery and Corruption

A number of countries, including Australia, have strict laws against bribery and corruption. The anti-bribery laws of some countries including Australia, the United States and United Kingdom can apply to things done in other countries (i.e., they have wide-reaching extra-territorial effect).

Our people must comply with and uphold all laws against bribery, corruption and related conduct applying to the Group in all the jurisdictions where the Group operates. Accordingly, the Group has a strict policy not to offer secret commissions or bribes to further its business interests. Depending on the circumstances, facilitation payments may breach anti-bribery laws.

Transparency

We are committed to open and transparent dealings with all our stakeholders. We publish information on our operational, financial and sustainability performance in a timely manner through several communication channels, including media releases, stock exchange announcements, social media, newsletters and community and investor meetings. We respond to stakeholder enquiries and requests for information, where appropriate.

3.2. Economic contribution

We contribute to the sustainable development of the countries and communities where we operate. Economic benefits generated by our activities include payment of taxes and royalties to local and national governments, paying dividends to shareholders and wages to employees, developing our people and our local suppliers, investment in infrastructure, payments to suppliers and investment in community programs.

The NSW Minerals Council's latest annual member Expenditure Survey has found that in the last financial year the 28 participating NSW mining companies directly injected $847 million into the Illawarra economy, supporting over 1,800 Illawarra mining jobs and 510 local mining supplier businesses. These survey results show that despite the COVID-19 pandemic, mining's contribution to the Illawarra economy last year remained strong.

While direct mining jobs in the Illawarra fell slightly due to the impact of COVID-19, direct mining spending increased and there was also an increase in the number of Illawarra businesses in the local mining supply chain. While the 1,800 Illawarra mining jobs supported by the NSW Minerals Council's member companies was around 300 lower than the previous year, the $847 million in direct spending in the Illawarra in the last financial year represented an increase of around $20 million compared to the previous year. In addition, the 510 Illawarra mining supplier businesses supported in the 2019-20 financial year represented an increase of 42 businesses compared to the previous year.

This $847m in direct mining spending in the Illawarra is estimated to have contributed 9.6 percent of the Gross Regional Product of the Illawarra region economy in 2019-20. This is a significant contribution by any measure, down only slightly from the 9.8% mining contribution in previous year. NSW Minerals Council's member companies spent nearly $850 million in the Illawarra last year, including during the pandemic, supporting 1800 local mining jobs and more than 500 local Illawarra businesses. This provided an important economic boost for the Illawarra region during tough times while maintaining the safety of miners, their families and local communities.

3.3. Responsible value chain

Our approach to responsible sourcing across our supply chain is focused on working with our suppliers to minimise health, safety, environmental, human rights and other social risks.

We work with our customers and suppliers to achieve responsible sourcing and product stewardship across our value chain. We build strong partnerships with our suppliers and customers that are mutually beneficial and aim to work with businesses whose values and standards align with ours.

In FY21, Wollongong Coal signed a contract with Linfox, Asia Pacific's largest privately-owned logistics company to transport our coal from Russell Vale Colliery to Port Kembla Coal Terminal. One of the reasons for choosing Linfox to haul our coal was the commitment Linfox has to sustainability. Their company is moving away from diesel powered trucks to electric trucks in line with their implementation of a range of initiatives to reduce their carbon footprint through the use of 'greener vehicles'. Fuel efficient fleet purchases using Euro VI technology is now standard for new purchases and electric fleet vehicles are beginning to be trialled. The values and drive to act sustainably aligns with the strategy of Wollongong Coal.

Source: Linfox Leading the Wat 2025 Presentation

3.4. Respecting human rights

We promote and respect the human rights of our employees, communities, customers, suppliers and contractors. This is critical to the integrity and success of our business and our long-term business partners.

4. OUR PEOPLE

4.1. Our people

Our people are the foundation of our success. A key part of our strategy to unlock the full value of our business includes engaging and connecting our people to our purpose.

We know that engaged people strengthen our performance and contribute to the long-term success of our business. By promoting honest and transparent dialogue, we continuously learn and develop

4.2. Staying safe and well

We prioritise the safety and health of our employees and contractors and recognise that the success of our business is dependent on a safe and healthy workforce; this is our top priority. We take a preventative approach towards health and safety to establish a proactive safety culture.

Wollongong Coal is committed to implementing a structured approach to workplace health and safety in order to achieve a consistently high standard of health and safety performance.

HEALTH AND SAFETY RISK MANAGEMENT

Our health and safety risks are managed through our system of risk management, with a focus on common fatality risks.

Most fatality and significant event risks are common across our industry. Our mining specific legislation stipulates the contents of our Safety Management System and includes Principal Hazard Management Plans and Principal Control Plans for;

- Dust Explosions
- Ground or Strata Failure
- Inundation or Inrush of any Substance
- Roads or Other Vehicle Operating Areas
- Air Quality or Dust or Other Contaminants
- Spontaneous Combustion
- Outburst
- Fire or Explosion
- Mine Shafts and Winders
- Subsidence PHMP
- Mechanical Engineering Control Plan
- Electrical Engineering Control Plan
- Health Control Plan
- Ventilation Control Plan
- Explosives Control Plan
- Emergency Response Control Plan

Health-related fatalities in the mining industry include long latency disease. We have a set of minimum controls for the prevention of four common health-related fatality risks. These are:

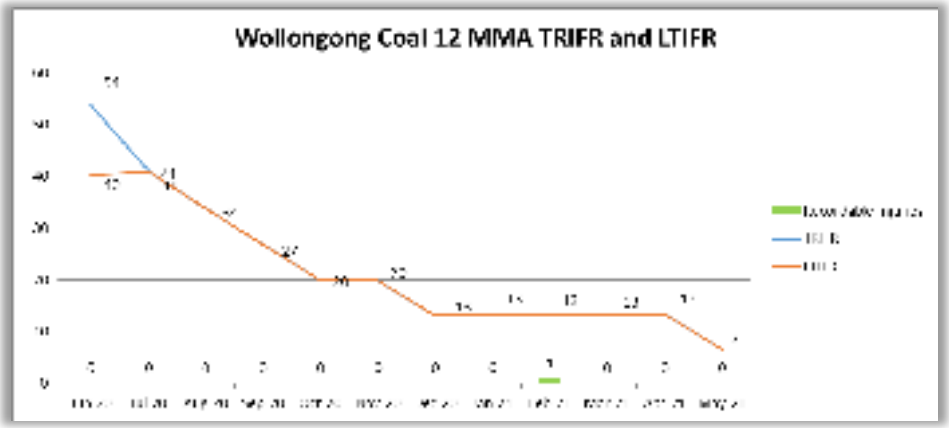
- Airborne contaminants
- Hazardous substances
- Communicable and infectious diseases; and
- Fitness for work

HEALTH AND SAFETY PERFORMANCE

The health and safety of our workforce is our priority. We also seek to influence and improve health and safety performance in environments associated with our operations that we do not control.

Continuous improvement in our health and safety performance is critical to our goal that everyone goes home safe and well.

In FY21, we reduced our Total Recordable Injury Frequency (TRIF) from 54 to 7.



In FY22, we will progressively built leading indicators into our metrics to drive improved health and safety performance. In FY21, we focussed on our Stop, Look, Assess and Manage (SLAM) process. This enables us to identify and eliminate hazards that have the potential for significant injury or fatality before an event can occur.

Supporting our people – tools for mental health and wellbeing

The COVID-19 pandemic has presented a unique global challenge with the potential to impact both the mental and physical wellbeing of our people. To proactively manage this, we've taken steps to enhance and expand our approach and support our people when they've needed it most. In FY20 and FY21, some of our employees participated in the Push-up challenge Push for better to help put the spotlight on the 3,318 Australians who died by suicide in 2019.

Our employees are making a difference to mental health and suicide prevention. We are fundraising for the Push for Better Foundation, Headspace and Lifeline to support critical mental health services across Australia.

Employee Assistance Program

All our employees and their families have access to our Employee Assistance Program (EAP), a confidential counselling and support service. It can help with a broad range of concerns, including dealing with self-isolation and disruption, being disconnected from loved ones, financial and legal questions, relationships, children's needs, balancing work and home, remote work, and dealing with change, stress and uncertainty.

Our Response To The Covid-19 Pandemic

We began monitoring the situation in January 2020 and implemented measures at that time to protect our people and to play our part in managing the spread of the virus. In February, we introcduced a COVID-19 Pandemic Management Plan which aims to minimise the risk of the spread of COVID-19 at Wollongong Coal by employing a range of strategies.

Over the coming weeks and months, we closely followed the advice of the World Health Organization, Governments and NSW Health. We took decisive action as the virus spread around the world, implementing business continuity plans, revising travel guidance and providing information for our employees.

In March 2020, we saw significant government action to control the spread of the virus. At Wollongong Coal, we developed and implemented appropriate critical controls designed to minimise the risk of potential exposure to COVID-19 and protect our employees and contractors. This included;

- Reducing and, in many cases, ceasing travel;
- Isolating and supporting people confirmed to have COVID-19 or had been exposed;
- Introducing screening and surveillance to identify at-risk personnel and potential cases;
- Modifying the workplace and work structures to maintain physical distancing;
- Providing facilities for improved personal hygiene;
- Increasing cleaning regimes and sanitisation of high use areas and equipment; and
- Issuing a new COVID-19 infectious disease management procedure for use during an outbreak.
- Providing information on the risks and controls as the pandemic progressed.

At the end of FY21, we were still seeing the emergence of hotspots which are a reminder that COVID-19 will continue to impact us and we cannot afford to be complacent. Our priority is always to keep our people safe and well. We will continue to assess the measures we have in place and address any opportunities for improvement while closely following the advice of governments.

5. EMISSIONS REDUCTION

5.1. Our Approach

At Wollongong Coal, we recognise we have a role to play in enabling the transition to a low carbon economy. We seek to lower the carbon footprint of our own operations.

As a direct and indirect emitter of greenhouse gases through our operations and value chain, we are committed to achieving the objectives of the Australian Government. Under internaltional climate agreements, Australia's current target is to reduce greenhouse gas emissions by 26 – 28% below 2005 levels by 2030 (under the Paris Agreement).

Our approach to climate change is guided by international standards, including regulatory schemes such as the National Greenhouse and Energy Reporting (NGER) Scheme.

Our approach is underpinned by our positions on key climate change matters. We support:

- The Paris Agreement objectives to limit global temperature rise to below 2°C this century, and to pursue efforts to limit the increase to 1.5°C.
- Collaboration across the value chain to strengthen product stewardship, encourage innovation and decrease emissions.

6. ENVIRONMENTAL STEWARDSHIP

6.1. Environmental Stewardship

At Wollongong Coal, being responsible stewards of the environment is integral to the way we work. Successful environmental management is essential to our business and our relationships with local communities and other stakeholders.

We work to protect natural resources including water, air, land and biodiversity so they are preserved for future generations.

We operate in a wide variety of environments which support a diversity of ecosystems. Without responsible stewardship, activities at our operations have the potential to impact these ecosystems through impacting on habitat and biodiversity, and contamination or degradation of land and water resources.

Working with our local communities helps us understand our environmental impact, address community concerns and improve our practices. Our community engagement and complaints and grievances processes enable us to record and respond to complaints about environmental issues such as dust, noise and water management in a timely manner.

Our environmental considerations span the full life cycle of our business. An essential part of our work is securing environmental approvals for our exploration and development projects, as well as life extensions of our existing operations.

Russell Vale Colliery operates under a regulatory framework which includes strict performance criteria and comprehensive monitoring and reporting requirements.

6.2. Land and Biodiversity

We seek to protect ecosystems and avoid and minimise biodiversity impacts and land disturbance. We recognise the importance of biodiversity conservation, the need for properly designated and managed systems of protected areas, and integrated land use planning.

Our Biodiversity Plan has measures that are implemented to:

- minimise impacts to biodiversity on the site, including any species and communities listed under the BC Act and EPBC Act;
- protect vegetation and fauna habitat outside of the approved disturbance areas;
- control weeds, including measures to avoid and mitigate the spread of noxious weeds;
- control feral pests;
- control erosion;
- control access to vegetated or revegetated areas; and
- manage bushfire hazards;

We have a program to monitor and report on the effectiveness of the above measures and identify measures that could be implemented to improve biodiversity outcomes.

Where a material biodiversity-related risk has been identified, we conduct impact assessments, and develop and implement controls. We align our controls with regulatory requirements and the mitigation hierarchy of avoidance, minimisation, and restoration through to offsetting where necessary.

6.3. Air Quality

The nature of our mining and processing activities can result in air emissions. We aim to prevent and minimise any effect on neighbouring communities and the environment.

Russell Vale Colliery has strict Air Quality Operating Conditions. We will;

- minimise odour, fume and particulate matter (including PM10 and PM2.5) emissions of the development, paying particular attention to minimising wheel-generated haul road emissions;
- eliminate or minimise the risk of spontaneous combustion;
- improve energy efficiency and reduce Scope 1 and Scope 2 greenhouse gas emissions of the development;
- minimise any visible off-site air pollution generated by the development; and
- minimise the extent of potential dust generating surfaces exposed on the site at any given point in time;
- ensure that major mobile diesel mining equipment used in undertaking the development includes reasonable and feasible diesel emissions reduction technology;
- operate a comprehensive air quality management system that uses a combination of meteorological forecasts, predictive air quality modelling and real-time monitoring to guide the day to day planning of mining operations and the implementation of both proactive and reactive air quality mitigation measures to ensure compliance with the relevant conditions of this consent;
- minimise air quality impacts of the development during adverse meteorological conditions and extraordinary events;
- carry out regular air quality monitoring to determine whether the development is complying with the relevant conditions of this consent; and
- regularly assess meteorological and air quality monitoring data, and modify operations on the site to ensure compliance with the relevant conditions of this consent.

To assist Russell Vale Colliery meets the requirements of the Air Quality Operating Conditions, our Air Quality and Greenhouse Gas Management Plan includes;

- compliance with the air quality criteria and operating conditions;
- greenhouse gas emissions generated by the development do not exceed the criteria;
- best practice management is being employed (including in respect of minimisation of greenhouse gas emissions from the site and energy efficiency) to:
    - minimise the development's air quality impacts;
    - minimise the development's Scope 1 and 2 greenhouse gas emissions;
    - improve the development's energy efficiency; and
- the air quality impacts of the development are minimised during adverse meteorological conditions and extraordinary events;
- describe the air quality management system in detail; and
- include an air quality monitoring program undertaken in accordance with the Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales (DEC, 2007), that:
    - uses monitors to evaluate the performance of the development against the air quality criteria in this consent and to guide day to day planning of operations;

- adequately supports the air quality management system; and
- includes a protocol for identifying an air quality incident and notifying the Department and relevant stakeholders of these events

6.4. Water

Water is a valuable shared resource that requires integrated management to ensure it is available and suitable for use by everyone. It is a critical input for our business for mining, dust suppression, drinking and sanitation purposes. Given this reliance on water, it is essential we have security of supply, while avoiding impacting the quality and availability of water for communities and the environment within the catchments where we operate.

Our Water Management Plan covers Site Water Balance that includes details of:

- predicted annual inflows to and outflows from the site;
- sources and security of water supply for the life of the development (including authorised entitlements, licences and harvestable rights);
- water storage capacity;
- water use and management on the site, including any water transfers or sharing with other industries;
- licensed discharge points and limits

Our Water Management Plan also covers Salt Balance that includes details of:

- sources of saline material on the site;
- saline material and saline water management on the site;
- measures to minimise discharge of saline water from the site; and

Our Erosion and Sediment Control Plan is consistent with the requirements of Managing Urban Stormwater: Soils and Construction - Volume 1: Blue Book (Landcom, 2004) and Volume 2E: Mines and Quarries (DECC, 2008). The Plan;

- identifies activities that could cause soil erosion, generate sediment or affect flooding;
- includes a program to review the adequacy of flood protection works, and ensure they comply with the relevant performance measures.
- describes measures to minimise soil erosion and the potential for the transport of sediment to downstream waters, and manage flood risk;
- describes the location, function, and capacity of erosion and sediment control structures and flood management structures; and
- describes what measures would be implemented to maintain (and if necessary decommission) the structures over time

Russell Vale Colliery's Surface Water Management Plan is consistent with the Guidelines for Controlled Activities on Waterfront Land (NRAR, 2018) and;

- includes detailed baseline data on surface water flows and quality of watercourses and/or water bodies potentially impacted by the development, including:
- stream and riparian vegetation health;
- channel stability (geomorphology); and
- water supply for other surface water users;
- includes a detailed description of the surface water management system;

- includes detailed plans, design objectives and performance criteria for water management infrastructure, including;
    - any approved creek diversions or restoration works associated with the development, including details of the Bellambi Creek Diversion Works that were required under the Russell Vale Preliminary Works Project (MP10_0046);
    - water run-off diversions and catch drains;
    - water storages and sediment dams; and
    - reinstated drainage networks on rehabilitated areas of the site;
- includes detailed performance criteria, including trigger levels for identifying and investigating any potentially adverse impacts (or trends) associated with the development, for:
    - downstream surface water flows and quality;
    - channel stability;
    - downstream flooding impacts;
    - stream and riparian vegetation heath;
    - water supply for other water users; and
    - post-mining water pollution from rehabilitated areas of the site;
    - includes a program to monitor and evaluate:
    - compliance with the relevant performance measures listed in Table 4 and the performance criteria in this plan;
    - controlled and uncontrolled discharges and seepage/leachate from the site;
    - surface water inflows, outflows and storage volumes, to inform the Site Water Balance; and
    - the effectiveness of the surface water management system and the measures in the Erosion and Sediment Control Plan

Our Groundwater Management Plan that includes;

- detailed baseline data of groundwater levels, yield and quality for groundwater resources potentially impacted by the development;
- a detailed description of the groundwater management system;
- groundwater performance criteria, including trigger levels for identifying and investigating any potentially adverse groundwater impacts associated with the development, on:
    - regional and local aquifers (alluvial and hardrock); and
    - groundwater supply for other water users such as licensed privately-owned groundwater bores;
- a program to monitor and evaluate:
    - compliance with the relevant performance measures and the performance criteria in this plan;
    - water loss/seepage from water storages into the groundwater system;
    - groundwater inflows, outflows and storage volumes, to inform the Site Water Balance;
    - the hydrogeological setting of any nearby alluvial aquifers and the likelihood of any indirect impacts from the development;
    - the effectiveness of the groundwater management system;
- reporting procedures for the results of the monitoring program, including notifying other water users of any elevated results;

- a trigger action response plan to respond to any exceedances of the groundwater performance criteria, and repair, mitigate and/or offset any adverse groundwater impacts of the development; and
- a program to periodically validate the groundwater model for the development, including an independent review of the model 3 years after the date of commencement, and a comparison of monitoring results with modelled predictions

Russell Vale Colliery's Adit Discharge Water Management Plan identifies the location of all mine related adits and other potential groundwater leakage points associated with the development and historical mining at the Russell Vale Colliery and includes;

- predictions of the volumes and discharge water quality from each point;
- timelines for discharges;
- avoidance, mitigation and monitoring measures to reduce adverse impact of discharge waters;
- treatment, discharge and beneficial reuse options during operations and post-mining, including associate environmental impacts and costs;
- details of any consultation with other mines in the region and relevant agencies to ensure outcomes are based on strategic regional considerations;
- any necessary funding arrangements during operations and post-mining which consider short and long term discharges and appropriate water quality targets based on an agreed potential discharge water end use

6.5. Noise

Wollongong Coal operates in close proximity to communities who may be affected by noise generated by our operations. We will;

- take all reasonable steps to minimise the construction, operational and road noise of the development, including low frequency noise and other audible characteristics;
- implement reasonable and feasible noise attenuation measures on all plant and equipment that will operate in noise sensitive areas, and monitors and reports on these measures;
- monitor and record all major equipment use and make this data readily available at the request of the Department or the EPA;
- minimise the noise impacts of the development during all meteorological conditions in order to satisfy the noise criteria
- operate a comprehensive noise management system that uses a combination of meteorological forecasts, predictive noise modelling and real-time monitoring to guide the day to day planning of mining operations and the implementation of adaptive management both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this consent;
- carry out attended noise monitoring (quarterly or as otherwise agreed with the Secretary) to determine whether the development is complying with the relevant conditions of consent; and
- regularly assess noise monitoring data and modify and/or stop operations on site to ensure compliance

Photo showing recently constructed noise wall at Russell Vale Colliery

6.6. Other environmental stewardship responsibilities

Energy Productivity

Energy productivity combines traditional energy efficiency measures such as more efficient appliances, with new technology and services such as smart appliances and solar power.

In line with the Federal Government 2030 emissions reduction target, the National Energy Productivity Plan (NEPP), which aims to enhance energy productivity by 40% between 2015 and 2030, Wollongong Coal has taken a number of initiatives to reduce the carbon footprint of our operations by implementing alternative sources of clean power such as solar power.

At the companies No.4 Shaft, the main ventilation fans have been decommsioned and solar power has been installed for the future power requirements of the site. This has resulted in a saving of 6,023 KWh and a CO_2 reduction of 6 tonnes.

Wollongong Coal purchases ultra low sulphur fuel for use in our mining equipment and combined with our emission based maintenance program and diesel particulate filters result cleaner air and lower GHG emissions.

Solar Panels at No.4 Shaft

TESLA Batteries Installation

Waste Management

The 2018 National Waste Policy provides framework for collective action by businesses, governments, communities and individuals until 2030. The Policy provides a framework for businesses to embrace innovation and develop technologies that create new opportunities.

Waste occurs at all stages of materials management and product development, from extraction, transformation and use, to reprocessing and disposal. Waste is also linked to the capabilities of technologies, processes and infrastructure as well as procurement and lifestyle choices.

The choices we make in what we buy, how we use products and how we dispose of them is central to improving the way we manage waste in Australia.

Following the waste hierarchy we can all choose to:

- Avoid purchasing products with excessive or unnecessary packaging
- Repair or reuse items rather than throwing them away
- Purchase products we can use multiple times and that are long-lived, rather than singleuse or poor quality items that are thrown away quickly

- Improve our recycling habits by sorting our waste appropriately into recycling and compost bins
- Use products that are recyclable and include recycled content.

Some of the specific benefits effective waste management practices delivers include:

- Reduced waste in landfill through improved processes for waste minimisation, segregation and collection
- Reduced levels of carbon emissions generated through waste
- Reduced costs for waste management through good practices and increased demand for sustainable services.

At Wollongong Coal, we collect our waste in various waste streams;

- Metals
- Wood
- Paper
- Oils
- Tyres
- Special wastes (diesel particulate filters)

7. OUR FUTURE DIRECTION

Our approach to environmental initiatives is focused on key areas:

- managing air pollution,
- managing water pollution,
- effective waste management,
- biodiversity & eco conversation and
- energy and GHG management.

In FY22, there are a number of initiatives planned for Wollongong Coal.

Energy and Greenhouse Gas Management

It is proposed to install solar panels on the main bath house at the Russell Vale operation to provide electrical energy for the mine site, replace existing incandescant lighting with LED lighting and move to a place change mining method rather than longwall mining will result in significant energy savings and reductions in GHG emissions. Refer to Table 1 showing energy savings and CO_2 reductions for existing and propsed projects.

Other strategies being considered for the future are;

- The use of low emissions technologies such as energy storage, the use of low carbon materials
- Purchasing of energy efficient products such as laptop computers, fridges, microwaves etc
- The possible purchasing of green power energy from government accredited renewable sources (such as solar, wind, hydro and biomass). GreenPower is Australia's government managed accreditation program helping the nation transition to renewable energy above and beyond legislated targets. GreenPower accredited renewable energy is electricity which produces no net greenhouse gas emissions.

- Annual energy audits including the identification of further energy saving opportunities
- The use of new geration diesel engines. Emission standards such as the US EPA Tier 4 Final, EU Stage V, Bharat IV in India, Stage IV in China, MLIT Step IV in Japan, Stage IV in South Korea and a variety of other local and regional mandates are all examples of the global trend toward cleaner diesel engines. Here in Australia, the mining industry is among the first to place this new generation of engines in service widely. Although not yet required by law, many gensets, light towers, crusher/screeners, water pumps, vehicles and other specialised pieces of equipment are already powered by Perkins diesels, meeting the latest emission standards. More efficient combustion captures more of the energy in the fuel, which not only reduces emissions, but also improves fuel economy to reduce operating costs.
- New hybrid or electric company vehicles will be considered
- Investigate the use of battery powered equipment
- Increased use of VVVF drives for conveyor equipment for energy efficiency
- The use low heavy metal products for water treatment
- Rain Water Harvesting
- Wollongong Coal will investigate the further use of recycled water. This will invlove increasing the treatment and reuse of domestic and industrial wastewater generated on site.

Proposed solar lighting Russell Vale Co

Proposed solar panels on Russell Vale Colliery Bath House

Description	Per Annum			
	Energy Saving kWH	CO2 Reduction (T)	SO2 (kg)	Trees returned to the planet
Change from 2MTpa using LW to 1Mtpa using Continuous Miners	5,000,000	5376	714.3	28,571
Remove #5 Shaft Ventilation Fans	4,117,200	4427	588.2	23,527
Install Solar Panels on Workshop	505,141	543	72.2	2,887
Replace Surface Lighting to LED	413,187	444	59.0	2,361
Install Solar Panels on Main Bathhouse	38,857	42	5.6	222
Install Solar Panels at #4 Shaft	6,023	6	0.9	34
TOTAL	**10,080,408**	**10,839**	**1,440**	**57,602**

Table 1 showing energy savings and CO_2 reductions for existing and propsed projects

Symbio Wildlife Park Koala Feeding Project

Wollongong Coal has established a dedicated plantation of approximately 250 eucalypt trees to support Symbio Wildlife Park Koala breeding program.

In the wild, Koalas can be found along mainland Australia's Eastern and Southern regions, inhabiting Queensland, New South Wales, Victoria and South Australia.

Mainly due to habitat loss, the Koalas population has seen rapid decline over the years and there is believed to be less than 80,000 Koalas left in the wild today.

It is planned to increase the number of eucalypt trees by a further 1000 trees at Wongawilli and Russell Vale Collieries.

Wollongong Coal is proud to partner with Symbio Wildlife Park and support the Koala breeding program.

8. WORKING WITH COMMUNITIES

8.1. Working with Communities

Wollongong Coal is committed to constructively engaging with the local community. Our community engagement activities, including community consultation and information sessions, are designed to provide information on our current and planned projects and operations.

Wollongong Coal is an important part of the community in which it operates and takes pride in the partnerships it develops and benefits it delivers. Wollongong Coal strives to create opportunities for ongoing growth and development. Whether through contributions to charities, sponsorship of local groups and organisations or employment opportunities, the company is committed to continued improvement in the community. Company growth will further expand Wollongong Coal's ability to invest in the social and economic well-being of the Illawarra.

Wollongong Coal commits to:

- Treating all community members who engage with us courteously, respectfully and in a professional manner;
- Explaining things clearly and simply and not using jargon, so as to avoid confusion or misunderstanding;
- Endeavouring to ensure that all information provided is accurate and up to date; and
- Encouraging feedback from the community, provided it does not:
    - harass, insult or appear abusive towards others;
    - make defamatory, libelous, false or misleading comments; or
    - appear repetitious, such as continuing to raise multiple versions of the same issue when genuine attempts have been made to respond to the matter.

Warwick Lidbury
Wollongong Coal CEO

Date

WOLLONGONG COAL

Wollongong Coal Ltd

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05-07-2021

Attention: Ms Louise Vickery
Assistant Secretary
Environmental Assessments (NSW, Act) Branch
Department of Agriculture, Water and the Environment

Dear Ms Vickery

EPBC Ref 2020/8702 – Russell Vale Underground Expansion Project
Extension of decision of Approval Time.

We refer to your letter and associated decision of 9 June 2021 to extend the decision of approval time for the Russell Vale Underground Expansion Project. To ensure you have adequate information to approve the project we provide the following information.

We note that while we understand the reasons for the decision, we do consider that this project can be distinguished from the mine that is the subject of the Sharma and Ors v the Minister for the Environment decision.

Some of these reasons include:

1. The mine intends to conduct operations in a method of extraction utilising continuous miners opposed to that of a longwall. Panel percent extraction when utilising this method generally is in the order of 40 to 50 per cent less than when compared to a standard longwall extraction operation.

   Conservatively total greenhouse gas liberated due to implementing continuous miner extraction is reduced by the same magnitude to that of longwall extraction when considering the total life cycle of the operation. The reduction is most

likely greater than this due to no perceptible caving outside of the targeted seam when implementing continuous miner extraction.

2. The mine intends to extract coal in an area where the in-situ gas contents are significantly lower than those of neighbouring mines, conservatively this total gas content is typically in the order of 10 to 15 metres cube per tonne lower per targeted tonne of coal extracted.

   This is a significant reduction of total greenhouse gas liberated throughout the total life cycle of the mining operation. Notwithstanding this the mine still intends to minimise emissions through the implementation of a robust greenhouse gas reduction strategy.

3. When comparing the proposed extraction to a tier 1 mining company operating in Queensland. Scope 1 and scope 2 emissions can be compared respectively:
   a) Scope 1 Tier 1 mining company in Queensland 3.9 billion tonnes CO_2-e.
   b) Scope 1 WCL 0.000283 billion CO_2-e.
   c) Scope 2 Tier 1 mining company in Queensland 1.09 billion CO_2-e.
   d) Scope 2 WCL 0.00002 billion CO_2-e.

   Source: Tier 1 mining company in Queensland sustainability report.

4. WCL has, and will continue to, evaluate options for reducing emissions through the implementation of measures including:
   a. The use of green electricity to service the mine's activities;
   b. Continuing to progress the installation of solar power networks to harness sustainable use of solar energy;
   c. The adoption of tree plantations to assist with carbon sequestration ;
   d. Use of electric trucks, when permitted, for coal transportation to reduce scope 3 emissions; and

   e. Engaging a professional services firm with a global reach and deep expertise in greenhouse gas reduction strategy to assist WCL to further develop a greenhouse gas reduction strategy for the company.

5. WCL's majority owner (JSPL), who is also the proposed end-user of our product, has a robust sustainability program, the details of which can be found in the reports submitted to DAWE. In these it is noted that its Corporate Social Responsibility (CSR) project has won many awards, and is ongoing as it continues to work towards the advancement of the society and under privileged sections of the population. JSPL has and continues to support WCL in its commitments to continue to develop and implement its greenhouse gas reduction strategy.

Despite this, and in the interests of having this approval determined we would also be willing to accept a condition on any approval in the following terms:

> *The proponent will comply with any industry wide policy on climate change emissions implemented within the next 12 months to the satisfaction of the Secretary.*

Such a condition should give sufficient confidence to determine the application now, with the knowledge that if there is an industry wide policy implemented due to the Sharma and Ors v the Minister for the Environment decision that it can be applied to the Russell Vale Underground Expansion Project.

We would be happy to meet with you to discuss or provide any further information.

Sincerely,

MILIND.K.OZA
Executive Chairman
Wollongong Coal Ltd

Supplementary information – Russell Vale Colliery Revised Underground Expansion Project (2020/8702)

Question	**Advice**
Would CO_2 emissions associated with the project, which occur in Australia, be covered by the Australian Government's emissions reduction commitments under the Paris Agreement?	Yes. CO_2 emissions associated with the Project that occur within Australia's jurisdiction over the period 2021-30 would be covered by the Australian Government's Paris Agreement Nationally Determined Contribution (NDC) for that period (2030 Paris target). The Government has committed to an economy-wide 2030 Paris target to reduce emissions to 26 to 28 per cent below 2005 levels by 2030, expressed as an emissions budget over the period 2021-30. Emissions from the project occurring beyond that period (within Australia's jurisdiction) will be covered by future NDCs made by the Government consistent with Article 4.3 of the Paris Agreement.
Would the project's CO_2 emissions affect the Australian Government's ability to meet its emissions reduction commitments under the Paris Agreement?	Emissions from the Project were not included in Australia's Emissions Projections 2020. The inclusion of the Project would increase Australia's projected emissions by less than 0.1 per cent and would not change the conclusion from the report that Australia is on track to meet and beat its 2030 Paris target.
Would CO_2 emissions associated with the project's exported coal, which occur in the proposed export markets, be covered by commitments under the Paris Agreement to reduce or limit emissions (NDCs)? Describe any emission reduction/limitation commitments/goals/policies (eg net zero goal)	Information provided by DAWE states that India is the Project's confirmed export destination. India's NDC commits to: • reducing the emissions intensity of its GDP by 33 to 35 percent by 2030 from 2005 levels; • achieving about 40 percent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030 with the help of transfer of technology and low cost international finance including from Green Climate Fund;

made by importing country governments that are additional to their NDC.	• creating an additional carbon sink of 2.5 to 3 billion tonnes of CO_2 equivalent through additional forest and tree cover by 2030. In addition, India first announced a target of 450 GW of renewable energy capacity by 2030 at the 2019 Climate Action Summit, and reiterated the target at the US-hosted Leaders Summit on Climate in April 2021.
Has the project proponent committed to any voluntary action to mitigate emissions associated with the project?	Based on the information provided by DAWE it is noted that: • The project proponent (Wollongong Coal Ltd, WCL) communicated to DAWE in a letter dated 10 July 2021 its commitment to achieve carbon neutrality by 2050. In pursuit of that commitment, the proponent states that it will reduce, abate or offset its emissions by 4 per cent each year, commencing 1 August 2021. • The proponent has made commitments with regard to scope 1 emissions from the project, set out in the *Russell Vale Colliery Air Quality and Greenhouse Gas Management Plan,* section 10.2. The commitments involve measurement and reporting of methane, and engagement with CSIRO on abatement technologies currently under development. ○ Given their nature, these commitments will not directly achieve reductions in emissions from the project's identified primary source of scope 1 emissions - fugitive emissions from the release of gas stored in the materials mined. Methane is usually the predominant greenhouse gas in such fugitive emissions, with a smaller proportion of carbon dioxide. ○ The proponent explains the absence of emission reduction measures for this primary scope 1 source: "On the basis of the low methane content of the underground mine gas released from the Russell Vale Colliery, it is considered that there are currently no established measures that are feasible for adoption to reduce fugitive GHG emissions from the underground mine ventilation emissions." (source: *Russell Vale Colliery Air Quality and Greenhouse Gas Management Plan, section 10.2*).

	• In its letter of undertaking to DAWE dated 7 July 2021, the proponent states it is evaluating a number of options for reducing emissions from the project, including continuing to progress installation of solar power networks and the use of electric trucks for coal transportation. If implemented, these options have the potential to reduce the project's scope 2 and 3 emissions, as well as minor sources of scope 1 emissions, which occur within Australia.

From: Devendra Vyas
To: s. 22(1)(a)(ii) Warwick Lidbury
Cc: s. 22(1)(a)(ii) Louise Vickery; Milind Oza
Subject: RE: Follow Up RFI [SEC=OFFICIAL]
Date: Friday, 20 August 2021 3:49:51 PM
Attachments: Aug 20 2021 - 2020-8702 further RFL to WCL-WCL response.docx
Longwall v.s. Bord and Pillar gas emission.docx

Hi s. 22(1)(a)(ii)

Please find attached the response to the RFI. Also attached is a document highlighting the reduction in the gas emissions

- Due to sealing of workings- about 40%
- Change over from longwall to Bord and Pillar- 89%

I will forward the information from JSPL as soon as we receive it.

Have a great week end.

Regards,
Devendra

From: s. 22(1)(a)(ii) @awe.gov.au>
Sent: Friday, 20 August 2021 10:06 AM
To: Devendra Vyas <devendra.vyas@jindalsteel.com>; Warwick Lidbury <wlidbury@wcl.net.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; Louise Vickery <Louise.Vickery@environment.gov.au>
Subject: FW: Follow Up RFI [SEC=OFFICIAL]

Dear Devendra and Warwick
Further to my last, please use the attached instead – minor typographical errors have been fixed.
Thanks
s. 22(1)(a)(ii)

From: s. 22(1)(a)(ii)
Sent: Friday, 20 August 2021 9:40 AM
To: Devendra Vyas <devendra.vyas@jindalsteel.com>; Warwick Lidbury <wlidbury@wcl.net.au>
Cc: s. 22(1)(a)(ii) @environment.gov.au>; Louise Vickery <Louise.Vickery@environment.gov.au>
Subject: Follow Up RFI [SEC=OFFICIAL]

Hello Devendra and Warwick
Thank you for your time yesterday – as discussed at that meeting – please find attached our follow up RFI based on the previous information provided.
s. 22(1)(a)(ii) and I more than happy to discuss on teams.
Thanking you in advance for a speedy response,

Wollongong Coal Ltd

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ABN 28 111 244 896

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CORRIMAL NSW 2518

PO Box 281
FAIRY MEADOW NSW 2519

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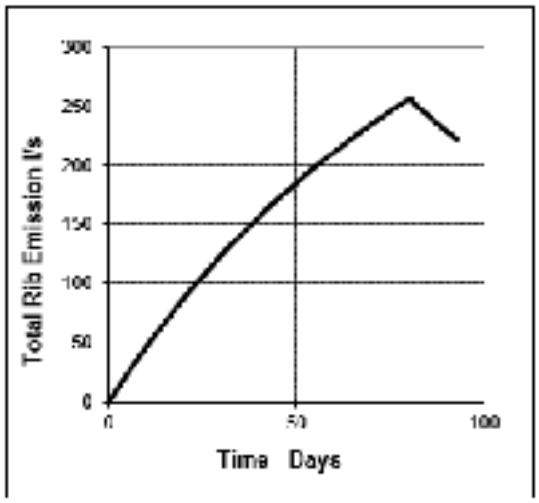
Fax +61 2 4283 7449
www.wollongongcoal.com.au

GAS RETENTION IN SEAM DUE TO SEALING OF WORKINGS:

Please see attached indicative reports for rib decay emissions using the place change mining method.
Attached are the reports for the rib emissions based upon the sealing of place change panels every quarter as opposed to not sealing. **The percent reduction by implementing this change is a 40% reduction in the Scope 1 rib emissions**.

Predicted Rib Emission Rates

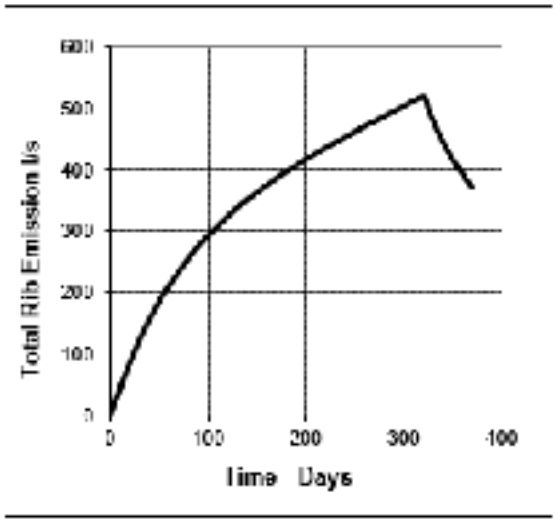
Panel advance	5 m/day
Panel length	400 m
Time face stopped	12.5 days
Number headings	6
Eo	14 l/s/100m
Decay	-0.015 per day
Er	2.5 l/s/100m



Panel Length m	Time days		Tot Gas l/s	Quantity mJ/s
0	0		0	0
27	5		26	0.0
53	11		49	0.0
80	16		72	0.0
107	21		93	0.0
133	27		112	0.0
160	32		131	0.0
187	37		148	0.0
213	43		164	0.0
240	48		180	0.0
267	53		194	0.0
293	59		208	0.0
320	64		221	0.0
347	69		233	0.0
373	75		245	0.0
400	80	Stop days:	256	0.0
400	81	1	252	0.0
400	83	3	248	0.0
400	84	4	245	0.0
400	85	5	242	0.0
400	86	6	238	0.0
400	88	8	235	0.0
400	89	9	232	0.0
400	90	10	229	0.0
400	91	11	225	0.0
400	93	13	222	0.0

Predicted Rib Emission Rates

Panel advance	5	m/day
Panel length	1600	m
Time face stopped	50	days
Number headings	6	
Eo	14	l/s/100m
Decay	0.015	per day
Fr	2.5	l/s/100m



Panel Length m	Time days		Tot Gas l/s	Quantity m3/s
0	0		0	0
107	21		93	0.0
213	43		164	0.0
320	64		221	0.0
427	85		266	0.0
533	107		303	0.0
640	128		335	0.0
747	149		362	0.0
853	171		386	0.0
960	192		408	0.0
1067	213		429	0.0
1173	235		448	0.0
1280	256		466	0.0
1387	277		484	0.0
1493	299		501	0.0
1600	320	Stop days	518	0.0
1600	325	5	498	0.0
1600	330	10	479	0.0
1600	335	15	462	0.0
1600	340	20	446	0.0
1600	345	25	431	0.0
1600	350	30	417	0.0
1600	355	35	404	0.0
1600	360	40	392	0.0
1600	365	45	381	0.0
1600	370	50	371	0.0

REDUCTION IN GAS EMISSIONS LONGWALL V.S BORD AND PILLAR

LONGWALL

The below report demonstrates indicative LW vs place change mining where it is shown that the difference in the two mining **techniques is 2091l/s (longwall) vs 222l/s (place change**). This is a reduction **of 89% in scope 1 emissions due to the change in mining technique**.

RECOMMENDATION REPORT

Russell Vale Colliery Revised Underground Expansion Project, Russell Vale, NSW (EPBC 2020/8702)

Recommendation

- That the proposed action, to extend mining operations at the existing Russell Vale Colliery in Russell Vale, approximately 8 km north of Wollongong, NSW, be approved subject to the conditions specified below.

Conditions

Part A – Conditions specific to the action

Water resources

The objective of conditions 1 to 13 is to minimise the **impacts** of the action on a **water resource**.

1. The **approval holder** must ensure there is no **adverse effect** on the **function** of a **water resource** as a result of the mining activities of the action.
2. For the protection of **water resources**, the **approval holder** must comply with **State development consent** conditions B12-B20, C1-C3, and C10-C11.
3. The **approval holder** must notify the **Department** in writing of any proposed change to the **State development consent** that may relate to **protected matters** within two **business days** of formally proposing a change or within five **business days** of becoming aware of any proposed change.
4. The **approval holder** must notify the **Department** in writing of any change to the **State development consent** conditions that may relate to **protected matters** within 10 **business days** of a change to conditions being finalised.
5. The **approval holder** must provide the **Department** with the final version of the **Plans** within 10 **business days** of their approval by the **NSW Planning Secretary**.
6. The **approval holder** must notify the **Department**, in writing, within two **business days** of proposing to the **NSW Planning Secretary** any changes to a version of the **Plan/s**, explaining what changes are requested and any implications for **protected matters** if the proposed changes are made. If the **NSW Planning Secretary** approves a revised version of the **Plan/s**, the **approval holder** must provide the **Department** with the approved revised **Plan/s** within 10 **business days** of its approval by the **NSW Planning Secretary**, explaining what changes have been made and any implications for **protected matters**.
7. In addition to the **Plan/s** monitoring requirements specified in condition B17 and condition C10 of the **State development consent**, the **approval holder** must:
   a. establish and maintain a network of groundwater monitoring bores across the **Development Application Area** designed to detect changes in groundwater levels in all potentially **impacted** aquifers including shallow aquifers used by **Coastal Upland Swamps**, and any changes in connectivity between aquifers;
   b. submit, for the **Minister's** approval, groundwater drawdown **limits** for groundwater monitoring sites located within **Coastal Upland Swamps**. The groundwater drawdown **limits** must be numerical values and justified through analysis of baseline groundwater **monitoring data** collected prior to **impacts** from the **commencement of the action**;
   c. not commence **second workings** until the groundwater drawdown **limits** have been approved by the **Minister** in writing;

d. monitor groundwater levels in each bore (required under condition 7.a) at least once every three months, starting within one week of the **commencement of the action** for the period for which the approval has effect;

e. publish on the **website** and submit to the **Department** all **monitoring data** collected in accordance with condition 7.d, updated at least once every three months to include the most recent readings available and maintain the data on the **website** for the period for which the approval has effect. The **monitoring data** must include hydrographs for the bore network and explain what the data means in relation to the groundwater drawdown **limit/s** required under condition 7.b;

f. establish and maintain, in all potentially **impacted Coastal Upland Swamps** as depicted in **Attachment B** and in multiple reference swamps that demonstrate baseline condition, monitoring capable of determining individual water balances for each potentially **impacted Coastal Upland Swamps** as depicted in **Attachment B**;

g. monitor all components of the network established in 7.f, and calculate the individual water balances for each **Coastal Upland Swamp**, at least once every three months, starting within one week of the **commencement of the action** until at least 12 months after mining ceases;

h. publish on the **website** and submit to the **Department** the **monitoring data** collected in accordance with condition 7.g and the updated water balances for each potentially **impacted Coastal Upland Swamps** as depicted in **Attachment B**, updated at least once every three months to include the most recent data available and maintain the data on the **website** for the period for which the approval has effect. An evaluation of what the data means in relation to **performance measures** specified in the **State development consent** and performance against the groundwater drawdown **limit/s** must be included; and

i. include in each **compliance report** the **monitoring data** collected in accordance with condition 7.d and 7.g and the updated water balance for each potentially **impacted Coastal Upland Swamps** as depicted in **Attachment B**, in respect of the period the subject of the particular **compliance report**, and an evaluation of performance against the groundwater drawdown **limit/s** established under condition 7.b and the **performance measures** specified in the **State development consent**.

8. In addition to the **Plan/s** requirements specified in condition B19 of the **State development consent**, the **approval holder** must:

a. provide to the **Department**, for written approval by the **Minister**, water quality **limits** for water discharging into Bellambi Gully which will ensure condition 1 of this approval will be achieved for the period for which the approval has effect. The water quality **limits** provided must include numerical values for relevant metals and metalloids, pH, electrical conductivity, total suspended solids and dissolved oxygen. The suitability of the water quality **limits** must be justified through analysis of baseline data (from suitable locations in the receiving environment as provided in the **Plan** required by condition B17(iv) and/or the **Plan** required by condition C10(iii) of the **State development consent**) and comparison with *Australian and New Zealand guidelines for fresh and marine water quality* (2018, or any subsequent version) default guideline values for slightly to moderately disturbed aquatic ecosystems;

b. not commence **second workings** until the water quality **limits** have been approved by the **Minister** in writing;

c. monitor any outflow from the adits at least once every week, starting within one week of the **commencement of the action** for the period for which the approval has effect; and

d. publish on the **website** and submit to the **Department** the **monitoring data** collected in accordance with condition 8.c, updated at least once every three months to include the most recent data available, and maintain the data on the **website** for the period for

which the approval has effect. The data must be presented graphically and be compared to the water quality **limits** outlined in condition 8.a.

e. include in each **compliance report** the **monitoring data** collected in accordance with condition 8.c, in respect of the period the subject of the particular **compliance report**, and an evaluation of performance against the water quality **limit/s** established under condition 8.a.

9. If, at any time during the period for which the approval has effect, the **approval holder** detects that any water quality **limit/s** and/or groundwater drawdown **limit/s** relevant to condition 7 and/or 8 have been reached or exceeded the **approval holder** must notify the **Department** of the exceedance within two **business days** of detecting the exceedance.

10. If the **approval holder** detects an exceedance of a groundwater drawdown **limit/s** pursuant to condition 7, the **approval holder** must cease **second workings** within two **business days**.

11. If the **approval holder** has been required to cease **second workings** pursuant to condition 10, **second workings** must not recommence until the **approval holder** provides **monitoring data** which demonstrates, and the **Minister** agrees in writing, that the approved groundwater drawdown **limit/s** are no longer being reached or exceeded.

12. The **approval holder** must prevent any adit discharge water that reaches or exceeds any approved water quality **limit** from entering any waterway within two **business days** of detecting an exceedance of any approved water quality **limit** and commence suitable treatment of the adit discharge water.

13. If adit discharge water is prevented from entering a waterway pursuant to condition 12, the adit discharge water must not be discharged to a waterway until the **approval holder** provides **monitoring data** which demonstrates, and the **Minister** agrees in writing, that the approved water quality **limits** in condition 8.a are no longer being reached or exceeded.

Listed threatened species and ecological communities

The objective of conditions 14 to 18 is to minimise, and if necessary, compensate for, the impacts of the action on **Listed threatened species and ecological communities**.

14. In addition to the **Plan/s** monitoring requirements specified in condition C10 of the **State development consent**, the **approval holder** must:

a. undertake surveys, using a method consistent with condition C2 of the **State development consent**, to determine the baseline condition at each potentially **impacted Coastal Upland Swamp** as depicted at **Attachment B**, prior to the **commencement of the action**;

b. monitor vertical subsidence using an approach consistent with condition C2 of the **State development consent**, at least weekly at any potentially **impacted Coastal Upland Swamp** as depicted at **Attachment B** when mining is within 600 m (horizontal distance from the closest boundary) of the **Coastal Upland Swamp**, starting within one week of the **commencement of the action** for the period for which the approval has effect;

c. publish on the **website** and submit to the **Department** the **monitoring data** collected in accordance with condition 14.b, updated at least once every three months to include the most recent data available, and maintain the data on the **website** for the life of this approval. An evaluation of what the data means in relation to the **subsidence limit/s** must be included.

d. include in each **compliance report** the **monitoring data** collected in accordance with condition 14.b, in respect of the period the subject of the particular **compliance report**, and an evaluation of performance against the **subsidence limit/s**.

15. If, at any time during the period for which the approval has effect, the **approval holder** detects that the **subsidence limit/s** have been reached or exceeded the **approval holder** must notify the **Department** of the exceedance within two **business days** of detecting the exceedance.
16. If the **approval holder** detects an exceedance of a **subsidence limit/s** pursuant to condition 15, the **approval holder** must cease **second workings** within two **business days**.
17. If the **approval holder** has been required to cease **second workings** pursuant to condition 16, the **approval holder** must not recommence **second workings** until it can be demonstrated that **new or increased impacts** will not occur and the **Minister** approves, in writing, the recommencement of **second workings**.
18. If the **approval holder** exceeds the **performance measures** required by **State development consent** conditions C1 , and the **NSW Planning Secretary** determines that an offset is required under **State development consent condition C4** , the **approval holder** must provide the **Department** with the approved offsets within 10 **business days** of their approval by the **NSW Planning Secretary**.

Part B – Standard administrative conditions

Notification of date of commencement of the action

19. The **approval holder** must notify the **Department** in writing of the date of **commencement of the action** within 10 **business days** after the date of **commencement of the action.**

Compliance records

20. The **approval holder** must maintain accurate and complete **compliance records**.
21. If the **Department** makes a request in writing, the **approval holder** must provide electronic copies of **compliance records** to the **Department** within the timeframe specified in the request.

Note: **Compliance records** may be subject to audit by the **Department** or an independent auditor in accordance with section 458 of the **EPBC Act**, and or used to verify compliance with the conditions. Summaries of the result of an audit may be published on the **Department**'s website or through the general media.

Preparation and publication of plans

22. The **approval holder** must:
    a. submit any **Plans** required by conditions 5 and 6 electronically to the **Department** within 10 **business days** of being approved by the **NSW Planning Secretary**;
    b. publish each **Plan** on the **website** within 20 **business days** of the date the **Plan** is approved by the **NSW Planning Secretary**, unless otherwise agreed to in writing by the **Minister**;
    c. exclude or redact **sensitive ecological data** from **Plans** published on the **website** or provided to a member of the public; and
    d. keep **Plans** published on the **website** until the end date of this approval.
23. The **approval holder** must ensure that any **monitoring data** (including **sensitive ecological data**), surveys, maps, and other spatial and metadata required under a **Plan** or conditions of this approval, is prepared in accordance with the **Department's** *Guidelines for biological survey and mapped data* (2018) and submitted electronically to the **Department** in accordance with the requirements of the **Plan** or within 10 **business days**.

Annual compliance reporting

24. The **approval holder** must prepare a **compliance report** for each 12 month period following the date of **commencement of the action**. The **approval holder** must:

    a. publish each **compliance report** on the **website** within 60 **business days** following the relevant 12 month period;

    b. notify the **Department** by email that a **compliance report** has been published on the **website** and provide the weblink for the **compliance report** within five **business days** of the date of publication;

    c. keep all **compliance reports** publicly available on the **website** until this approval expires;

    d. exclude or redact **sensitive ecological data** from **compliance reports** published on the **website**; and

    e. where any **sensitive ecological data** has been excluded from the version published, submit the full **compliance report** to the **Department** within five **business days** of publication.

Note: This approval decision requires that a compliance report be submitted every year until the end date of this approval because data from monitoring of discharge from adits must be submitted until at least 2067. **Compliance reports** may be published on the **Department**'s website.

Reporting non-compliance

25. The **approval holder** must notify the **Department** in writing of any: **incident;** non-compliance with the conditions; or non-compliance with the commitments made in **Plans**. The notification must be given as soon as practicable, and no later than two **business days** after becoming aware of the **incident** or non-compliance. The notification must specify:

    a. any condition which is or may be in breach;

    b. a short description of the **incident** and/or non-compliance; and

    c. the location (including co-ordinates), date, and time of the **incident** and/or non-compliance. In the event the exact information cannot be provided, provide the best information available.

26. The **approval holder** must provide to the **Department** the details of any **incident** or non-compliance with the conditions or commitments made in **Plans** as soon as practicable and no later than 10 **business days** after becoming aware of the **incident** or non-compliance, specifying:

    a. any corrective action or investigation which the **approval holder** has already taken or intends to take in the immediate future;

    b. the potential impacts of the **incident** or non-compliance; and

    c. the method and timing of any remedial action that will be undertaken by the **approval holder**.

Independent audit

27. The **approval holder** must ensure that **independent audits** of compliance with the conditions are conducted as requested in writing by the **Minister**.

28. For each **independent audit**, the **approval holder** must:

    a. provide the name and qualifications of the **independent** auditor and the draft audit criteria to the **Department**;

    b. only commence the **independent audit** once the audit criteria have been approved in writing by the **Department**; and

c. submit an audit report to the **Department** within the timeframe specified in the approved audit criteria.

29. The **approval holder** must publish the audit report on the **website** within 10 **business days** of receiving the **Department's** approval of the audit report and keep the audit report published on the **website** until the end date of this approval.

Completion of the action

30. Within 20 **business days** of whichever is the earlier of:

- the **completion of the action**; or
- 60 **business days** before the end date of the period for which the approval has effect,

the **approval holder** must notify the **Department** in writing of the date of the **completion of the action** and submit all **completion data** to the **Department**.

Part C definitions

In these conditions, except where contrary intention is expressed, the following definitions are used:

Adverse effect means the occurrence of **impacts** greater than those predicted in the **assessment documentation** and is represented by the exceedance of an approved **limit**.

Approval holder means the person to whom the approval is granted as identified on the approval notice for EPBC 2020/8702 or to whom the approval is transferred under s 145B of the EPBC Act, or a person who may take the action in accordance with section 133(2A) of the EPBC Act.

Aquatic GDEs means groundwater dependent ecosystems dependent on the surface expression of groundwater, including:

i. River baseflow systems, aquatic and riparian ecosystems that exist in or adjacent to streams (including the hyporheic zone (subsurface interface between surface and groundwater bodies)) which are fed by groundwater; and

ii. Wetlands (aquatic communities and fringing vegetation dependent on groundwater-fed lakes and wetlands), including palustrine (non-tidal wetlands dominated by vegetation) and lacustrine (lake) wetlands that receive groundwater discharge, and can include spring and swamp ecosystems.

Assessment documentation means the Final Public Environment Report, Russell Vale Colliery Revised Underground Expansion Project (EPBC 2020/8702) prepared by Umwelt (Australia) PTY Ltd dated April 2021 and attachments.

Associated user means groundwater supply bores, **aquatic GDEs**, **terrestrial GDEs** and **subterranean GDEs**.

Bord and pillar workings means a mining method comprising of a series of self-supporting roadways (or bords) within the coal seam leaving a grid of pillars of unmined coal which are designed to remain stable for the long term.

Business day/s means a day that is not a Saturday, a Sunday or a public holiday in the state or territory of the action.

Coastal Upland Swamp/s means the **EPBC Act** listed Coastal Upland Swamps in the Sydney Basin Bioregion.

Commencement of the action means the first instance of any specified activity associated with the action. **Commencement of the action** does not include;

i. install signage and /or temporary fencing to prevent unapproved use of the project area;

ii. protect environmental and property assets from fire, weeds and pests, including construction of fencing, and maintenance of existing surface access tracks;

iii. install temporary site facilities for persons undertaking pre-commencement activities so long as these are located where they have no impact on the **protected matters**; and

iv. undertaking geotechnical investigation if it causes only minor physical disturbance and is required well in advance of most of the site works to inform design.

Completion of the action means the time at which all approval conditions (except this condition) have been fully met.

Completion data means an environmental report and spatial data clearly detailing how the conditions of this approval have been met. The **Department's** preferred spatial data format is **shapefile**.

Compliance records means all documentation or other material in whatever form required to demonstrate compliance with the conditions of approval in the approval holder's possession or that are within the approval holder's power to obtain lawfully.

Compliance report/s means written reports:

i. providing accurate and complete details of compliance, **incidents**, and non-compliance with the conditions and the **Plans**;

ii. consistent with the **Department's** *Annual Compliance Report Guidelines* (2014);

iii. include a **shapefile** of any clearance of any **protected matters**, or their habitat, undertaken within the relevant 12 month period; and

iv. annexing a schedule of all **Plans** prepared and in existence in relation to the conditions during the relevant 12 month period.

Department means the Australian Government agency responsible for administering the **EPBC Act**.

Development Application Area as defined by the red line labelled UEP application area in **Attachment A**.

EPBC Act means the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).

Function means the ecosystem components, processes and benefits or services that characterise the **associated user**, including support for biological diversity or species composition.

Impacted/impacts means having any measurable direct or indirect disturbance or harmful change as a result of any activity associated with the action.

Incident means any event which has the potential to, or does, impact on one or more **protected matter** except as permitted by this approval.

Independent audit means an audit conducted by an independent and **suitably qualified person** as detailed in the *Environment Protection and Biodiversity Conservation Act 1999 Independent Audit and Audit Report Guidelines* (2019)**.**

Limit/s means a threshold represented by a numerical value that should it be reached or exceeded, condition 1 will be taken as not be being achieved.

Listed threatened species and ecological communities means Macquarie Perch (*Macquaria australasica*), Silver Perch (*Bidyanus bidyanus*), Prickly Bush-pea (*Pultenaea*

aristata), Giant Burrowing Frog (*Heleioporus australiacus*), Littlejohn's Tree Frog (*Litoria littlejohni*), Stuttering Frog (*Mixophyes balbus*), Broad-headed Snake (*Hoplocephalus bungaroides*), Large-eared Pied Bat (*Chalinolobus dwyeri*) and Coastal Upland Swamps in the Sydney Basin Bioregion endangered ecological community.

Monitoring data means the data required to be recorded under the conditions of this approval.

Minister means the Australian Government Minister administering the **EPBC Act** including any delegate thereof.

New or increased impacts means a new or increased environmental impact or risk relating to **Coastal Upland Swamps**, when compared to the likely **impacts** of the action assessed in the **assessment documentation**.

NSW Planning Secretary means the Planning Secretary under the *Environment Planning and Assessment Act 1979* (NSW), or nominee.

Plan/s means the Water Management Plan required under condition B17, Adit Discharge Water Management Plan required under condition B19 and Extraction Plan required under condition C10 of the **State development consent** and approved by the **NSW Planning Secretary**, implemented by the **approval holder** and/or published on the website as required by the **State development consent**.

Performance measure/s means as specified in Tables 4 and 6 of the **State development consent** and as defined in the Water Management Plan and Extraction Plan approved by the NSW Government as a result of the action.

Protected matter/s means a matter protected under a controlling provision in Part 3 of the **EPBC Act** for which this approval has effect, being **water resources** and **Listed threatened species and ecological communities**.

Sensitive ecological data means data as defined in the Australian Government Department of the Environment (2016) *Sensitive Ecological Data – Access and Management Policy V1.0*, or as subsequently officially revised.

Shapefile means location and attribute information of the action provided in an Esri shapefile format. Shapefiles must contain '.shp', '.shx' , '.dbf' files and a '.prj' file that specifies the projection/geographic coordinate system used. Shapefiles must also include an '.xml' metadata file that describes the shapefile for discovery and identification purposes**.**

Second workings means extraction of coal from **bord and pillar workings**.

State development consent means the Development Consent issued by the Independent Planning Commission of New South Wales for application number MP09_0013 dated 8 December 2020.

Subsidence limit/s means a vertical subsidence of 100 mm or more at a **Coastal Upland Swamp** when compared to the baseline condition determined under condition 14.a.

Subterranean GDEs means groundwater dependent ecosystems partially or wholly dependent on aquifer ecosystems, including stygofauna.

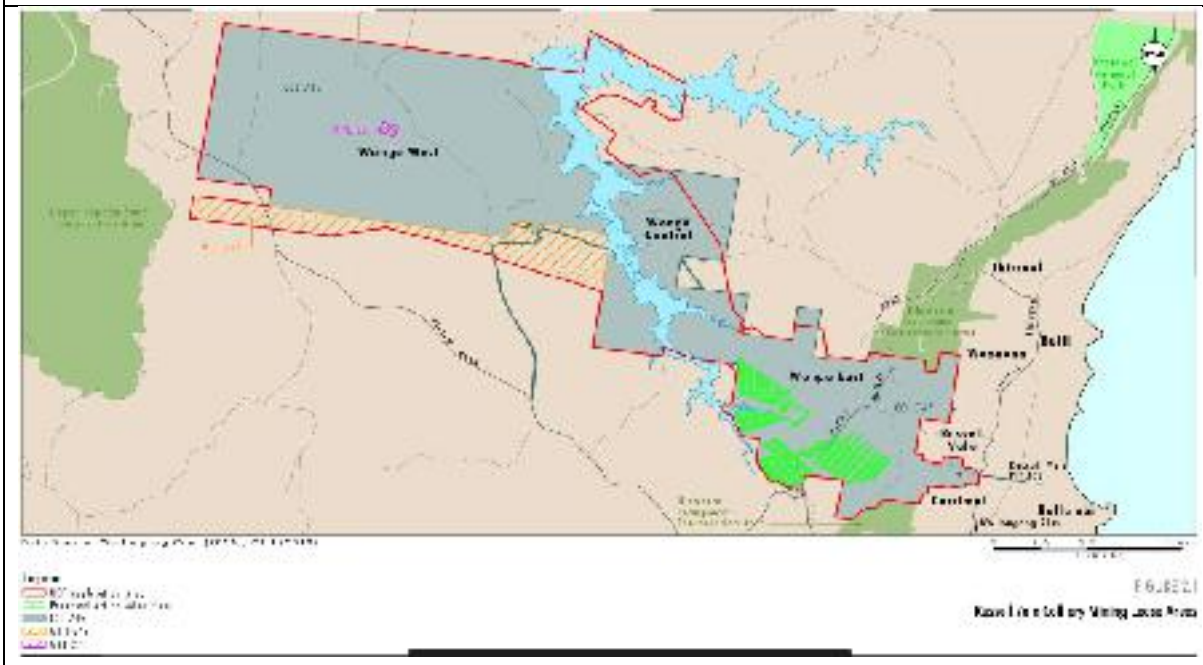
Suitably qualified person means a person who has professional qualifications, training, skills and/or experience related to the nominated subject matter and can give authoritative independent assessment, advice and analysis on performance relative to the subject matter using the relevant protocols, standards, methods and/or literature

Terrestrial GDEs means land-based groundwater dependent ecosystems that are partially or wholly dependent on the subsurface presence of groundwater.

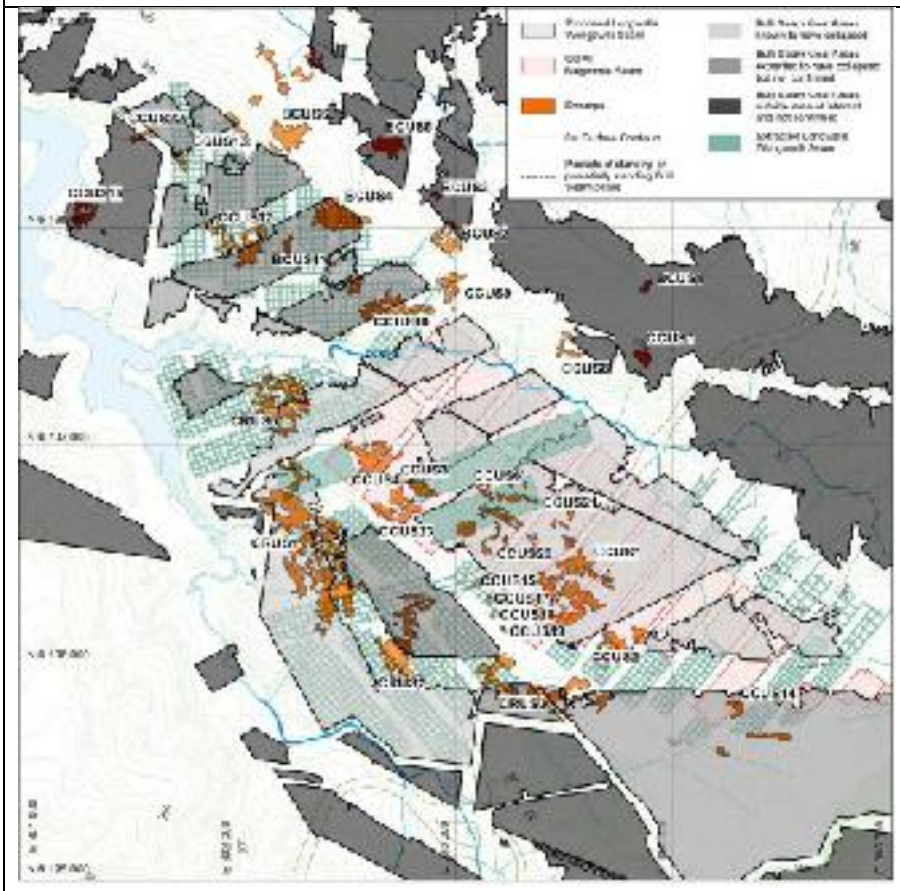
Water resource has the same meaning as in the Commonwealth *Water Act 2007.*

Website means a set of related web pages located under a single domain name attributed to the approval holder and available to the public

Attachment A – Development application area is outlined in red and identified as UEP application area



Attachment B – Coastal Upland Swamps identified in orange



Using this report

1. This recommendation report should be read in conjunction with the covering brief and other attachments. All attachments refer to attachments to the proposed decision brief unless otherwise specified.

Background

Description of the project and location

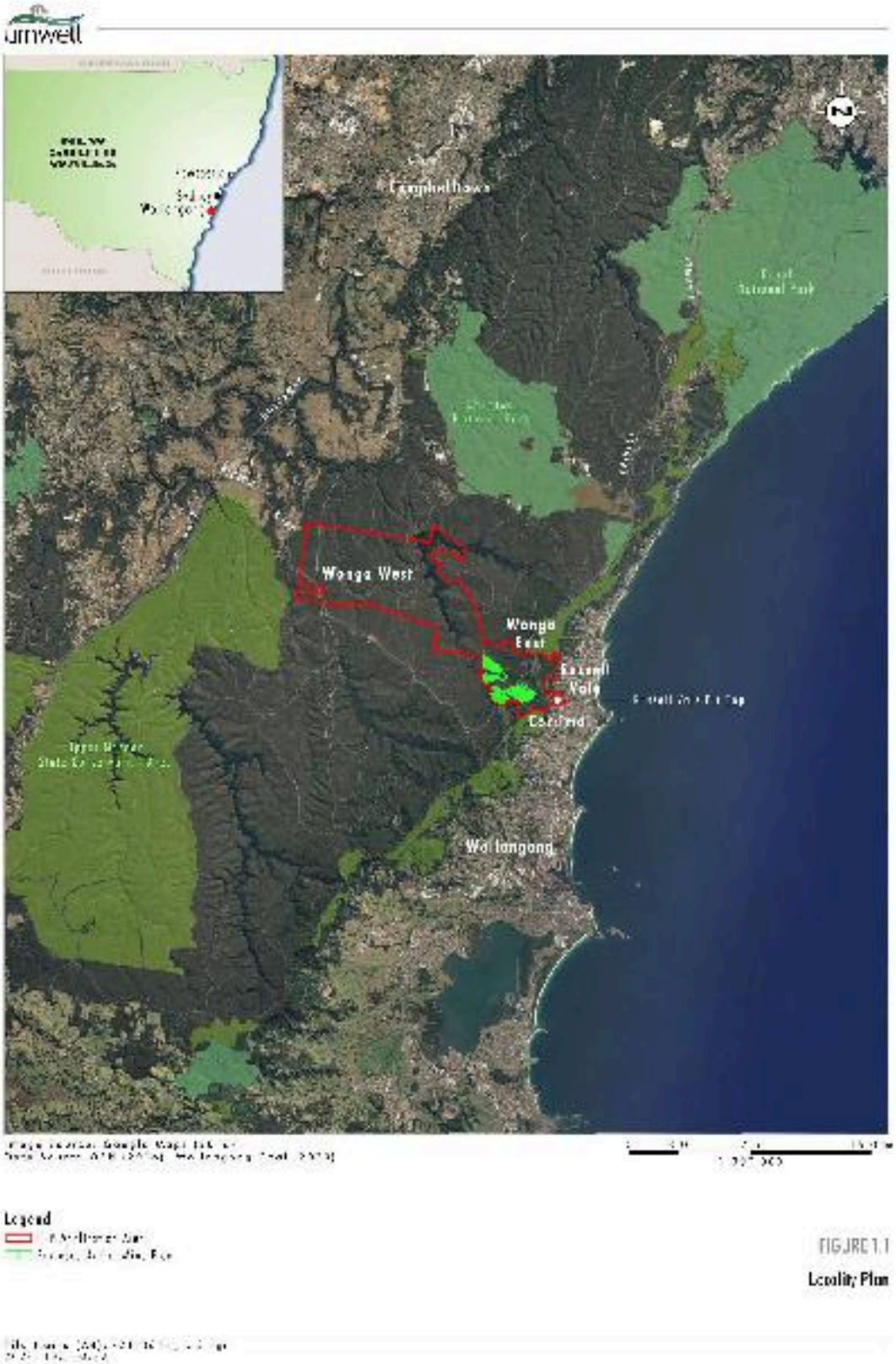
1. The proposed action, also known as the Russell Vale Revised Underground Expansion project (UEP), is the extension of mining operations at the existing Russell Vale Colliery in Russell Vale, approximately 8 kilometres (km) north of Wollongong, NSW, within the Wollongong and Wollondilly Local Government Areas.

2. The current Russell Vale Colliery has been operating in 'care and maintenance' since mining operations ceased in 31 December 2015.

3. Wollongong Coal Limited (WCL) is the proponent and the person taking the action.

4. The proposal is located west of the Illawarra Escarpment within the upper catchment of the Cataract Reservoir, which forms part of Greater Sydney's drinking water supply catchment.

5. The proposed action study area covers the surface area and underlying mining areas of Wonga East and Wonga West (figure 1). While Wonga West is considered part of the existing colliery and has been historically mined, the proposed action would occur only at Wonga East.



6. Wonga East is located on the Illawarra Escarpment, with the colliery pit top on the lower slopes of the escarpment bound by Princes Highway to the east, and the residential areas of Russell Vale and Corrimal to the east and south.

7. Key elements of the proposed action include mining using bord and pillar mining techniques for the extraction of approximately 3.7 megatons (Mt) of run of mine (ROM) coal, within the existing Consolidated Coal Lease 745 (CCL 745).

8. Bord and pillar mining involves tunnelling through the coal seam, leaving in place supportive pillars. In this instance, the pillars to be left behind are designed for long term stability with an 8:10 width to height ratio. This mining technique has a lower risk to the environment and water resources than longwall mining and is strongly encouraged by the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC).

9. The proposed action consists of the underground activities including the bord and pillar operations. The action also includes the emplacement of 200,000 tonnes per annum of reject rock material within the underground mining works, if it cannot be beneficially resuse. The upgrade and the re-design of the pit top facilities, including the existing water management infrastructure, is not part of the referred action.

10. The department notes that the water treatment facilities required to treat adit discharge water is not included as part of this proposed action. The proponent has confirmed that the precise nature of the treatment requirements, timing or processes is not known at present, the Adit Discharge Water Management Plan will establish the processes for implementing the necessary treatment measures. It is expected that the treatment facilities will be located within existing disturbed area, however the proponent notes that an assessment will be undertaken to ensure it meets State and Commonwealth regulatory requirements.

11. The development footprint, being the underlying mining area at Wonga East, is approximately 970 ha. Sensitive habitats within the development footprint include rocky environments, aquatic environments, and Coastal Upland Swamps which provide habitat for other listed threatened flora and fauna.

Mining history

12. Historically, mining undertaken at the Russell Vale Colliery has occurred in three seams, the Bulli Seam, the Balgownie Seam, and the Wongawilli Seam, all which outcrop along the Illawarra Escarpment (figure 2). The Balgownie Seam is located approximately 10 metres (m) below the Bulli Seam, and the Wongawilli Seam is located approximately 20 m below the Balgownie Seam. As both the Bulli Seam and the Balgownie Seam have been fully extracted, the proposed action includes work solely on the Wongawilli Seam.

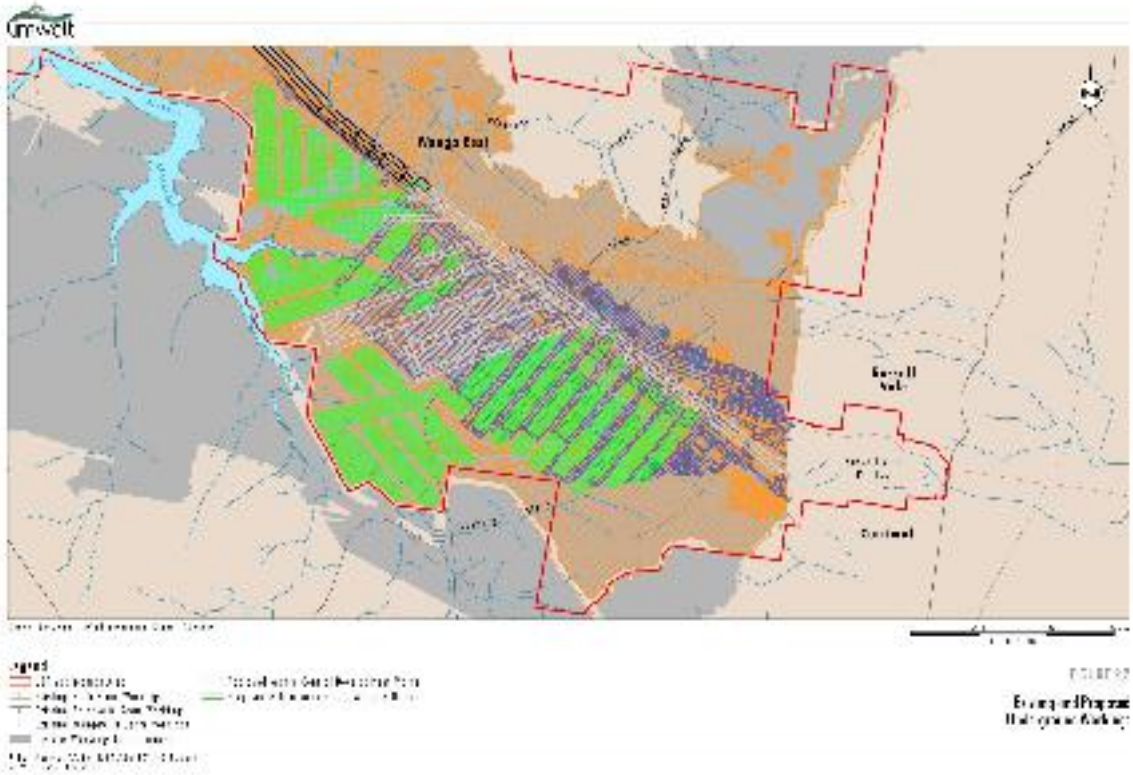


Figure 2: Russell Vale existing and proposed underground workings (proposed workings shown in bright green)

13. Mining has been undertaken at Russell Vale Colliery since the 1880s, with numerous extensions to the mining area. There are six previously referred stages and/or iterations of the proposed action under the EPBC Act. Four of these referrals were withdrawn by the proponent and two were approved with conditions.

14. Prior to the referral of the current proposal, the most recently referred iteration of the project was the Underground Expansion Project (EPBC 2014/7268). This proposal involved longwall mining techniques, as opposed to bord and pillar extraction. Based on advice from the NSW Planning Assessment Commission (PAC) and the IESC, that referral was withdrawn in June 2020 and WCL revised the design of the proposed action to utilise bord and pillar techniques.

Cumulative impacts

15. The Public environment Report (PER) notes that there are no active mines within 13 km of the proposed action other than operations within Russell Vale Colliery. However, depressurisation and recovery within historical operations, including the Cordeaux and Bulli Colliery, have been observed to influence current groundwater conditions and predicted impacts. The department notes that potential cumulative impacts of the proposed action are largely associated with the historic impacts of the mining and the potential impact of subsidence. The impact of subsidence has been addressed in paragraphs 55-83 below.

State Assessment and Approval

16. The application for the Underground Expansion Project (UEP) of the Russell Vale Colliery was first submitted to the NSW Government in 2009 and proposed a substantial expansion of longwall mining across both Wonga East and Wonga West.

17. As a result of the application being submitted prior to NSW legislation amendments, the proposed action underwent assessment as a transitional Part 3A project under the *NSW Environmental Planning and Assessment* (*Savings, Transitional, and Other Provisions*) *Regulations 2017*. As a transitional project, the provisions of the now repealed Part 3A of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) continued to apply to, and in respect of, the current iteration of the proposed action.

18. As more than 25 submissions objected to the original proposal, the former PAC was required to make the determination on the project. The Department of Planning, Industry and Environment (DPIE) prepared an assessment report (DPIE assessment report) and referred it to the PAC in December 2014. Public hearings were held in February 2015 and the PAC advised DPIE in April 2015 that further work and assessment was required before a determination could be made.

19. Further changes were made to the project and detailed in a Revised Preferred Project Report. The Revised Preferred Project Report was placed on public exhibition from 1 August 2019 to 29 August 2019. A total of 213 submissions were made on the report including 11 government agency submissions, and 202 community and interest group submissions. Key issues raised in the submissions were environmental, social, and economic issues, including impacts to the community, mining in the water catchment and biodiversity.

20. None of the agency submissions identified opposition to the project, however, several agencies, including Geoscience Australia and the NSW Environment Protection Agency (EPA), made submissions seeking further clarification regarding aspects of the proposed action. 131 submissions from community members and interest groups were in objection to the project, while 70 were in support.

21. The proponent prepared a response to submissions report for DPIE, and DPIE undertook its assessment. As more than 50 submissions from the public objecting to the UEP, the Independent Planning Commission (IPC), which replaced the PAC, was required to make the determination on the project, DPIE provided its assessment report to the IPC on 15 September 2020. The IPC held a 12 week public hearing and approved the Russell Vale UEP on 8 December 2020.

Assessment process

22. The proposal was referred on 4 August 2020 and determined to be a controlled action on 2 September 2020 due to likely significant impacts on a water resource, in relation to coal seam gas development and large coal mining development (section 24D and 24E) and on listed threatened species and ecological communities (sections 18 and 18A).The proposal was referred on 4 August 2020 and determined to be a controlled action on 2 September 2020 due to likely significant impacts on a water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E) and on listed threatened species and ecological communities (sections 18 and 18A).

23. On the same day, the delegate decided that the proposed action would be assessed by Public Environment Report (PER). The PER guidelines were provided to the proponent on 5 November 2020.

24. The proponent submitted the draft PER on 16 December 2020 and the Stage 2 fee payment was received on 13 January 2021. The department determined the draft PER met the requirements of the PER guidelines, and subsequently, the draft PER was published for a public comment period of 20 business days ending 25 February 2021.

25. The proponent received 29 submission on the draft PER. The key issues were the environmental history of the company, mining in the Sydney water catchment, impacts on biodiversity and the community.

26. On 22 December 2020, the department submitted the draft PER to the IESC for consideration of the proposed action's potential impacts on water resources.

27. On 8 February 2021, the IESC provided advice on the potential impacts of the proposed action on water resources, including the long-term impacts associated with subsidence and discharge from adits. The IESC advice was provided to the proponent on 12 February 2021.

28. The final PER, including the response to submissions on the draft PER, was submitted to the department on 14 April 2021, commencing the 40 business day period in which to make a decision on whether or not to approve the project. Wollongong Coal Limited paid Stage 3 and 4 cost recovery fees on 19 February 2021.

29. The submissions made on the draft PER have been taken into account during the assessment of the project. Issues raised during the comment period were addressed by the proponent in finalising the PER and are discussed in this recommendation report.

30. On 21 April 2021, the PER was published in accordance with section 99(4) of the EPBC Act.

31. The department sought further information from the proponent relating to social matters (Aboriginal heritage) and greenhouse gas emissions on 20 April 2021. The proponent provided the information on the same day (Attachment C2-C3).

32. On 5 May 2021, the department requested further clarification regarding the treatment of adit discharge water. The proponent provided a response on 7 May 2021 (Attachment C4)

33. On 5 May 2021, the department requested further clarification regarding the treatment of adit discharge water. The proponent provided a response on 7 May 2021 (Attachment C4).

34. For the purpose of this report the additional documentation and the final PER are here after referred to as the PER.

Assessment

Mandatory Considerations – section 136(1)(a) Part 3 controlling provisions

35. Under section 136(1)(a), in deciding whether or not to approve an action and what conditions to attach to the approval, the Minister must consider matters relevant to any

matter protected by the controlling provisions for the action, so far as they are not inconsistent with any other requirement of Subdivision B, Division 1 of Part 9 of the EPBC Act.

36. The proposal was determined to be a controlled action under the following controlling provisions of the EPBC Act:

- A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E);
- Listed threatened species and ecological communities (sections 18 and 18A).

37. These controlling provisions are discussed respectively below.

A water resource, in relation to coal seam gas development and large coal mining development (s24D & s24E)

38. As noted above, the proposed action is located on the Woronora Plateau which supports groundwater-dependent ecosystems (GDEs), such as the EPBC-listed threatened ecological community Coastal Upland Swamp in the Sydney Basin Bioregion and sits within Sydney drinking water supply catchments.

Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC)

39. In accordance with section 131AB, the Minister is required to obtain advice from the IESC before deciding whether or not to approve, for the purposes of the controlling provision, the taking of the proposed action.

40. The IESC previously provided advice on the proposed action on 19 November 2019 (IESC-108) (Attachment E3) and 5 March 2020 (IESC-112) for DPIE (Attachment E2). The key matter raised in the advice related to the risk of pillar destabilisation in the historical workings and associated impacts on the Coastal Upland Swamps. The IESC recommended that a quantitative assessment of the risk of pillar failure be undertaken and independently reviewed. The IESC also identified discharge of water into Bellambi Creek from the adits and long-term changes to groundwater levels as an issue requiring further consideration.

41. The PER includes the proponent's quantitative risk assessment of pillar failure, which concludes that the likelihood of pillar failure is expected to be negligible, and known areas of marginally stable pillars occur in the Bulli Seam and these have the potential to cause subsidence, independent of the proposed action.

42. This assessment was independently reviewed by the Independent Advisory Panel for Underground Mining (IAPUM) (at Appendix K of the PER at Attachment C1) and Professor Bruce Hebblewhite (at Appendix D of the PER at Attachment C1) and both agreed with the pillar failure assessment. Professor Hebblewhite also recommended that the existing management plans be updated to include

43. On 8 February 2021, the IESC provided further advice on the proposed action to the department (Attachment E1). The IESC (2021 page 2) identified that the key potential impacts to water resources from the proposed action are:

- altered water regimes (including drying) with irreversible effects on EPBC Act-listed swamps;
- long-term effects on Bellambi Gully Creek and nearshore marine environments downstream from the discharge of adit water that exceeds Australian and New Zealand Guidelines (ANZG) (2018) default guideline values for freshwater aquatic ecosystems for some metals and metalloids; and
- long-term impacts on groundwater levels and quality post-mining where discharge from adits may occur in perpetuity.

44. The IESC identified key areas in which work is required to address the key potential impacts of the proposed action including:

- further work to assess the status of pillar stability in seven of the 14 goaf areas;
- swamp-specific ecological monitoring should commence at least two years before mining resumes to establish baseline data, then continue during the life of the mine and for a suitable period afterwards until the risk of any further ground movements can be demonstrated to be negligible;
- swamp-specific water balances for potentially impacted swamps and multiple corresponding reference ones should be calculated based on monitoring data collected over an adequate time period. These multiple reference swamps are needed to differentiate changes caused by mining from those associated with natural climatic variability and will be required to demonstrate negligible impact from the project;
- further monitoring of the adit water quality to address the potential risks associated with the discharge of either untreated or treated water into Bellambi Gully Creek. This monitoring should occur at more than one site downstream of the release point and should include analysis of sediment-bound contaminants; and
- groundwater and surface water monitoring focusing on the multi-seam extraction areas should quantify the drawdown response during mining and for a long enough period after mining ceases to confirm that no delayed significant impacts occur on aquatic environments, or, if they do, until recovery is complete. These monitoring data should be assimilated into updated models.

45. On 14 April 2021, the proponent provided a response to the IESC advice in the PER. The proponent's response addressed most of the matters raised by the IESC.

46. The additional information provided in the response to the IESC advice has been used to inform the department's assessment of the potential impacts of the proposed action and in drafting the recommended proposed decision.

47. The department considers that several of the matters raised by the IESC are addressed through the additional information supplied by the proponent. Where this additional information does not adequately address the issues identified by the IESC, the department has proposed additional conditions. A summary of the IESC advice, proponent's response and departs consideration is provide at Attachment E5.

Impacts

48. The key potential impact pathway associated with the proposed action is via subsidence. Subsidence may result in altered water regimes (including drying) within the Coastal

Upland Swamps which can change the ecological character of the threatened ecological community and result in a loss and/or degradation of habitats for threatened flora and fauna.

49. Subsidence can also result in impacts on creeks with subsequent effects on surface and groundwater hydrology. Subsidence-induced cracks occurring beneath a creek or other surface water body may result in the loss of water to near-surface groundwater flows.

50. If the diverted water re-emerges downstream the quality of that water can be altered with changes to dissolved oxygen levels and pH common. These changes can result in the re-emerging water containing increased concentrations of metals such as manganese and the deposition of orange iron oxides in surface waterways. The salinity of the water may also increase following diversion into the near-surface groundwater system.

51. Furthermore, subsidence can cause changes to surface water quality through increased sedimentation, bank instability and loss, creation or alteration of riffle and pool sequences, changes to flood behaviour and, increased rates of erosion with associated turbidity impacts.

52. The NSW Threatened Species Scientific Committee's *Alteration of habitat following subsidence due to long wall mining* (2005) noted that where subsidence below creeks within the southern coalfields resulted in cracking of the streambed, this was followed by significant dewatering of permanent pools and in some cases complete absence of surface flow.

53. The other important impact pathway noted by the IESC was discharge of groundwater with potentially elevated levels of metals from the adits into Bellambi Creek. This may lead to further degradation of the creek and changes to the aquatic habitats and species diversity.

54. The impacts associated with subsidence, ground water and surface water are discussed below.

Subsidence impacts

55. Underground mining within the Russell Vale holdings has been extensive, with extraction having occurred in the Bulli, Balgownie, and Wongawilli seams (figure 3). Historically, mining in the Bulli Seam has included a mix of bord and pillar, pillar extraction and longwall mining and has occurred over almost the entire proposed action area. Eleven longwall panels have also been mined in the Balgownie Seam covering approximately half of the proposed action area. The current action proposes to mine the Wongawilli Seam.

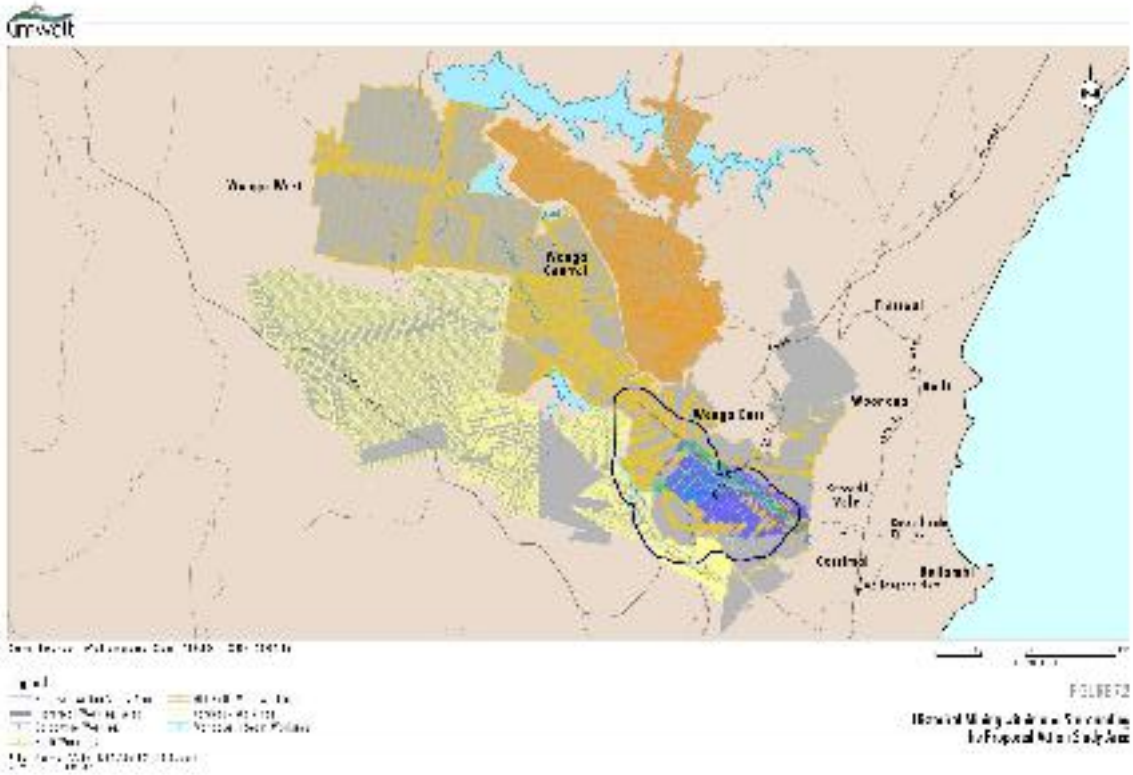


Figure 3 Historical mining within and surrounding the proposed action study area.

56. Historical mining and resultant subsidence have likely led to surface water and groundwater impacts within the proposed action study area, including:

    - surface subsidence to Cataract Creek from historical longwall mining and second workings (extraction of coal using bord and pillar workings) in the Bulli and Balgownie Seams;
    - reduction in baseflow contributions from the Hawkesbury Sandstone aquifer; and
    - localised changes in water quality within the Hawkesbury Sandstone aquifer.

57. The PER identified two potential causal pathways through which the proposed action could cause subsidence-related impacts; incremental subsidence, and pillar collapse.

58. The PER states that the consequence of mining-induced subsidence impacts include changes to groundwater regimes (including the potential to damage the low-permeability material underlying the perched aquifers), loss of, or change in, surface flow, and loss of standing water and near-surface groundwater. This may result in changes to the extent and composition of Coastal Upland Swamps and riparian habitats within the proposed action area, and in the worst-case scenario, the loss of Coastal Upland Swamp/s.

59. According to the PER, Coastal Upland Swamps with existing high levels of tensile strains form historical mining are considered most at risk. The PAC, in its assessment of proposed longwall mining beneath Coastal Upland Swamps, also identified that swamps with a greater tensile strain may be of risk of environmental consequences.

60. A peer reviewed subsidence assessment report (subsidence assessment report) and a quantitative assessment of the risk of pillar failure report (pillar risk assessment report) in the Russell Vale East Area were provided in the PER. Assessment of subsidence-related impacts were informed by the forementioned reports and key findings are discussed in the following sections.

61. The subsidence assessment report noted that four Coastal Upland Swamps within the proposed action study area were estimated as having a tensile strain of approximately 10.5 mm/m. Of the four, two will not be directly undermined by the proposed action, and the PER concludes that they are unlikely to experience any additional subsidence as a result of the proposed action.

Incremental subsidence

62. The subsidence assessment report found that some low-level deformation is expected within the Wongawilli Seam irrespective of the strength, load and behaviour of the pillars utilised for the proposed bord and pillar workings. This has the potential to result in low-level vertical subsidence movements, which are unlikely to exceed 150 mm. Although, the pillar risk assessment report notes that the subsidence impacts are likely to occur gradually and movement is expected to be imperceptible.

63. The subsidence assessment report identifies that several areas within the proposed action study area are currently in limiting equilibrium (on the verge of moving) because of previous mining. Some ongoing low-level ground movement, mainly horizontal movement associated with previous mining including the Wongawilli Seam longwalls, may not yet have ceased completely. This low-level movement related to previous longwall mining operations has potential to continue to cause low-level impacts to Mount Ousley Road and Cataract Creek that may be perceptible.

64. The PER notes that this movement is a legacy of previous mining and is not expected to be influenced by the proposed action. Movement may continue irrespective of any further mining in the Wongawilli Seam. These findings were confirmed by Professor Hebblewhite in the peer review at Appendix D of the PER (Attachment C1).

65. The subsidence assessment report also predicted that:

    - the proposed bord and pillar workings will not have a significant interaction with surface or sub-surface groundwater systems in terms of fracturing. Impacts on groundwater are not expected to occur beyond the immediate vicinity of the Wongawilli Seam; and

    - there is no credible risk of water flow along major structures from Cataract Reservoir.

66. The subsidence assessment report concluded that “the small subsidence movements that are forecast for the proposed mining layout are not expected to cause perceptible impacts to any natural surface features including Coastal Upland Swamps, cliffs, steep slopes, drainage lines, creeks, Cataract Creek and Cataract Reservoir”.

Pillar Failure

67. The pillars used in bord and pillar mining serve two main roles: promoting the serviceability of underground roadways adjacent to areas of extraction (e.g. chain pillars) and maintaining long-term regional stability (e.g. main heading pillars).

68. The PER noted that there are two identified potential impact pathways associated with pillar failure:

    - failure of pillars in the Wongawilli Seam (i.e. pillars developed as part of the proposed action); and
    - failure of remnant pillars in overlying workings in the Bulli Seam.

69. Two pillar sizes are proposed in the Wongawilli Seam; square pillars formed at 30 m (30 m by 30 m) and 25 m (25 m by 25m). The 30 m pillars are located outside of the area of extracted Balgownie Seam longwall panels, with the 25 m pillars located below the extracted seam area where the vertical load is significantly reduced due to removal of the overlying coal.

70. The pillar risk assessment report notes that the potential for further subsidence to occur below any Coastal Upland Swamps as a result of pillar instability in the Balgownie Seam is “extremely rare”. Record tracings and mine plans for the Balgownie Seam indicate there are no areas in the proposed action study area where Balgownie Seam pillars might be unstable.

71. The PER notes proposed mining in the Wongawilli Seam is designed to avoid mining directly below Balgownie Seam chain pillars and there is little potential for proposed mining in the Wongawilli Seam to destabilise pillars in the Balgownie Seam. The main heading pillars are long-term stable. The chain pillars are heavily loaded but supported on both sides by collapsed goaf.

72. Key findings of the pillar risk assessment report of pillar failure in Wongawilli Seam include:

    - the majority of the proposed Wongawilli Seam pillars have been assessed to have a probability of failure of well below 1 in 100,000. The failure of these pillars would result in vertical subsidence impacts of up to 140 mm; and
    - two panels of bord and pillar workings located outside the overlying Balgownie Seam goaf area have been assessed to have a risk of failure of less than 1 in 1,000. These two panels are not located beneath Coastal Upland Swamps. Should failure occur, the maximum subsidence for these panels is predicted to be less than 100 mm and likely less than 300 mm, consistent with the predictions for imperceptible levels of subsidence across the proposed mining area.

73. Based on the assessment, the department considered it is unlikely that subsidence impacts associated with Wongawilli Seam pillar failure would occur as a result of the proposed action. However, the pillar risk assessment report notes that due to historic mining there is the potential for standing pillars to remain in the overlying Bulli Seam. These areas correspond to 14 ‘Bulli Seam goaf areas’ as shown by the grey areas in figure 4.

74. The Bulli Seam goaf areas are likely to include a range of remnant structures including areas of solid coal, large standing pillars, standing pillars associated with Welsh bords, and goaf areas where there has been pillar extraction or pillar collapse.

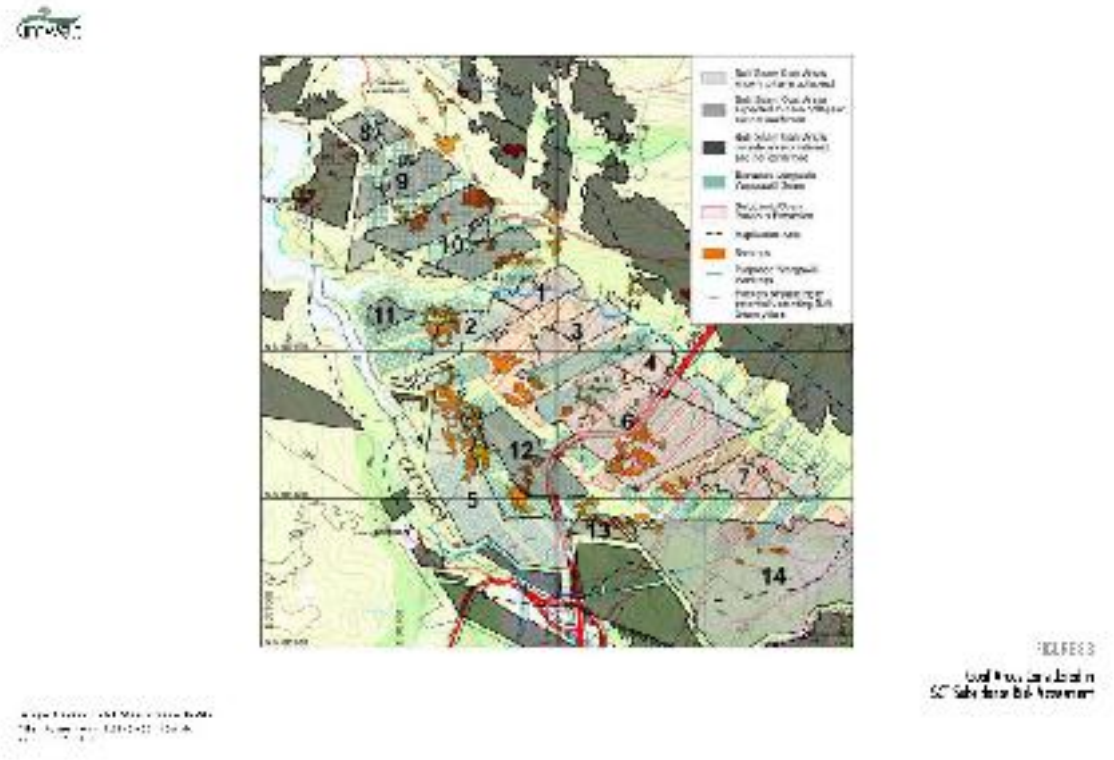


Figure 4: Location of swamps (in orange), confirmed collapsed goaf area (light grey) and unconfirmed areas (grey) within the proposed action study area

75. The subsidence assessment report confirms that seven of the Bulli Seam goaf areas (numbers 1-7) have collapsed. While it is expected that the remaining seven have also collapsed (numbers 8-14) due to the use of similar mining techniques, this is yet to be confirmed.

76. The IESC and IAPUM noted that if any standing pillars remain in the Bulli Seam goaf areas 8 to 14, surface features above these standing pillars may not yet have experienced the previously predicted subsidence associated with historical mining. These areas could also experience additional subsidence from the proposed action.

77. The subsidence assessment report notes that the Bulli Seam goaf areas were not designed to be long-term stable and, in many cases, would be designed to fail as mining retreated from the area. The eventual failure of these pillars is almost certain, and all subsidence predictions of the assessment have assumed that pillars in these areas have already collapsed.

78. The PER concludes that the proposed action is unlikely to increase the consequences associated with these pillars failing (other than the predicted incremental subsidence). Due to historical mining these consequences will eventually occur irrespective of the proposed action proceeding, however the proposed action could bring the timing of these consequences forward if the works did result in destabilisation.

Impacts to swamps, surface water and cliff lines

79. The subsidence assessment report identified 12 Coastal Upland Swamps (figure 5) which are wholly or partly located over Bulli Seam goaf areas 8-14 and the proposed action area.

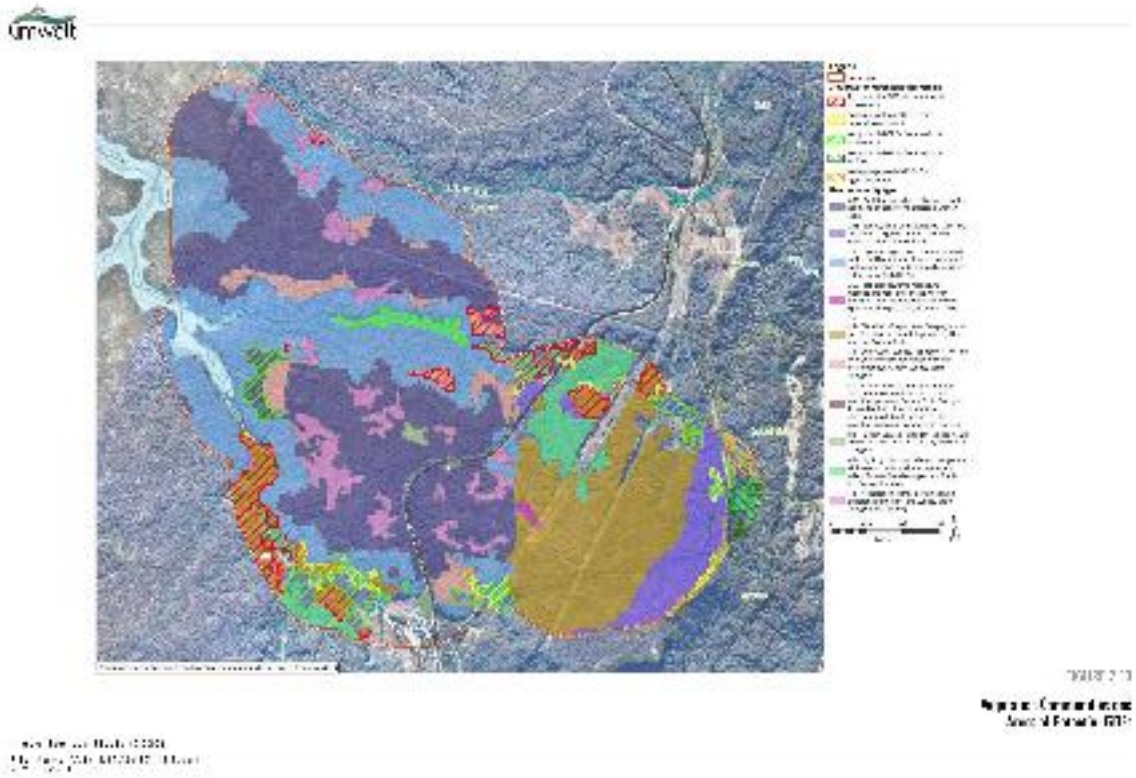


Figure 5: Vegetation communities in the proposed action area. Plant Community Types 978 and 1256 correspond to Coastal Upland Swamps

80. The subsidence assessment report noted that incremental subsidence associated with the proposed action is unlikely to exceed 100 mm, however observed subsidence may be larger (300 mm) if there are standing pillars which fail during the life of the project.

81. The predicted maximum vertical subsidence in all of the 12 swamps over Bulli Seam goaf areas 8-14 are lower than the maximum levels predicted and/or observed in Bulli Seam goaf areas 1-7. The PER states that Coastal Upland Swamps located over the Bulli Seam goaf areas (1-7) known to have fully collapsed have not experienced any catastrophic failure of ecological function.

82. The PER notes that impact on the surface water resulting from subsidence would only be material if greater than negligible subsidence was to occur. The peer review undertaken by Professor Hebblewhite agreed that the proposed action is not considered to have any potential or perceptible impacts on any surface features including creeks, drainage lines or the Cataract reservoir.

83. The department notes that additional subsidence below cliff lines and under rock platforms and shelfs has the potential to cause cliff line instability and cracking of rock features. Noting predicted subsidence impacts associated with the proposed action of up

to 100 mm, the subsidence assessment report considered it was unlikely to result in any cliff line instability or additional observable surface cracking in rocks.

Avoidance and mitigation measures

84. The following proposed avoidance and mitigation measures were informed by the environmental assessments completed for the proposed action under the NSW planning process, the NSW Development Conditions for the project, and advice from IESC and IAPUM.

85. Avoidance of subsidence through mine design is the key avoidance measure adopted by the proponent. The mine plan has been designed to be long-term stable with imperceptible subsidence and subsidence-related impacts. This has been achieved through using a long-term stable bord and pillar mine design. The selected mining method is highly flexible allowing for rapid changes should unexpected conditions be observed as part of ongoing subsidence and hazard monitoring during mining.

86. Monitoring will be implemented to confirm predicted low levels of subsidence and inform adaptive mine management measures if required.

87. Condition C1 of the NSW development consent includes specific performance measures for subsidence-related impacts, including that vertical subsidence from the proposed action must not exceed 300 mm.

88. As a precautionary measure, the proponent will commit to ensuring that the mine design will not result in vertical subsidence at the four affected Coastal Upland Swamps in excess of 100 mm. This is designed to limit the potential for any adverse impacts at these swamps due to the previous impacts from mining below and adjacent to these swamps.

89. A performance indicator of 100 mm vertical subsidence will be implemented for all other swamps overlying the proposed mining area. Should the subsidence monitoring indicate that subsidence at any swamp exceeds this performance indicator, the proponent has committed to potentially undertaking more intensive and additional groundwater and vegetation monitoring to provide early warning of any adverse impacts that may arise from elevated levels of subsidence.

90. A subsidence monitoring framework is in development as part of the NSW Extraction Plan process. The existing subsidence monitoring program for Russell Vale East is not considered appropriate for the proposed bord and pillar mining method of the proposed action. A full-time (continuous) high accuracy ground based system, backed up by accurate aerial or satellite based remote sensing on a regular basis, is considered a better way to measure the expected low-magnitude movements from the proposed action and any larger movements from the collapse of pillars remaining in the Bulli Seam that may occur during the life of the proposed action.

91. The use of GPS and remotely sensed data for this subsidence monitoring program is expected to provide higher levels of accuracy and more extensive terrain survey data than ground-based surveys.

92. Underground visual and geotechnical monitoring will also be used to ascertain whether there are any standing pillars within goaf areas as road headings advance below these areas. Should monitoring indicate that standing pillars may be present, operations below

the pillar would be halted until a risk assessment has been undertaken to ascertain whether the collapse of the pillar would potentially lead to an exceedance of performance measures.

Proposed conditions

93. The department notes the while the PER predicts that subsidence impacts are expected to be in the range of 100 mmm, this may be up to 300 mm. The department notes, that while 300 mm of vertical subsidence is not expected to create significant impacts generally, it is unclear whether this level of impact could adversely affect Coastal Upland Swamps. Therefore, the department recommends that you attach conditions to the approval to ensure the impacts of subsidence associated with the proposed action on the threatened ecological community of Coastal Upland Swamps are minimised.

94. In preparing the conditions (Attachment B), the department has taken into consideration the recommendations of the IESC and the NSW development consent which sets out conditions including performance measures and requirement for the proponent to prepare and implement management plans.

95. The department recommends that the approval holder must comply with conditions C1-C3 and C10-C11 of the NSW development consent (condition 2). This requires the approval holder to ensure that the proposed action does not exceed the subsidence impact performance measures set out in table 6 of the NSW development consent. The performance measures include, but are not limited to, negligible subsidence impacts or environmental consequence including diversion of flows or changes in the natural drainage behaviour of pools; and changes to the structural integrity of the bedrock base or any controlling rock bar of the Coastal Upland Swamp.

96. The department recommends that the approval holder be required to monitor the vertical subsidence to ensure that it does not exceed the subsidence limit of 100 mm at Coastal Upland Swamps. If the subsidence limit is exceeded, the approval holder must cease second workings and notify the department. Works may only re-commence if the approval holder can demonstrate that no new or increased impacts will occur (conditions 14-17).

97. It is also recommended that the approval holder be required to provide the department with the Extraction Plan required under Condition C10 (C10) of the NSW development consent (condition 5). The Extraction Plan must:

- provide details of the mine plan including the consideration of final pillar design dimension (pillar height to width ratio) and the long-term stability of pillars;
- provide revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences and validate them;
- describe in detail the performance indicators that would be implemented to ensure compliance with performance measures;
- confirm the status of the Bulli Seam goaf area;
- provide a groundwater monitoring program to monitor and report on the permeability, hydraulic gradient, flow direction and connectivity of deep and shallow groundwater aquifers;

- include a trigger action response plan which contains appropriate triggers to warn of increased risk of exceedances of any performance measures and/or indicators;
- provide contingency plans that provide for adaptive management where monitoring indicates that there have been exceedances; and
- provide a Subsidence Monitoring Program, and Swamp Monitoring Plan. The plans must include monitoring, triggers, and adaptive management to ensure the performance measures are not exceeded.

98. The department notes that the Extraction Plan requires the approval holder to further investigate the status of the Bulli goaf area (including numbers 8-14) and the hydrologic connectivity between the perched aquifers upon which the swamps rely and underlying groundwater which could be impacted by the proposed action. This will inform subsidence management measures and is consistent with the IESC recommendations.

99. Noting that the person proposing to take the action may seek to vary the NSW development consent conditions, the department recommends that the approval holder notifies the department within two business days of requesting changes to the conditions, and within 10 business days of the modifications having been approved by the NSW Planning Secretary (conditions 3-4).

100. Furthermore, the person proposing to take the action must notify the department of any proposed and approved changes to the Extraction Plan and provide a copy of the revised version within 10 business days of it being approved by the NSW Planning Secretary (conditions 5-6).

Conclusion

101. Based on the information provided, the department notes that there is a low likelihood that the proposed action may result in subsidence leading to cracking of the rock base or rock bar features overlying Coastal Upland Swamps and waterways.

102. The department concludes that the subsidence associated with the proposed action will not have unacceptable impacts on water resources provided the above recommendations and proposed mitigation measures are implemented.

Surface Water Impacts

Discharges of dewatered mine water

103. The extended duration of mining associated with the proposed action will necessitate the ongoing dewatering of mine workings. The existing workings are currently dewatered and have historically been dewatered with the predicted rates of dewatering required during the proposed action being well below the historical dewatering rates during the mining of longwalls 4, 5 and 6 in the Wongawilli Seam.

104. Dewatered mine water has historically and is currently treated on-site prior to discharge to Bellambi Gully at LDP2 in accordance with existing NSW Environment Protection Licence (EPL) conditions. Discharge water quality is managed to meet existing EPL criteria, and this will continue for the life of the proposed action with no proposed changes to water management processes required. The proposed action's incremental impacts are limited only to the extended duration of licenced discharges into Bellambi Gully.

105. Bellambi Gully is highly modified below the discharge point, due to ongoing commercial, industrial, and residential activities. The PER notes that the discharge is unlikely to result in further impacts on the aquatic environment, and as discussed above would be managed under the existing licence.

106. Condition B15 of the NSW development consent requires the approval holder to comply within the existing dewatering discharge limits (volume and quality). The IESC noted that in addition to the existing EPL, metals and metalloids should be tested to minimise impacts associated with ongoing dewatering.

Pit Top surface water run-off

107. The proposed action does not involve any changes to the existing Pit Top surface water management system. The extended life of the Pit Top facilities (up to 5 years) due to the proposed action is not considered to be material because the Pit Top is likely to remain disturbed for an extended period of time irrespective of the proposed action as part of the rehabilitation and redevelopment of the site. Existing on-site management arrangements would be extended to these activities for at least the period covered by the proposed action.

Mitigation measures

108. A Water Management Plan will be prepared in consultation with relevant agencies for approval prior to the commencement of mining, in accordance with condition B17 of the NSW development consent. This would ensure that monitoring is undertaken in a manner that enables assessment against performance measures. A draft of the Water Management Plan has been provided at Appendix Q of the PER (Attachment C1). The Water Management Plan includes a Surface Water Management sub-plan, which outlines the following objectives:

- provide methods to monitor watercourse instability;
- identify surface water quantities and qualities;
- identify potential impacts associated with the mining operation; and
- provide appropriate mitigation measures and responses where necessary.

Groundwater Impacts

Depressurisation

109. The mining of the Wongawilli Seam directly results in inflows to the mining void which reduces groundwater pressures within the coal seam and immediately adjacent groundwater systems. This impact is certain to occur and is related to other induced (indirect) groundwater related impacts.

110. Groundwater modelling has indicated that the influence of the proposed action can be broken down into the depressurisation of two separate regimes:

- within the Wongawilli seam, and
- overburden above the Wongawilli Seam.

111. The proposed action would cause the Wongawilli Seam and overburden immediately overhead to be depressurised to atmospheric pressure. There would be minimal propagation of depressurisation above the Bulli Seam at the end of the mining period due to the lack of goaf development and associated subsidence associated with the bord and pillar mining method.

112. A maximum drawdown of up to 50 m within and immediately above the Wongawilli Seam is predicted to occur out to a distance of approximately 0.5 km from the proposed action.

113. The overlying Balgownie and Bulli seams have previously been mined and therefore significant depressurisation has occurred historically. Groundwater assessment and modelling undertaken by the proponent at Appendix I of the PER (Attachment C1) shows maximum predicted drawdown of up to 5 m within the Balgownie Seam due to the proposed action, localised over the proposed bord and pillar workings.

114. The Bulli Seam has been mined over a long period of time over a large regional area. Within the Russell Vale area where there is over 100 years of historical mining activity, unsaturated voids still exist and continue to be drained. As such the Bulli Seam is generally dry at the proposed action study area. The proposed action is predicted to delay recovery within the historical workings but not affect the final level on the long-term recovery.

115. The proposed action is not predicted to result in a change in existing connective cracking/goaf effects. Groundwater impacts will therefore be largely localised to within 50 m above the Wongawilli Seam with the shallower groundwater levels in this area predicted to be unaffected by the proposed action.

116. Groundwater within the upper Hawkesbury Sandstone could undergo a water level reduction over the proposed workings if subsidence occurs, but this would be a consequence of transmitted depressurisation from the triple seam mined areas, and not directly due to the proposed action.

Post closure recovery impacts

117. Post-closure, groundwater levels within the coal measures are likely to recover back towards pre-mining conditions over time. It is anticipated that if groundwater levels recover sufficiently, there is potential for natural seepage from the escarpment. Therefore, existing adits (remaining from historical mining) may form a potential pathway for additional seepage post closure.

118. The Wongawilli Seam Adits are located in the Bellambi Gully catchment and any discharges from the adits would flow into Bellambi Gully. Water quality may be impacted if untreated adit outflow water interacts with surface water within Bellambi Gully.

119. Due to the increased underground void area created by the proposed mining and continued dewatering to facilitate mining, the proposed action will delay outflows relative to existing approved operations. As a result of the proposed action, it has been predicted that adit outflows would not occur for several decades after the cessation of mining and cessation of discharges to Bellambi Gully associated with Pit Top facilities and dewatering activities.

120. Any post-mining adit outflows will require management. The PER provides the following management options:

- use of untreated water for industrial purposes;
- treatment of water for other beneficial reuse purposes (including potable uses); and
- controlled discharge to Bellambi Gully.

121. Discharge of water from the adits to Bellambi Gully has the potential to impact the downstream aquatic environment, as this water will have interacted with coal reject material which will be placed in the underground workings once mining is completed. However, the proposed action will not change the type or magnitude of impacts associated with discharges to Bellambi Gully relative to approved operations, other than impacts potentially associated with the underground disposal of rejects.

122. Potential ecological impacts can arise when this water discharges to the surface water environment as it may contain a range of dissolved metals found within the reject material. Since the reject material is broken rock, groundwater more rapidly dissolves the metals contained in the reject material than under natural aquifer conditions.

123. As outlined below as a proposed mitigation measure, rejects will be tested prior to underground disposal with underground emplacement not pursued if this testing indicates a potential for significant adverse impacts on water quality within the mining void.

Mitigation measures

124. A Water Management Plan will be prepared in consultation with relevant agencies for approval prior to the commencement of mining, in accordance with condition B17 of the NSW development consent. This would ensure that monitoring is undertaken in a manner that enables assessment against performance measures. A draft of the Water Management Plan has been provided at Appendix Q of the PER (Attachment C1).

125. Reject material meeting NSW EPA standards for beneficial reuse will be prioritised for reuse in preference to emplacement underground. This would minimise adverse impacts on groundwater quality within the coal seam associated with underground emplacement of reject material and ensure that waste material is minimised.

126. If reject material cannot be beneficially reused, it will be subject to leachate testing prior to the first instance of underground emplacement to ensure that it is suitable for underground emplacement. Geochemical testing undertaken on a six-month basis during the course of the proposed action will be used to confirm continued suitability for underground emplacement. A Groundwater Management Plan will be developed prior to any underground disposal and will detail all monitoring and management requirements related to the disposal of reject material underground.

127. An Adit Discharge Water Management Plan will be prepared and submitted for approval to the NSW Planning Secretary within 12 months of commencing mining. This will include plans for the control and treatment of groundwater seepage from existing adits post-mining, and additional monitoring and modelling to inform the detailed design of arrangements for the treatment and discharge of water to Bellambi Creek.

This management plan will ensure that adit outflows are managed to prevent further adverse impacts on environmental values of Bellambi Gully.

Proposed Conditions

128. In preparing the proposed conditions (Attachment B), the department has taken into consideration the recommendations of the IESC (Attachment E1) and the NSW development consent which sets out conditions including performance measures and requirements for the proponent to prepare and implement management plans.

129. The department recommends that the approval holder must comply with conditions B12-B20 of the NSW development consent relating to managing potential impacts to water resources (condition 2). This includes a requirement for the approval holder to ensure that the proposed action does not exceed water management impact performance measures. The performance measures are grouped under general water management, erosion and sediment control works, clean water diversions and storage infrastructure, flood protection works, mine water storages, chemical and hydrocarbon storage, and aquatic and riparian ecosystems.

130. It is also recommended that the approval holder be required to provide the department with the Water Management Plan required under Condition B17 and the Adit Discharge Water Management Plan required under Condition B19 of the NSW development consent (condition 5).

131. The Water Management Plan must include:

- baseline data on surface water flows that could be affected and groundwater levels, yield, and quality in the region;
- surface and groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse impacts on water resources or water quality;
- surface and groundwater monitoring programs;
- adaptive management practices implemented to guide future mining activities in the event of greater than predicted impacts on aquatic habitat;
- a program to validate the surface water and groundwater models for the development, and
- a plan to respond to any exceedances of the surface water and groundwater assessment criteria.

132. The department recommends that in addition to the monitoring requirements specified in the Groundwater Management Plan required under condition B17 of the NSW development consent, and in order to address issues identified by the IESC (Attachment E1), the approval holder must:

- establish and maintain a network of groundwater monitoring bores designed to detect changes in groundwater levels in all potentially impacted aquifers including the shallow aquifers that support the Coastal Upland Swamp, and to determine connectivity between aquifers (condition 7a);

- submit groundwater drawdown limits for groundwater monitoring sites located within Coastal Upland Swamps. The groundwater drawdown limits must be numerical values and justified through analysis of baseline groundwater monitoring data collected prior to impacts of the proposed action (condition 7b). The groundwater limits must be approved by the minister prior to commencing second workings (condition 7c);

- monitor groundwater levels in each bore at least once every 3 months, for the life of this approval (condition 7d); and

- publish online the groundwater monitoring data from the bore network, updated at least once every three months and displayed relative to performance measures for the life of the approval (condition 7e).

133. The IESC noted that a broad range of metals and metalloids should be tested to minimise impacts associated with the adit discharge (Attachment E1). To address these concerns the department recommends that in addition to the requirements specified in the Adit Discharge Water Management Plan required under Condition B19 of the NSW development consent, the approval holder must:

- provide for approval water quality limits for water discharging into Bellambi Gully (condition 8a) to ensure that there is no adverse impact (per condition 1) to Bellambi Gully;

- not commence second workings until the water quality limits have been approved by the Minister in writing (condition 8b);

- monitor any outflow from the adits at least once every week for the life of the approval, starting within one week of the commencement of the action (condition 8c);

- publish the monitoring data collected in accordance with condition 8c online, updated at least once every three months and displayed relative to the approved limits required in condition 8a (condition 8d); and

- report on the monitoring data in annual compliance reports. This must also include an evaluation of the data against the water quality limits (condition 8e).

134. The department also recommends that if the approval holder detects that the water quality limits are reached or exceeded the approval holder must prevent any adit discharge water that reaches or exceeds any approved water quality limit from entering any waterway within two business days and inform the department (condition 9 and 12).

135. The approval holder cannot discharge adit water until monitoring data can be provided that demonstrates the water quality limits are no longer being reached or exceeded (condition 13).

136. The department notes that the Water Management Plan requires a program to periodically validate the surface water and groundwater models for the proposed action and compare monitoring results with modelled predictions. This is consistent with the IESC recommendations (Attachment E1).

Conclusion

137. Following consideration of the information discussed above, the department is satisfied that the proposed action will not have unacceptable impacts on water resources, provided it is taken in accordance with the proposed conditions listed above.

138. On this basis, the department recommends approving the proposed action for the purposes of sections 24D and 24E of the EPBC Act.

Listed threatened species and ecological communities (sections 18 and 18A)

139. The department's Environmental Reporting Tool (ERT) identifies 106 listed threatened species and 16 ecological communities that may occur within 10 km of the proposed action area (Attachment I).

140. Based on the nature and location of the proposed action, habitat known to be present on the site and survey results, the department has assessed the likely impacts to:

- Coastal Upland Swamps in the Sydney Basin Bioregion – Endangered;
- Macquarie Perch (*Macquaria australasica*) – Endangered;
- Silver Perch (*Bidyanus bidyanus*) – Critically Endangered;
- Prickly Bush-pea (*Pultenaea aristata*) – Vulnerable;
- Giant Burrowing Frog (*Heleioporus australiacus*) – Vulnerable;
- Littlejohn's Tree Frog (*Litoria littlejohni*) – Vulnerable;
- Stuttering Frog (*Mixophyes balbus*) – Vulnerable;
- Broad-headed Snake (*Hoplocephalus bungaroides*) – Vulnerable; and
- Large-eared Pied Bat (*Chalinolobus dwyeri*) – Vulnerable.

141. All data on the above listed species and ecological communities has been sourced from the department's Species Profile and Threats Database (SPRAT), unless otherwise stated. The information represented in SPRAT considers the conservation advices and recovery plans, as well as threat abatement plans where relevant.

Coastal Upland Swamps in the Sydney Basin Bioregion – Endangered

142. Coastal Upland Swamps in the Sydney Basin Bioregion ecological community includes a range of vegetation and fauna associated with periodically waterlogged soils on the Hawkesbury sandstone plateau. It is characterised by highly diverse and variable mosaics of vegetation depending on soil condition, size of the site, recent rainfall, fire regimes and disturbance history.

143. The ecological community is endemic to NSW, where in the south it primarily occurs on the Woronora plateau. It is highly dependent on hydrological processes such as precipitation, run-off, and percolation, which limit the distribution of the community.

144. The approved Conservation Advice (including listing advice) for Coastal Upland Swamps states that given the very specific set of variables required for Coastal Upland Swamps to develop and persist, the areas currently occupied and the associated sub-catchments are considered to be areas critical to the survival of the community.

Proposed action area

145. There are 39 Coastal Upland Swamps mapped within the proposed action area classified as upland headwater swamps. All 39 swamps are considered to meet the EPBC Act listing criteria for the Coastal Upland Swamps in the Sydney Basin Bioregion EEC. These swamps have an average size of 1.26 ha and cover a total area of approximately 49 ha. Twenty-seven (27) of these Coastal Upland Swamps are located over the proposed bord and pillar workings.

146. The Coastal Upland Swamps in the proposed action area may provide suitable habitat for a number of threatened species listed under the EPBC Act, including some flora and amphibian species.

147. The swamps within the proposed action area were found to differ from other Coastal Upland Swamps on the Woronora plateau in that they are predominantly drier, smaller and with shallower soils (up to 1.8 m deep).

148. The PER notes that these Coastal Upland Swamps are located over Hawkesbury sandstone, which provides a low permeability base on which the swamps sediments and organic matter accumulate. The Coastal Upland Swamps largely rely on rainfall recharge directly into the sandy sediments and accumulated organic matter.

149. Most of the swamps within the proposed action study area have previously been undermined by workings in the Bulli Seam with a number also undermined by workings in the Balgownie Seam and Wongawilli Seam. Predicted and observed subsidence effects at swamps have occurred due to this historical mining.

Impacts

150. The proposed action does not involve additional surface disturbance or the clearing or removal of vegetation. The proposed action will therefore not have any direct impacts on the Coastal Upland Swamp.

151. The department notes that the proposed action may result in indirect impacts associated with subsidence and groundwater drawdown.

Subsidence

152. As noted in the discussion on water resources, the predicated incremental subsidence associated with the proposed action is 100 mm. Although the level of subsidence is considered to be minimal, it may result in fracturing of bedrock beneath Coastal Upland Swamp and changes in water distribution resulting from surface deformation.

153. The fracturing of the bedrock can lead to water loss from the perched aquifer into the subsurface flow. This may result in the Coastal Upland Swamp drying out, therefore a change in the extent and composition of the vegetation and fauna habitats.

154. The potential surface deformation may result in minor changes to the topography due to tilts and uplifting. Some parts of the swamp may subside more than others leading to localised redistribution of water. Tilting of sufficient magnitude can also result in scour and erosion, potentially allowing water to escape from the swamp margins (possibly affecting the whole swamp) or to alter water distribution in parts of the swamp, thus favouring some vegetation associations over others.

155. The PER notes that monitoring undertaken at previously mined Coastal Upland Swamps had identified softening of the bridging capacity of the underlying rock strata, and that the subsidence was restricted to the immediate area overlying goaf. The monitoring also noted that some areas observed a decline in water level and soil moisture, however the composition and extent of the vegetation did not significantly change.

156. Monitoring undertaken in 2010 during the drought conditions showed evidence of dieback in the Coastal Upland Swamps in both mined and undermined areas. The PER noted that the die back was more acute in areas that had been undermined, and this may indicate that these Coastal Upland Swamps have a reduced resilience to environmental stress. The IESC also noted that the impacts of altered water regimes associated with subsidence may increase the vulnerability of the Coastal Upland Swamps to events such as bushfires.

157. The PER states that the proposed mine plan has been designed to be long-term stable so as to limit any strata deformation and/or cracking impacts above the coal seam that could result in cumulative subsidence related impacts in the historical multi-seam mining environment.

158. The PER concludes that the proposed action is not expected to result in perceptible surface subsidence and is not considered to have any potential to perceptibly impact on Coastal Upland Swamp through changes in surface water flows.

159. In addition, the subsidence assessment report and the pillar risk assessment report noted that the proposed action is unlikely to result in a catastrophic impact to the Coastal Upland Swamp.

Groundwater

160. The PER identified the potential for drawdown within the shallow water table as part of the proposed action. The drawdown is isolated to the area above the existing longwalls 4 and 5 and is associated with a delay in the recovery of the groundwater systems impacted by historical mining.

161. The impacts from historical mining are predicted to have already caused a drawdown of around 7 m. The proposed action is expected to result in a further 2 m of drawdown in this area.

162. The PER notes that Coastal Upland Swamp mapped in this area are associated with a perched aquifer and disconnected from the underlying water table in the Hawkesbury Sandstone. Therefore, potential drawdown on the shallow water table is unlikely to impact the swamps.

Approved conservation advice, recovery plans and threatened abatement plans

163. The approved Conservation Advice for Coastal Upland Swamps states that changes in hydrology such as those induced by mining subsidence are one of the key threats to Coastal Upland Swamps. As discussed above the fracturing and deformation associated with mining can result in the altered flow regimes which have the potential to change the extent and composition of the swamps.

164. The approved Conservation Advice also notes that subsidence impact may be sufficiently low for impacts to be considered negligible where mining techniques such as bord and pillar are used rather than longwalls.

165. The department notes that the predicated levels of subsidence for the proposed action are expected to have negligible environmental consequences.

166. Other threats to Coastal Upland Swamps include invasive species, risk of fires, habitat loss, disturbance, and modification. The proponent has provided mitigation measures to address the impacts associated with the proposed action and these are discussed below.

167. One threat abatement plan (TAP) was identified relevant to the Coastal Upland Swamps; Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi.* This TAP provides strategies to prevent Phytophthora spreading into areas that are free of disease and strategies to reduce the impacts in infested areas.

168. The department notes that die back within the Costal Upland Swamps was detected in previous ecological surveys. The PER notes that this was largely a result of drought conditions, and there is no indication that it was related to infection from *Phytophthora cinnamomic.*

169. The proposed action does not involve any surface activity, and therefore the department considers that the proposed action is unlikely to promote the spread of *Phytophthora cinnamomic* in the proposed action area.

170. There is no approved or adopted recovery plan for the Coastal Upland Swamp ecological community.

Mitigation measures

171. The following mitigation measures were provided in the PER to minimise and manage the impacts of the proposed action on Coastal Upland Swamps:

- A Biodiversity Management Plan will be prepared in consultation with DPIE Biodiversity Conservation Division as part of the Extraction Plan in accordance with Condition C10 (iv) of the NSW development consent (Attachment F)
- An Upland Swamp Ecological Monitoring Program will be prepared in consultation with DPIE Biodiversity Conservation Division, DPIE Water and Water NSW as part of the Extraction Plan in accordance with Condition C10 (v) of the NSW development consent (Attachment F).
- The approval holder will undertake swamp specific risk assessments for all swamps as part of the NSW Extraction Plan process. The risk assessment will be completed as part of the Extraction Plan processes for any mining under these swamps and will require the approval of the NSW Planning Secretary under the requirements of the NSW Extraction Plan process.
- Where an unacceptable risk is identified through the risk assessment process, additional mitigation measures will be utilised to reduce the level of risk to an acceptable level. This may include measures such as installation of additional roof supports or amendments to

the mine plan or panel design to reduce the risk of additional subsidence effects to these swamps.

- The PER also noted that the site water balance will be updated as part of the development of management plans and will be further reviewed annually based on monitoring and any modelling updates.

Residual impacts

172. The PER states that due to the proposed mining method and mine design, the proposed action is not expected to have any direct or perceptible indirect impacts on Coastal Upland Swamps and therefore no residual significant impacts are expected.

173. The NSW development consent provides provisions for offsetting in the event of greater than negligible environmental consequence to threatened species or communities as a result of the proposed action. The PER states that where monitoring detects more than a negligible impact on a Coastal Upland Swamp, an offset will be identified and retired in accordance with the Biodiversity Offset Scheme of the *NSW Biodiversity Conservation Act 2016* (NSW). The department agrees with this approach.

Proposed conditions

174. The IESC recommended swamp-specific ecological monitoring should commence at least two years before mining to establish baseline data, then continue during the life of the mine and for a suitable period afterwards until the risk of any further ground movements can be demonstrated to be negligible.

175. The PER notes that ecological swamp monitoring has been undertaken in the proposed action study area since 2005. To ensure the monitoring data was considered a suitable robust baseline, the proponent must prepare a statistical analysis of the dataset.

176. The department's Office of Water Science (OWS) reviewed the analysis and confirmed that the existing monitoring data provides a suitable established baseline for future monitoring. Based on this, the department is of a view that two years of baseline monitoring data is not required.

177. The department recommends the following conditions be attached to the approval to further minimise the impacts of the proposed action on Coastal Upland Swamps:

- The approval holder must submit groundwater drawdown limits for groundwater monitoring sites located within the Coastal Upland Swamps. The groundwater drawdown limits must be numerical values and justified through analysis of baseline groundwater monitoring data collected prior to impacts. The groundwater limits must be approved by the Minister prior to commencing the proposed action (condition 7b and 7c).

- The groundwater level must be monitored at least every three months for the life of the approval (condition 7d), and data submitted to the department and published on the internet (conditions 7e).

- The monitoring data must be reported in the annual compliance reports and include an evaluation of performance against the groundwater drawdown limit/s and the performance measures specified in the State development consent (condition 7i).

- The approval holder be required to provide an Extraction Plan in accordance with condition C10 of the NSW development consent. The Extraction Plan includes a biodiversity management plan and a swamp monitoring program. These plans aim to provide a baseline ecological monitoring data including the water table depth, performance indicators, and adaptive management measures to minimise impacts of the proposed action on Coastal Upland Swamps (condition 2, 5, and 6).

- establish and maintain monitoring capable of determining individual water balance for the Coastal Upland Swamps (condition 7f) and monitor every three months (condition 7g). This data must be published and provided in the compliance reporting with an evaluation against the groundwater drawdown limits and performance measures identified in the NSW development consent (conditions 7h and 7g). The requirement to calculate and monitor swamp-specific water balances, including references swamps. was recommended by the IECS. The IESC advice noted that these are needed to differentiate changes caused by mining from those associated with natural and climatic variability and will be required to demonstrate negligible impact from the project (Attachment E1).

- The approval holder be required to determine a baseline for subsidence at each potentially impacted Coastal Upland Swamp and monitor vertical subsidence using an approach consistent with condition C2 of the NSW development consent and publish the monitoring data on the proponent's website (condition 14).

- If at any time, until the end date of the approval, vertical subsidence at any Coastal Upland Swamp that exceeds the subsidence limit of 100 mm the approval holder must notify the department and cease second workings within two business days (conditions 15-17). This subsidence limit is in addition to the performance measures set out in the NSW development consent, and reflects the predicated subsidence discussed in the PER. The department considers that the subsidence limit of 100 mm is necessary to ensure the subsidence impacts on the Coastal Upland Swamps are minimised. The subsidence limit of 100 mm was also recommended by the IESC (Attachment E1).

- The approval holder can only re-commence second workings when it can be demonstrated that new or increased impacts will not occur and the Minister approves, in writing, the recommencement (condition 17).

- The NSW development consent requires an offset be provided for Costal Upland Swamps if the performance measures are exceeded, and if it is determined that remediation it is not feasible or if remediations fails. The department agrees with this approach and recommends that offsets be provided in accordance with the NSW development consent (condition 18).

- The department considers that these conditions above and those recommended in paragraph 93-100 (subsidence) will ensure that any subsidence is detected early and avoids catastrophic impacts on the Coastal Upland Swamps.

Conclusion

178. The department concludes the proposed action will not have unacceptable impacts on Coastal Upland Swamp provided the above recommendations and proposed mitigation measures are implemented.

Prickly Bush-pea (*Pultenaea aristata*) – Vulnerable

179. The Prickly Bush-pea is a small shrub, usually less than 40 cm tall. The species is restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Kiera above Wollongong.

180. The Prickly Bush-pea is often associated Coastal Upland Swamps vegetation complex and is also known to occur in dry sclerophyll woodland and gully forest plant communities.

181. The species is known to be widely distributed throughout the proposed action study area and locality, and occurs in a variety of vegetation communities, particularly drier margins of upland swamps and surrounding sandstone woodland.

182. The PER notes that the Prickly Bush-pea was recorded at a number of Coastal Upland Swamps within the proposed action study area.

Approved conservation advice, recovery plans and threatened abatement plans

183. The approved conservation advice for the Prickly Bush-pea notes the main threats to the species are inappropriate fire regimes, understorey clearing, widening and easement maintenance practices. The advice also includes actions to minimise the impacts of these threats including managing changes to hydrology, weed management, surveys of known and suitable habitat.

184. The proposed action only involves underground mining operations, and no clearing or disturbance to vegetation will be undertaken. The department notes that the proposed action does have the potential to alter water regimes, due to subsidence, within the Prickly Bush-pea habitat. In addition to the proposed mitigation measures identified in the PER, the department has recommended conditions to further minimise the impacts of the proposed action on the Prickly Bush-pea, and its habitat. The conditions are discussed below and in the Coastal Upland Swamp section of this report.

Impacts

185. The proposed action does not involve additional surface disturbance or the clearing or removal of vegetation. Proposed action will therefore not have any direct impacts on the Prickly Bush-pea.

186. Any impacts to Prickly Bush-pea are therefore limited to potential indirect impacts associated with subsidence from the underground mining activities to the sensitive habitats identified, such as if there was any potential for surface cracking and hydrological changes affecting surface water regimes.

187. In addition, the PER states that the species grows in sandstone areas, on the edges of swamp habitats necessitating a shallow root depth which would be unaffected by changes in water table at depths greater than five metres.

188. Consistent with the discussion of Coastal Upland Swamps above, the potential for indirect impacts to this species is predicted to be very rare to negligible.

189. The mitigation measures for Coastal Upland Swamps discussed above are also relevant for this species.

190. Due to the proposed mining method and mine design, the proposed action is not expected to have any direct impacts on this species. With the implementation of proposed management measures, it is unlikely to indirectly impact on the habitat of the Prickly Bush-pea.

Recommendation

191. The department considers that the conditions recommended for subsidence (paragraph 93-100 and paragraph 174-177) will be sufficient to minimise the impacts of the proposed action on the Prickly Bush-pea. No further conditions are recommended.

Conclusion

192. Given the above information, the department considers that the proposed action would not have an unacceptable impact on Prickly Bush-pea, provided that it is undertaken in accordance with the conditions recommended by the department.

EPBC Listed fish species

193. The PER identified four EPBC fish species as likely to occur within the proposed action area:

- Murray cod - the Murray cod is the largest freshwater fish found in Australia. The Murray cod was translocated into Cataract Dam (Nepean River NSW), have hybridised, and the cod population existing there is composed largely of hybrids.
- Trout cod - this species is a moderately large freshwater fish endemic to the Murray-Darling River system in south-eastern Australia. The species was translocated into several waters outside its recorded range, including Cataract Dam on the Nepean River prior to 1910.
- Silver Perch - the Silver Perch are endemic to the Murray-Darling system however a self-sustaining population of Silver Perch occurs in Cataract Dam in the Hawkesbury-Nepean system. Silver Perch spawn in spring or summer.
- Macquarie Perch - extant populations of the Macquarie Perch are known to occur in the Hawkesbury-Nepean catchment on the east coast, but populations are often small and geographically separated. Macquarie Perch spawn from October to December at sites located at the downstream end of pools.

194. The PER notes that targeted aquatic surveys undertaken between 2009 -2019 identified Macquarie Perch and Silver Perch in lower reaches of Cataract Creek approximately 12 m upstream of the full supply level of Lake Cataract. The surveys also identified a species of freshwater cod which was assumed to be either Murray Cod or Trout Cod.

Approved conservation advice, recovery plans and threatened abatement plans

195. The approved Conservation Advice for the Silver Perch identifies the key threats to the species as river regulation blackwater events (resulting from floods), alien pathogens and fish entering the waterway, and habitat degradation. Whilst these threats are largely related to the habitat in the Murray-Darling River system, the department has also considered the threats in relation to the proposed action and habitat within the Cataract Dam.

196. The main threats to Macquarie Perch identified in the approved Conservation Advice include human activity-induced sedimentation increases; competition and predation by alien fish species including carp, gambusia, redfin perch and trout; barriers to fish movement; and altered flow regimes. The advice also states a number of priority actions for the recovery and management of threats including managing changes to hydrology including the quality of water.

197. The National Recovery Plan for the Macquarie Perch provides a framework to guide and coordinate the recovery of the species throughout its range within Australian waters. The plan identifies the following key actions to achieve this goal:

- prompt action to mitigate the key threats to the Macquarie Perch and also provide valuable information to help identify long-term population trends. This involves protecting the species from competition, impact of recreational fishing and disease; restoring connectivity through breeding and translocation programs
- provide a more informed basis for the long-term management and recovery of the Macquarie Perch. Key task includes undertaking rehabilitation, managing appropriate flow regimes, minimising cold water pollution and instream habitat improvement.
- assessment of trends in that recovery including investigation into methods to promote recruitment in naturally occurring populations and gaining a better understanding of competition and predations on Macquarie Perch. The recovery plan notes that this is desirable but not critical to the Macquarie Perch.

198. The department notes that the proposed action only involves the underground bord and pillar operation, therefore it is unlikely that the proposed action would result in alien pathogens or fish being released into the aquatic environment.

199. The proponent has provided measures to mitigate the impacts associated with potential discharge from the adits and will maintain surface discharges in accordance with the existing water licences. The department considers that the mitigation measures provided in the PER are not inconsistent with the actions identified in the recovery plan.

200. In addition, as discussed in paragraph 128-136, the department has recommended conditions to ensure that the water impacts associated with the proposed action are managed to minimise impacts on EPBC listed fish species.

201. The department notes there are no approved Conservation Advices for the Murray cod or trout cod. Furthermore, there are no recovery plans or threatened abatement plans for any of the Silver Perch, Murray cod or Trout cod.

Impact

202. Impacts associated with the proposed action on aquatic habitats include adverse impacts of water quality from adit discharge water and loss of surface flow, and reduction in baseflow due to subsidence. The department notes that these impacts may result in degradation of the EPBC listed fish habitats.

203. The PER notes that Bellambi Creek flows into the Pacific Ocean, therefore the discharge is not expected to impact on the Cataract Creek, Lake Cataract or Nepean river where the fish are known to occur.

204. The PER concludes that the proposed action is not expected to result in perceptible surface subsidence and is not considered to have any potential to perceptibly impact on natural surface features, including small creeks and tributaries, Cataract Creek and Cataract Reservoir. Therefore, no perceptible indirect impacts to aquatic environments supporting Murray Cod, Trout Cod, Silver Perch or the Macquarie Perch are expected occur as a result of the proposed action.

Recommendation

205. The department considers that the conditions recommended for subsidence (paragraph 93-100 and paragraph 174-177) and water management (paragraph 128-136) will be sufficient to minimise the impacts of the proposed action on the EPBC listed fish species. No further conditions are recommended.

Conclusion

206. Given the above information, the department considers that the proposed action would not have an unacceptable impact on Murray cod, trout cod, Silver Perch or the Macquarie Perch, provided that it is undertaken in accordance with the conditions of approval recommended by the department.

EPBC Listed frog species

207. The PER identified three EPBC listed frog species as likely to occur within the proposed action area:

- Giant Burrowing Frog - occurs in areas of native vegetation and can be found in heath, woodland, and open dry sclerophyll forest on a variety of soils, except those that are clay based. The species has not been recorded in cleared land. Breeding habitat is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water.
- Littlejohn’s Tree Frog - Littlejohn's Tree Frog is known to inhabit forest, coastal woodland, and heath from 100 to 950 m above sea level but is not associated with any specific vegetation types.
- Stuttering Frog - found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. It breeds in streams during summer after heavy rain. Eggs are laid on rock shelves or shallow riffles in small, flowing streams, and as the tadpoles grow, they move to deep permanent pools and take approximately 12 months to metamorphose.

208. The PER identified potential breeding and non-breeding habitat for all of the above EPBC listed frog species.

209. Habitat for the Giant Burrowing Frog and Littlejohn's Tree Frog was recorded in small sections of the upper tributaries within the proposed action study area.

210. The Giant Burrowing Frog was recorded in pools in an unmapped tributary of Costal Upland Swamp (CRUS2) located on the southern boundary of the proposed action study area. No records of the Littlejohn’s Tree Frog were found in the proposed action study area.

211. The PER states that the Stuttering Frog is not known from localities with disturbed riparian vegetation or significant human impacts upstream. The adopted recovery plan for the species notes that the Stuttering Frog is dependent on the integrity of the physical stream habitat. The PER notes that the habitat in Cataract Creek was found to exhibit pollution due to run-off from Mount Ousley Road, as well as high levels of iron flocculent from past mining. The PER concludes that although there is potential suitable habitat for the species, it is considered sub-optimal. The Stuttering Frog was not recorded during the ecological surveys.

Approved conservation advice, recovery plans and threat abatement plans

212. The approved conservation advice for the Giant Burrowing Frog identifies the key threats as habitat loss through clearing of vegetation, hydrological changes due to subsidence from longwall mining, forestry operations and infection from chytrid fungus.

213. The main threats identified in the approved conservation advice for the Littlejohn's Tree Frog includes habitat disturbance, fragmentation and degradation, frequent fires from chytrid fungus.

214. There is no approved conservation advice for the Stuttering Frog. The adopted national recovery plan for the Stuttering Frog notes the species has suffered an extensive decline in distribution and abundance. Formerly occurring from north-eastern NSW to far eastern Victoria, the species is now rare or absent throughout much of its former range. The key threats to the species are considered to be habitat destruction and disturbance, altered hydrological regimes, disease, and pollution.

215. The recovery plan also identifies a number of actions required for the species including:

- determine the distribution, habitat requirements, conservation status, taxonomy, population demography and genetic structure of Stuttering Frog populations.
- identify and address the causal factors of the decline and prevent the local extinction of important populations of the Stuttering Frog across it geographic range.
- build community support for the Stuttering Frog recovery program.

216. The proponent has provided measures to mitigation the impacts associated with potential subsidence and discharge from the adits. As discussed in the paragraph 93-100 and paragraph 174-177 and paragraph 128-136 above, the department has recommended conditions to ensure that the subsidence and water impacts associated with the proposed action are managed to minimise the impacts on the EPBC listed frog species. The department notes that the proposed mitigation measures and recommended conditions are not inconsistent with the recovery plans actions.

217. There is no recovery plan for the Giant Burrowing Frog or Littlejohn's Tree Frog.

218. The threat abatement plan relevant to all EPBC listed frog species is the Threat Abatement Plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis (chytrid TAP). The chytrid TAP has two broad goals:

- to prevent amphibian populations or regions that are currently chytridiomycosis-free from becoming infected by preventing further spread of the amphibian chytrid within Australia; and

- to decrease the impact of infection with the amphibian chytrid fungus on populations that are currently infected.

219. The department notes that the proposed action only involves the underground bord and pillar operation, therefore it is unlikely that the proposed action would result in the transfer of chytrid fungus.

Impacts

220. The PER noted that impacts associated with the proposed action on the non-breeding habitats for the frog species are considered negligible

221. As discussed above, subsidence may cause fracturing of the bedrock resulting in the potential loss of water from swamps and drainage line leading to drying out of pools prior to tadpoles reaching metamorphosis. This could result in further declines of the EPBC listed frog species.

222. The proposed action will involve bord and pillar techniques, which are designed to be long-term stable and reduce the impacts associated with subsidence. The PER notes that the predicated subsidence is expected to be 100 mm, consequently there is likely to be only minimal subsidence impacts to the ground surface.

223. The PER concludes that the proposed action is not considered to have any potential to perceptibly impact on natural surface features, including small creeks and tributaries, Cataract Creek and Cataract Reservoir. Therefore, no perceptible indirect impacts to aquatic environments supporting Giant Burrowing Frog, Littlejohn's Tree Frog, and Stuttering Frog are expected as a result of the proposed action.

Proposed conditions

224. The department considers that the conditions recommended for subsidence (paragraph 93-100 and paragraph 174-177) and water resources (paragraph 128-136) will be sufficient to minimise the impacts of the proposed action on the EPBC listed frog species. No further conditions are recommended.

Conclusion

225. Given the above information, the department considers that the proposed action would not have an unacceptable impact on Giant Burrowing Frog , Littlejohn's Tree Frog, or the Stuttering Frog, provided that it is undertaken in accordance with the conditions of approval recommended by the department.

<u>Broad-headed Snake</u>

226. The Broad-headed Snake occurs on exposed rocky sites on sandstone outcrops and benching within woodland, open woodland and /or heath.

227. The species is nocturnal, and shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter, and spring, and moves from the sandstone rocks to shelters in crevices or hollows in large trees within 500 m of escarpments in summer.

228. The PER notes that the Broad-headed Snake was not recorded during the targeted ecological surveys, and suitable habitat for the species within the proposed action study

area was considered limited due to historic removal of bush rock and lack of northwest facing sandstone benching with exfoliating sandstone.

229. The habitat assessment identified isolated patches of habitat for Broad-headed Snake with some sandstone benches and overhangs. The PER notes that these areas were monitored across two years, although no Broad-headed Snakes or their prey were detected.

Approved conservation advice, recovery plans and threat abatement plans

230. The approved conservation advice for the Broad-headed Snake identifies the key threats as disturbance of habitat (particularly tree removal and bush rock), urban development of the cliff tops and inappropriate fire regime.

231. There are no adopted or made recovery plans for the Broad-headed Snake.

232. The threat abatement plans relevant to the Broad-headed Snake, include the Threat abatement plan for predation by feral cats and Threat abatement plan for predation by the European red fox. The goal of both of these plans is to minimise the impact of exotic species on biodiversity by protecting affected threatened species.

233. The proponent has provided measures to mitigate the impacts associated with potential subsidence. As discussed in paragraph 93-100 and paragraph 174-177 above, the department has recommended conditions to ensure that the subsidence associated with the proposed action are managed to minimise the impacts on the Broad-headed Snake.

234. The department notes that the proposed action only involves the underground bord and pillar operation, therefore it is unlikely that the proposed action would result in the tree and/or bush rock removal or an increase in the European fox or feral cats.

235. The impacts to and recommendations relating to the Broad-headed Snake are discussed below jointed with the Large-eared Pied Bat.

<u>Large-eared Pied Bat</u>

236. The Large-eared Pied Bat is a medium-sized insectivorous bat measuring approximately 100 mm. Much of the known distribution is within NSW. Available records suggest that the largest concentrations of populations appear to be in the sandstone escarpments of the Sydney region.

237. The species appears to predominantly roost in caves and overhangs in sandstone cliffs and forage in nearby high-fertility forest or woodland near watercourses.

238. The PER notes that targeted surveys were undertaken for microchiropteran bats within the proposed action study area. No Large-eared Pied Bats were recorded.

239. Furthermore, a habitat assessment noted that cliffs providing suitable roosting habitat for Large-eared Pied Bat are limited within the proposed action study area, with suitable cliffs restricted to an area in the north of Cataract Creek. Although, no evidence of occupation of cliffs by Large-eared Pied Bat was observed during the habitat assessment.

Approved conservation advice, recovery plans and threat abatement plans

240. There is no approved Conservation Advice for the Large-eared Pied Bat, and no threat abatement plans have been identified as being relevant for this species.

241. The national recovery plans for the Large-eared Pied Bat notes the species is dependent on the presence of diurnal roosts for shelter. Roosts are utilised during the day and also at night when not feeding, as well as for the raising of young. Sandstone cliffs and fertile wooded valley habitat within close proximity of each other should be considered habitat critical to the survival of the Large-eared Pied Bat.

242. The recovery plan sets out a number of threats to the species, including mine induced subsidence of cliff lines (Attachment H3). Much of the habitat of the Large-eared Pied Bat occurs in sandstone escarpments, large parts of which are underlain by coal seams and potentially at risk of collapse from underground mining. This could be particularly problematic if a nursery roost collapsed, especially during the breeding season, as this could cause large losses to local population.

243. The recovery plan also identifies a number of actions required for this species including:

- reviewing all available species information identifying, mapping and modelling bat colonies
- identifying priority colonies for conservation management; surveying the species to clarify distribution and abundance to inform management
- protecting known roosts and associated foraging habitats
- managing threats through installation of bat gates, establishing fire management plans and control of introduced species
- initiating public education and extension programs to encourage the public to be involved in the recovery process
- developing press releases to promote the recovery program
- conducting further research into the biology and ecology of the species; and analysing population genetics.

244. The proponent has provided measures to mitigate the impacts associated with potential subsidence. As discussed in paragraph 93-100 and paragraph 174-177 above, the department has recommended conditions to ensure that the subsidence associated with the proposed action are managed to minimise the impacts on the Large-eared Pied Bat. The department notes that the proposed mitigation measures and recommended conditions are not inconsistent with the recovery plan.

Impacts to Broad-headed Snake and Large-eared Pied Bat

245. Subsidence associated with the proposed action may result in instability of the overhanging rock shelters and cliffs lines and fracturing of rocky outcrops.

246. The subsidence assessment report note that the predicted incremental vertical subsidence impact associated with the proposed action is 100 mm (and a consequent 0.5 mm/m tensile stain). This is considered unlikely to result in any cliff line instability or additional observable surface cracking in rocks.

247. In addition, the assessment noted that even the incremental impacts associated with an unlikely failure of a Wongawilli Seam pillar is considered unlikely to have a significant impact on these surface features.

248. The PER concludes the proposed action is not expected to result in perceptible surface subsidence and is not considered to have any potential to perceptibly impact on natural surface features, including cliffs and rocky outcrops. Therefore, no perceptible indirect impacts to rocky environments that may support the Broad-headed Snake or Large-eared Pied Bat are expected occur as a result of the proposed action.

Recommendation

249. The department notes that the performance measures required under conditions B16 and C1 of the NSW development consent require negligible consequences including subsidence rockfalls, displacement or dislodgement of boulders, slabs, or fracturing.

250. The department considers that the conditions recommended for subsidence (paragraph 93-100 and paragraph 174-177) will be sufficient to minimise the impacts of the proposed action on the Broad-headed Snake Large-eared Pied Bat. No further conditions are recommended.

Conclusion

251. The department considers that the proposed action would not have an unacceptable impact on the Broad-headed Snake and Large-eared Pied Bat provided that it is undertaken in accordance with the conditions recommended by the department.

Bushfire impacts

252. The department has taken a precautionary approach and considered the impacts of the bushfires in preparing the recommendations provided in this report.

253. The proposed action area is located within the Sydney Cataract sub-region of the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) bioregion which was partly affected by 2019/2020 bushfires according to the department's self-service analysis and reporting tool (Wylie). At its closest point to the proposed action area, the large bushfire which burned through a large area of the Nattai National Park and Blue Mountains National Park was located approximately 12 kilometres west of the proposed action area.

254. The department examined the impacts of the recent bushfire in relation to the distribution and habitat of listed threatened species and ecological communities within the proposed action and surrounding areas against the department's revised provisional list of animals, ecological communities and plants requiring urgent management intervention as a result of the 2019-20 bushfires.

255. The Coastal Upland Swamp ecological community is not included on this list. The department's self-service analysis and reporting tool (Wylie) indicates that less than 10 per cent of the estimated distribution of the ecological community was within the extent of the 2019/2020 bushfires.

256. The Macquarie Perch, Giant Burrowing Frog, Littlejohn's Tree Frog, Stuttering Frog and Broad-headed Snake were identified on the department's Revised provisional list of

animals, ecological communities and plants requiring urgent management intervention to support their protection and recovery following the 2019/2020 bushfires.

257. The proportion of each of these species' habitat impacted by the bushfires can be seen at Attachment D3 and are quantified for Australia and the relevant Natural Resource Management (NRM) region below. The department has had consideration of the aims and management actions outlined in the department's technical report on the bushfires, and notes that the proposed action area is not considered a priority area as it is not adjacent to largely burnt areas of habitat for these species.

258. The department's Bushfire Recovery Environmental Analysis Decision Support (BREADS) tool identified that the 2019/2020 bushfires affected approximately 472,698 ha (approximately 47 per cent) of estimated Broad-headed Snake habitat in Australia and approximately 357,259 ha (approximately 49 per cent) of estimated habitat in the South East NSW NRM Region, where the proposed action area is predominantly located.

259. The BREADS tool identified that the 2019/2020 bushfires affected approximately 32,919 ha (approximately 18 per cent) of estimated Macquarie Perch habitat in Australia and approximately 2,216 ha (approximately 5 per cent) of estimated habitat in the South East NSW NRM Region, where the proposed action area is predominantly located.

260. The BREADS tool identified that the 2019/2020 bushfires affected approximately 512,903 ha (approximately 34 per cent) of estimated Littlejohn's Tree Frog habitat in Australia and approximately 468,936 ha (approximately 56 per cent) of estimated habitat in the South East NSW NRM Region, where the proposed action area is predominantly located.

261. The BREADS tool identified that the 2019/2020 bushfires affected approximately 764,769 ha (approximately 53 per cent) of estimated Giant Burrowing Frog habitat in Australia and approximately 200,601 ha (approximately 38 per cent) of estimated habitat in the South East NSW NRM Region, where the proposed action area is predominantly located.

262. The BREADS tool identified that the 2019/2020 bushfires affected approximately 1,864,789 ha (approximately 38 per cent) of estimated Stuttering Frog habitat in Australia and approximately 532,240 ha (approximately 60 per cent) of estimated habitat in the South East NSW NRM Region, where the proposed action area is predominantly located.

263. As noted above, the proposed action may result in subsidence leading to changes in the hydrology of the swamps (drying), and aquatic habitats. If this occurs, the Coastal Upland Swamp may be more susceptible to bushfires.

264. However, the PER notes that the proposed action is not considered to have any potential to perceptibly impact on natural surface features, including creeks and tributaries, Cataract Reservoir or Coastal Upland Swamps, therefore unlikely that the proposed action would result in the aquatic environments becoming more susceptible to bushfires as a result of subsidence.

265. The department considers that the extent of the impact of the 2019/2020 bushfires on protected matters, in the context of this proposed action, is not sufficient to justify additional avoidance or mitigation measures to those already proposed.

Conclusion

266. Following consideration of the information discussed above, the department is satisfied that the proposed action will not have unacceptable impacts on listed threatened species and ecological communities, provided it is taken in accordance with the proposed conditions listed above.

267. On this basis, the department recommends approving the proposed action for the purposes of (sections 18 and 18A) of the EPBC Act.

Greenhouse Gas (GHG) emissions

268. Greenhouse Gas (GHG) emissions are categorised into three different types:

- Scope 1: direct emissions from owned or controlled sources of an organisation/ development;
- Scope 2: indirect emissions from the generation of purchased energy electricity, heat and steam used by an organisation/ development; and
- Scope 3: all other upstream and downstream emissions related to an organisation/ development.

269. The PER (Attachment C2) notes that Scope 1 emissions associated with the proposed action relate to the combustion of diesel and release of fugitive emissions.

270. Fugitive emissions result from the release of gas stored in the materials mined (primarily carbon dioxide and methane) and vented during underground extraction. The proposed action is forecast to generate approximately 1,419,000 t CO_2-e of Scope 1 emissions during its operational phase, with annual average Scope 1 emissions forecast at approximately 284,000 t CO_2-e per annum.

271. The GHG report provided to the IPC notes that the predicated gas quantities associated with the proposed action will not be sufficient to support gas utilisation via gas engines to generate electricity. The report notes that gas will be captured into gas drainage and extraction network with controlled flaring on the surface. The report also notes that further investigation will be undertaken to explore opportunities to capture and /or re-use of ventilation gas.

272. Scope 2 emissions are those emissions associated with the production of electricity used by the proposed action including underground mining equipment, conveyor belts, ancillary equipment, and administration facilities. This consumption of electricity is expected to attribute approximately 104,000 t CO_2-e of Scope 2 emissions.

273. According to the PER, the proposed action is expected to require approximately 573,000 GJ of energy from diesel and grid electricity, and this is consistent with the industry average energy use for an underground mine.

274. The PER (Attachment C2) notes that Scope 1 and 2 emissions represent approximately 13 per cent of the overall emissions from the proposed action. The greatest source of emissions associated with the project relate to Scope 3.

275. The proposed action is forecast to be associated with approximately 9,600,000 t CO2-e of Scope 3, which would be generated by third parties who transport and consume the extracted coal.

276. The PER notes the extracted coal comprises 57 per cent coking coal and 27 per cent thermal coal with rejects accounting for the remaining 16 per cent. The ROM coal will be exported to India to be used in the production of iron and steel.

277. The forecast emissions relating to the proposed action are expected contribute to 0.0005 per cent of annual global GHG emission estimates. Based on this estimate, the PER considers that the proposed action, in isolation, is unlikely to influence global emissions and climate change trajectories.

278. In addition, the PER noted that for Australia to achieve its commitment under the Paris Agreement, it would need to achieve a 28 per cent (ie. 762,000,000 t CO_2-e) reduction in GHG emissions by 2030. According to the PER the forecast emissions relating to the proposed action would increase the required national mitigation effort by approximately 0.19 per cent. The PER notes this increase is unlikely to affect Australia achieving its national mitigation targets in any material way.

279. The IPC (IPC 2020 [217]) notes that under the Paris Agreement the Australian Government committed to a nationally determined contribution to reduce greenhouse gas emissions by 26 per cent to 28 per cent from 2005 levels by 2030.

280. The IPC also notes that Australia does not require monitoring or reporting of Scope 3 emissions under the Commonwealth Government's National Greenhouse and Energy Reporting Scheme (NGERS), and they are not counted in Australia's national inventory of greenhouse gas emissions under the Paris Agreement. The IPC notes that these Scope 3 emissions become the consumer country's Scope 1 and 2 emissions and would be accounted for under the Paris Agreement in their respective national inventories.

281. DPIE's assessment report noted that the coal produced during the proposed action would most likely be used for steelmaking in India, which is a signatory of the Paris Agreement. The IPC is of the view that in the absence of a viable alternative to the use of metallurgical coal in steel making, on balance the impacts associated with the emissions from the combustion of the proposed action's metallurgical coal are justified.

282. The NSW development consent includes conditions for air quality and greenhouse gas regulation (B8, B9, B10 and B11), including the approval holder must:

- not exceed GHG emission criteria (1,148,997 t CO_2-e of Scope 1 emission; 103,500 t CO_2-e of Scope 2 emissions);
- take all reasonable steps to improve energy efficiency and reduce Scope 1 and Scope 2 GHG emissions;
- ensure that major mobile diesel mining equipment used in undertaking the development includes reasonable and feasible diesel emissions reduction technology; and
- prepare and implement an Air Quality and Greenhouse Gas Management Plan.

283. The department has considered all completed assessments and NSW development consent conditions relating to GHG emissions. The department does not consider that further conditions on GHG are necessary to protect matters of national environmental significance.

Mandatory considerations – section 136(1)(b) Economic and social matters

284. Under section 136(1)(b) of the EPBC Act, in deciding whether or not to approve an action and what conditions to attach to the approval, you must consider economic and social matters.

Economic

285. The PER notes that the proposed action is expected to deliver 205 jobs and provide an estimated total net economic benefit for the NSW community of approximately $174.3 million in net present value (NVP). This includes $116.9 million in direct benefits to NSW through company tax payments, and royalties.

286. In addition, a further $57 million is expected from indirect benefits comprising $43.6 million of worker benefits and $13.8 million of supplier benefits.

287. According to the PER, a significant portion of workers are likely to reside in the local and regional areas contributing to an overall net benefit due to the potential for salaries to be reinvested and circulated in the Wollongong region. The PER notes that the proposed action is estimated to deliver a benefit of $14.3 million (NVP) to local suppliers and employees.

288. The PER notes that the economic benefits have been calculated using the worst case scenario which takes the most pessimistic assumptions around coal prices, capital expenditure, operational expenditure as well as worker and supplier benefits. Based on the best-case scenario the estimated benefit to NSW is predicted to be $220.1 million (NPV) and $17.4 million (NPV) to the local economy.

Social

289. The PER notes that a social impact and opportunities assessment was undertaken to determine the issues and concerns of importance within the community. The assessment included face-to-face meetings, analysis of existing stakeholder data (e.g. complaints) and a review of secondary resources (e.g. local media, historical records).

290. The following project matters were identified as potential negative social risks/impacts:

- noise emissions from construction impacting social amenity, health and wellbeing;
- operational traffic impacting on social amenity;
- greenhouse gas emissions;
- mining in the water catchment;
- financial viability of the proponent; and
- the proponent's ability to meet regulatory requirements.

291. The department notes that many of these concerns were also raised in public submission on the draft PER (Attachment G2).

292. The PER notes that the community also identified positive social perceptions related to local employment and increased opportunities for community investment.

293. Russell Vale Colliery has been operating in 'care and maintenance' since mining operations ceased in 31 December 2015. The IPC noted that the surface facilities pre-dates the residential development, however, potential impacts experienced by local residents would be increased should coal production recommence at the site.

294. The PER notes that a Social Impact Management Plan to monitor social impacts and commitments made as part of the proposed action will be prepared in accordance with the NSW development consent conditions.

295. The department notes that concerns relating to air, noise and traffic will be regulated by the NSW government. The NSW development conditions require the approval holder to ensure air quality and noise criteria are met, prepare noise, traffic and air quality management plans and comply with restrictions on timing of transport (i.e. no trucks permitted on Sunday or public holidays, or before 7am Monday to Friday).

296. Mining in the water catchment was raised during the social assessment and also in the public submissions. The IESC noted that uncertainties were raised regarding the previous proposal to long wall mine in the catchment and the potential impacts on the catchment.

297. The DPIE assessment report notes that the water catchment is managed by WaterNSW, which has a legislative function to protect and enhance the quality and quantity of water within the catchment. Water NSW considered that:

- the proposed actions bord and pillar mining technique is considered safer and is unlikely to cause significant surface subsidence or interaction with the overlying coal seams
- the mining method is likely to minimise the potential groundwater impacts by limiting depressurisation within and immediately above the mined coal seam; and
- the proposed workings are likely to have negligible impacts on natural surface features including upland swamps, cliffs, steep slopes, drainage lines, creeks, Cataract Creek, Cataract River, and Cataract Reservoir.

298. The DPIE assessment report notes that the proponent is required to provide subsidence monitoring, aquatic health and stability assessments, and meet performance measures required under the NSW development consent conditions. The DPIE assessment report concludes that Water NSW and the DPIE are satisfied that the proposed action would have a neutral impact on water quality within the catchment.

299. In addition to the requirements set out in the NSW development consent, the department considers that the recommended condition for subsidence (paragraphs 93-100 and paragraphs 174-177) and water resources (paragraphs 128-136) will further minimise the impacts of the proposed action on the issues raised by the community.

300. Wollongong Coal Limited's environmental history is considered below in paragraphs 14-324.

Indigenous and Cultural Matters

301. In the Response to Submissions Report at Appendix P of the PER (Attachment C1), a full list of Aboriginal sites has been identified, as recorded in the NSW database Aboriginal Heritage Information Management System.

302. The PER notes that fieldwork was undertaken in consultation with two Aboriginal community representatives, Illawarra Local Aboriginal Land Council and the D'harawal Knowledge Holders.

303. The documentation provided to the DPIE notes that further consultation on the proposed action, was undertaken with Aboriginal groups including the Wodi Wodi Elders Corporation, Kullila Welfare and Housing Aboriginal Corporation and the Northern Illawarra Aboriginal Collective (representing 3 groups) in accordance with the NSW government requirements.

304. The department notes that several Aboriginal heritage sites have been previously identified within the proposed action study area. These sites are mainly associated with rock shelters in sandstone cliff formations and grinding groove sites on upland sandstone outcrops.

305. Subsidence associated with the proposed action may result in instability of the overhanging rock shelters and cliffs lines and fracturing of rocky outcrops, resulting in damage to Aboriginal heritage sites.

306. Mitigation measures to minimise the impacts on Aboriginal heritage sites were outlined in the assessment documentation provided to the DPIE. These measures include monitoring of heritage sites pre and post-mining, photographical archival recording, and relocation of artefacts where possible.

307. The PER states that the proposed action is predicted to result in imperceptible subsidence and are not expected to cause perceptible impacts to any natural surface features, including Aboriginal Heritage sites.

308. The NSW Assessment concluded that the proposed bord and pillar mining method substantially reduces the risk of subsidence-related impacts on Aboriginal heritage sites however the Aboriginal Cultural Heritage Management Plan should be updated to include baseline data, subsidence risk and consultation outcomes; and detailed indicators to ensure compliance with the subsidence impact performance measures prohibiting harm to Aboriginal objects.

309. The department considers that the conditions recommended for subsidence (paragraphs 93-100 and paragraphs 174-177) will further minimise the impacts on Aboriginal heritage sites.

Conclusion

310. The PER concluded that the proposed action is estimated to result in an economic benefit to the NSW community with modest indirect costs, and with appropriate management and mitigation, negative social impacts can be managed to achieve the benefits of the proposed action.

311. The department agrees with the assessment of social and economic impacts as outlined in the PER.

Factors to be taken into account – section 136(2)(a) Principles of ecologically sustainable development

312. In deciding whether or not to approve the taking of an action and the conditions to attach to an approval, section 136(2)(a) of the EPBC Act provides that you are required to take into account the principles of ecologically sustainable development (ESD). The principles of ESD, as defined in Part 1, section 3A of the EPBC Act, are:

    (a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social, and equitable considerations

    (b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation

    (c) the principle of inter-generational equity – that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations

    (d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making

    (e) improved valuation, pricing and incentive mechanisms should be promoted.

313. In addition, section 391 of the EPBC Act provides that you must take into account the precautionary principle in deciding whether or not to approve the taking of an action. The precautionary principle requires that, if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

314. In formulating this recommendation, the department has taken into account the principles of ecologically sustainable development. In particular:

- This report and the assessment documentation provided information on the long-term and short-term economic, environmental, social, and equitable considerations that are relevant to the decision and are presented for your consideration.
- Any lack of certainty related to the potential impacts of the projects is addressed by conditions that restrict environmental impacts, impose strict monitoring and adopt environmental standards which, if not achieved, require the application of response mechanisms in a timely manner to avoid adverse impacts.
- The proposed conditions will ensure protection of water resources and EPBC listed species and communities. Those conditions allow for the project to be delivered and operated in a sustainable way to protect the environment for future generations and preserve EPBC listed species and communities in perpetuity.
- The department has considered the importance of conserving biological diversity and ecological integrity in relation to all of the controlling provisions for this project, and the advice provided within this document reflects that consideration.
- The department's advice includes reference to and consideration of a range of information on the economic costs, benefits and impacts of the project.

Factors to be taken into account – section 136(2)(c) – public environmental report

315. In accordance with section 136(2)(c)(i), the finalised PER relating to the action given to the Minister under section 99 is at Attachment C1 of the proposed decision briefing package.

316. In accordance with section 136(2)(c)(ii), this document forms the recommendation report relating to the action given to the Minister under section 100.

Person's environmental history – section 136(4)

317. In deciding whether to approve a proposed action, and what conditions to attach to any approval, the Minister may, under section 136(4) of the EPBC Act, consider whether the person proposing to take the action is a suitable person to be granted an approval.

318. A recurring theme in the public submissions on the draft PER was the proponent's compliance history. The most frequently raised compliance matters related to the proponent's environmental history (25 of the 28 submissions) and financial position (22 of the 28 submissions). Many of the submissions consider the proponent does not have a satisfactory record of responsible environmental management and compliance with environmental laws. The proponent's liabilities are such that its financial situation is unlikely to improve and consequently the proponent would be unable to or unwilling to address its environmental obligations.

Environmental History from the proponent

319. The department wrote to the proponent on 26 March 2021 requesting information from the last ten years on the following:

- the environmental history of WCL and its executive officers;
- the environmental history of WCL's parent body or parent bodies; that is; any body or bodies of which WCL is a subsidiary; and
- the environmental history of the executive officers of WCL's parent body or parent bodies.

320. The proponent responded on 13 April 2021 detailing 47 contraventions and the executive officers at the time of those contraventions (Attachment D1). Of those 47 contraventions, only one remains outstanding; the remedial action for which is scheduled for completion in the second half of 2021. A summary of the contraventions is in Table 1 below.

Table 1 – Summary of WCL Environmental History 7 April 2011 to 7 April 2021

Contravention Type	Number	Key matters
Administrative	10	• Direction to engage a suitably qualified independent person to prepare a rehabilitation cost estimate • Provide information on financial matters (bank loans, working capital facilities, securities) • Failure to pay rental fees and administrative levies • Failure to undertake at least three community consultation meetings a year ($15,000 penalty) • Failure to make existing monitoring data publicly available ($1000 penalty)

Contravention Type	Number	Key matters
		• Failure to pay revised assessed security deposit by due date ($750 penalty) • Non-compliant pollution monitoring data being published
Workplace Health and Safety	3	• Direction to complete actions from audits to address matters of non-compliance or where further action is required
Mine-related infrastructure	8	• Failure to comply with conditions of the development consent for construction of Bellambi Gully diversion works ($3,000 penalty) • Direction to complete controls and implementation program from the independent risk assessments for catchment infrastructure for the Russell Vale Colliery and Wongawilli Colliery • Direction to replace underground pipe with suitable culvert required by development consent ($3,000 penalty)
Water impacts	10	• Excess water taken during dewatering operations • Turbid water discharge (two penalty notices $15,000 each) • Direction to implement various actions from audit • Failure to correctly activate pollution incident response management plan • Precipitate and discharge detected in tributary (proponent self-reported) • Loss of water from Highway dam to Bellambi Gully
Environmental	16	• Direction to complete erosion and sediment controls and weed removal • Ordered to remove coal from emplacement area ($3000 penalty) • Direction to secure, contain and clean up oil spill at vent shafts 1 and 3-the proponent advised the oil spill was the result of theft by third parties where the intent of the perpetrator was to remove copper from the transformer and to do so the perpetrator drained the transformer of oil • Caution due to failure to comply with self-imposed speed limit of 50km/h on Bellambi Lane • Two penalty notices ($15,000 each) for discharge of coal fines (tailings) into Bellambi Gully • Direction to remove 174,000 tonnes of stored coal in breach of project approval • Two penalty notices issued in relation to failure to wash trucks before leaving the facility (two penalty notices $1500)

321. The proponent noted that no action has resulted in a conviction being recorded against a company or an executive officer.

Environmental History from NSW Regulators

322. On 26 March 2021, the department requested advice from DPIE on the environmental history of the proponent and its parent bodies for the past 10 years. A response was received on 27 April 2020, and provided detailed information from the following NSW government agencies:

- DPIE
- NSW Resource Regulator
- NSW Environment Protection Agency
- Natural Resource Access Regulator

323. The compliance history from DPIE aligned with that provided by the proponent. On 3 May 2021, the department sought additional information from the proponent in relation to

formal enforcement actions for environmental audits in 2013. On 5 May 2021, the proponent advised the matters had been addressed.

324. The NSW Resources Regulator's compliance history for the proponent was predominately in relation to late payments of royalties, rent and levies, which are not directly related to the proponent's environmental history for the purposes of the EPBC Act. On 28 April 2021, the department sought further information from the NSW Resources Regulator. The additional information (Attachment D1) received on 5 May 2021 demonstrated the breaches were administrative in nature, such as not submitting a revised Mine Operations Plan within the timeframe specified in the regulator's guidelines.

325. The compliance history provided by the Environment Protection Agency is consistent with that provided by the proponent. The compliance history provided by the Natural Resources Access Regulator is also consistent with that provided by the proponent.

Department's Environmental History Records

On 21 April 2021 and 4 May 2021 (Attachment D1), the Environment Compliance Branch advised the following:

- A search of the department's Compliance and Enforcement Management System database and records held by the department for the proponent found that the proponent was non-compliant with a reporting condition. The proponent failed to publish its Extraction Plan within five days of it being re-approved. The Extraction Plan was re-approved on 25 March 2015 but had not been published by 28 April 2015. The non-compliance was confirmed as rectified as at 3 June 2015.
- In 2014, the proponent was investigated for a potential impact on matters of national environmental significance. It was concluded that no offence of national environmental law was identified, and no further compliance action would be taken.

326. Having regard to the nature and scale of the incidents and contraventions outlined above, the department notes that these did not result in significant environmental harm. Most of the penalties imposed were at the low end (i.e. between $750 and $15,000). The department notes that WCL, or its parent body, accepted and acknowledged these infringements and penalties. The department considers that this represents WCL's commitment to taking responsibility for incidents that result in environmental harm.

327. On that basis of the above factors, the department considers that it would be open to you to conclude that the proponent is a suitable person to be granted an approval.

Considerations in deciding on condition – section 134

328. In accordance with section 134(1), the Minister may attach a condition to the approval of the action if he or she is satisfied that the condition is necessary or convenient for:

(a) protecting a matter protected by a provision of Part 3 for which the approval has effect (whether or not the protection is protection from the action); or

(b) repairing or mitigating damage to a matter protected by a provision of Part 3 for which the approval has effect (whether or not the damage has been, will be or is likely to be caused by the action).

329. As detailed in the Assessment section above, all recommended conditions attached to the proposed approval are necessary or convenient to protect, repair and/or mitigate impacts on a matter protected by provision of Part 3 for which this proposed approval has affect.

330. In accordance with section 134(4), in deciding whether to attach a condition to an approval the Minister must consider:

(a) any relevant conditions that have been imposed, or the Minister considers are likely to be imposed, under a law of a State or self-governing Territory or another law of the Commonwealth on the taking of the action;

331. The IPC approved the Russell Vale UEP on 8 December 2020 with conditions. The department has considered these conditions, to the extent they are relevant to matters of national environmental significance (MNES) and is of the view that the proposed conditions of approval at Attachment B are not inconsistent with the requirements of the NSW development consent. Further, the department has developed the proposed conditions of approval to avoid duplication with the NSW development consent (Attachment F).

(b) information provided by the person proposing to take the action or by the designated proponent of the action

332. The referral and assessment documentation provided by the proponent has been considered by the department in preparing this proposed decision package. The proponent will be given up to 10 business days to comment on the proposed decision, and the practicability of proposed conditions recommended in section 1 of this report. The comments the proponent provides on the proposed approval decision, including on any conditions attached to that approval, will be included in the final decision package.

(c) the desirability of ensuring as far as practicable that the condition is a cost-effective means for the Commonwealth and a person taking the action to achieve the object of the condition

333. The department considers that the proposed conditions of approval will be cost effective and will ensure that matters of national environmental significance are protected over time.

334. The department has consulted with the Environmental Audit Section and the Post Approvals Section on the proposed conditions of approval.

335. Accordingly, the department considers that it is necessary and convenient to apply approval conditions to this project, as outlined in Attachment B. In applying this analysis, the department has had regard to the EPBC Act Condition-setting Policy (2015).

Requirements for decisions about listed threatened species and communities – section 139

336. In deciding whether or not to approve for the purposes of a subsection of section 18 or section 18A the taking of an action, and what conditions to attach to such an approval, the Minister must not act inconsistently with:

(a) Australia's obligations under:

(i) the Biodiversity Convention; or

(ii) the Apia Convention; or

(iii) CITES; or

(b) a recovery plan or threat abatement plan.

(2) If:

(a) the Minister is considering whether to approve, for the purposes of a subsection of section 18 or section 18A, the taking of an action; and

(b) the action has or will have, or is likely to have, a significant impact on a particular listed threatened species or a particular listed threatened ecological community;

the Minister must, in deciding whether to so approve the taking of the action, have regard to any approved conservation advice for the species or community.

The Biodiversity Convention

- The Biodiversity Convention is available at: http://www.austlii.edu.au/au/other/dfat/treaties/ATS/1993/32.html

337. The objectives of the Biodiversity Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

338. The recommendations are not considered by the department to be inconsistent with the Biodiversity Convention, which promotes environmental impact assessment (such as this process) to avoid and minimise adverse impacts on biological diversity. The department has also given particular consideration to an appropriate combination of avoidance and mitigation measures for the management of species potentially impacted by the proposed action.

339. The Biodiversity Convention has been considered in, and is not inconsistent with, the recommended approval which requires avoidance, mitigation, and management measures for listed threatened species and communities. The recommended approval requires information related to the proposed action to be publicly available to ensure equitable sharing of information and improved knowledge relating to biodiversity.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is available at: http://www.austlii.edu.au/au/other/dfat/treaties/ATS/1976/29.html

340. CITES is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

341. The recommendations are not inconsistent with CITES as the proposed action does not involve international trade.

Convention on the Conservation of Nature in the South Pacific (Apia Convention)

- The Apia Convention is available at: http://www.austlii.edu.au/au/other/dfat/treaties/ATS/1990/41.html

342. The Apia Convention encourages the creation of protected areas which together with existing protected areas will safeguard representative samples of the natural ecosystems occurring therein (particular attention being given to endangered species), as well as superlative scenery, striking geological formations, and regions and objects of aesthetic interest or historic, cultural or scientific value.

343. The Apia Convention was suspended with effect from 13 September 2006. As Australia currently has no international obligations under the Apia Convention, it cannot act inconsistently with them. While this Convention has been suspended, Australia's obligations under the Convention have been taken into consideration.

344. The proposed action has undergone an environmental assessment which concluded that the proposed action will not have an unacceptable impact on biodiversity, geological formations, and objects of aesthetic interest or historic, cultural, or scientific value, subject to the proposed conditions.

345. The proposed conditions of approval place restrictions on the extent of impacts the action can have on biodiversity and water resources, and how they are managed in the long-term. The proposed conditions also require ongoing monitoring of potential impacts and obligations for the person taking the action to implement mitigation and corrective actions. As such, the department considers that you could be satisfied that approving the proposed action, subject to conditions, is not inconsistent with the obligations under the Convention.

Recovery Plans and Threat Abatement Plans

346. The Recovery Plans relevant to the proposed action and assessment are:

- Department of the Environment and Energy (2018). *National Recovery Plan for the Macquarie Perch* (Macquaria australasica). Canberra: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/macquaria-australasica-2018.

- Department of Environment and Resource Management (2011). *National recovery plan for the large-eared pied bat* Chalinolobus dwyeri. Report to the Department of Sustainability, Environment, Water, Population and Communities, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-large-eared-pied-bat-chalinolobus-dwyeri.

- Hunter, D., & G.R. Gillespie (2011). *National Recovery Plan for the Stuttering Frog* Mixophyes balbus. Department of Sustainability and Environment, Melbourne. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-stuttering-frog-mixophyes-balbus.

347. These Recovery Plans are provided at Attachment H3.

348. The department has considered all relevant recovery plans and, for the reasons discussed in the listed threatened species and ecological communities above, is satisfied the approval of the proposed action, and proposed conditions of approval, are not inconsistent with the above recovery plans.

349. The Threat Abatement Plans relevant to this action are:

- Department of the Environment and Energy (2018). *Threat abatement plan for disease in natural ecosystems caused by* Phytophthora cinnamomi. Canberra: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/threat-abatement-plan-disease-natural-ecosystems-caused-phytophthora-cinnamomi-2018.

- Department of the Environment and Energy (2016). *Threat abatement plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis (2016*). Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/infection-amphibians-chytrid-fungus-resulting-chytridiomycosis-2016.

- Department of the Environment (2015). Threat *abatement plan for predation by feral cats*. Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/threat-abatement-plan-feral-cats.

- Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). *Threat abatement plan for predation by the European red fox*. DEWHA, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/predation-european-red-fox.

350. These Threat Abatement Plans are provided in Attachment H2.

351. The department has considered the threat abatement plans and, for the reasons discussed in the listed threatened species and ecological communities' section above, is satisfied that the approval of the project, and the conditions of approval, are not inconsistent with the above threat abatement plans.

Conservation Advice

352. The approved Conservation Advices relevant to this proposed action are:

- Department of the Environment (2014). *Conservation Advice (including listing advice) for Coastal Upland Swamps in the Sydney Basin Bioregion*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/140-conservation-advice.pdf.

- Department of the Environment (2013). *Approved Conservation Advice for* Macquaria australasica *(Macquarie perch*). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66632-conservation-advice.pdf.

- Department of the Environment (2013). *Conservation Advice* Bidyanus bidyanus *(silver perch*). Canberra: Department of the Environment. Available from:

http://www.environment.gov.au/biodiversity/threatened/species/pubs/76155-conservation-advice.pdf

- Department of the Environment, Water, Heritage and the Arts (2008). *Approved Conservation Advice for* Pultenaea aristata. Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/18062-conservation-advice.pdf.

- Department of the Environment (2014). *Approved Conservation Advice for* Heleioporus australiacus *(giant burrowing frog*). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1973-conservation-advice.pdf

- Department of the Environment, Water, Heritage and the Arts (2008). *Approved Conservation Advice for* Litoria littlejohni *(Littlejohn's Tree Frog*). Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/64733-conservation-advice.pdf.

- Department of the Environment (2014). *Approved Conservation Advice for* Hoplocephalus bungaroides (*broad-headed snake*). Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1182-conservation-advice.pdf.

353. The approved Conservation Advices are provided at Attachment H1.

354. The department has had regard to the approved Conservation Advices relevant to this project and has given consideration to the likely impacts of the project on listed threatened species and ecological communities.

Bioregional Plans section 176(5)

355. In accordance with section 176(5), the Minister is required to have regard to a bioregional plan in making any decision under the EPBC Act to which the plan is relevant. The proposed action is not located within or near an area designated by a bioregional plan. The department considers that there are no bioregional plans relevant to the proposed action.

Duration of approval

356. The PER states the proposed action will be undertaken within 5 years. However, the department notes that there is some uncertainty regarding the timing of the discharge of the adits. The DPIE assessment report notes that in around 2057 a maximum of 110 ML/year of groundwater would discharge out of the adits.

357. The IESC raised concerns regarding he quality of the discharge water into Bellambi Creek, and recommended ongoing monitoring for a long enough period after mining ceases.

358. Therefore, the department recommends the approval remain valid for a period of 46 years to allow sufficient time for the ongoing monitoring of the adit water and to ensure that the implementation of measures to protect MNES are undertaken.

Conclusion

359. The department considers the impacts of the proposed action on relevant MNES will not be unacceptable, provided the proposed action is undertaken in accordance with the proposed avoidance, mitigation and management measures described in the preliminary documentation, the conditions imposed under the NSW development consent, and assuming compliance with the proposed conditions of approval.

360. Having considered all matters and factors required to be considered under the EPBC Act in deciding whether or not to approve the action, the department recommends the proposed action be approved, subject to the proposed conditions of approval.

Material used to prepare this recommendation report

In addition to the material listed in the References section, the Department also considered the following documents:

- Referral documentation.
- ERT report.
- Final Public Environment Report, including attachments.
- Relevant Conservation Advice, Recovery Plans and Threat Abatement Plans.
- Departmental policies and guidelines.

References

Independent Planning Commission NSW, (2020). *Russell Vale Underground Expansion Project Statement of Reasons for Decision.* Sydney Independent Planning Commission NSW. Available from(https://www.ipcn.nsw.gov.au/resources/pac/media/files/pac/projects/2020/08/russell-vale-underground-extension-project/determination/201208-russell-vale-uep--statement-of-reasons.pdf)

NSW Department of Planning, Industry and Environment (2020). *Russell Vale Revised Underground Expansion Project-Planning Secretary's Final Assessment Report*. NSW Department of Planning, Industry and Environment Available from (https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=MP09_0013%2120200915T064719.367%20GMT)

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (2020) IESC 2020-112 Russell Vale Revised Underground Expansion Project (MP 09_0013) Expansion. The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development, Available from https://iesc.environment.gov.au/system/files/iesc-advice-russell-vale-2020-112.pdf

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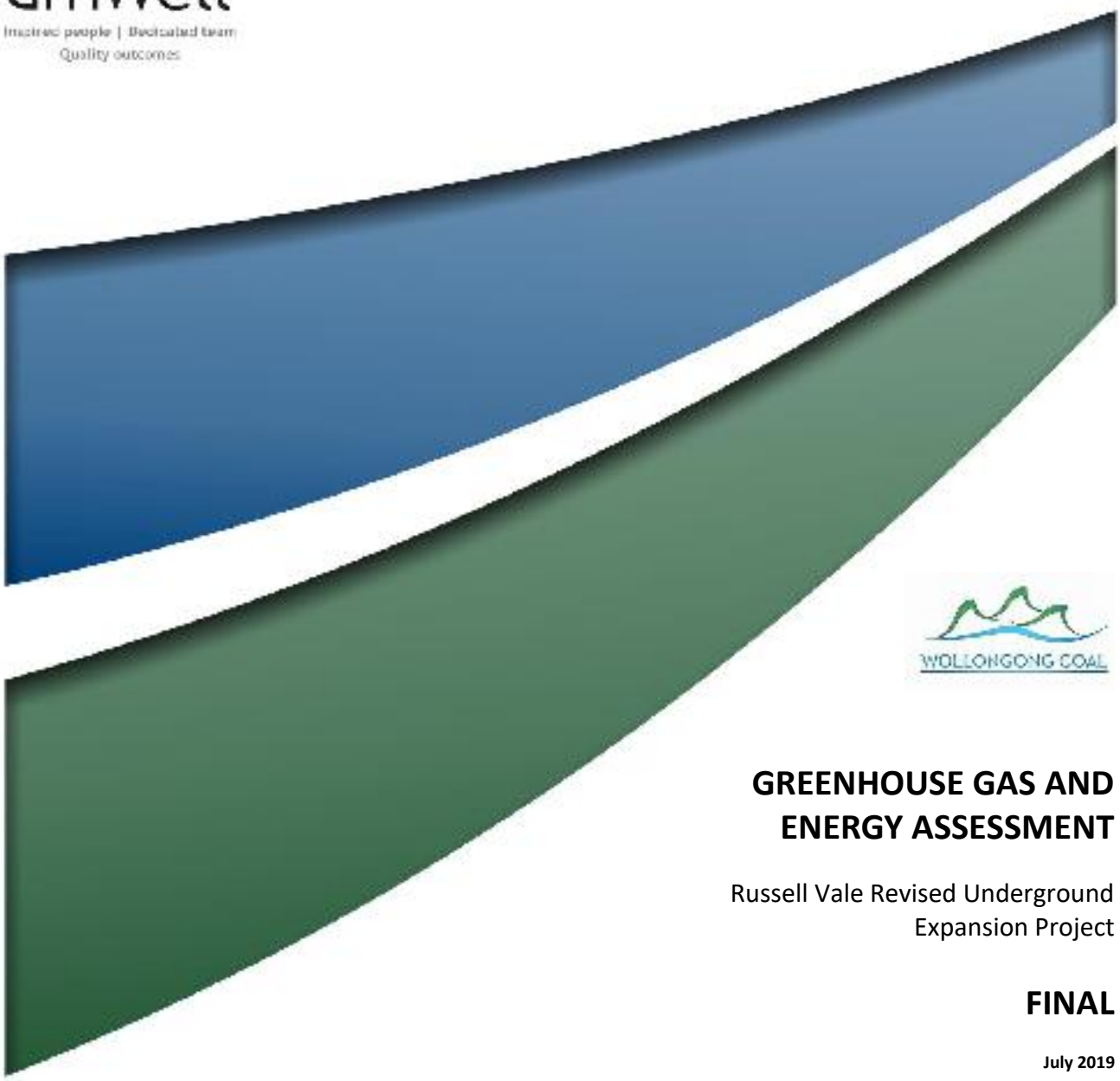

WOLLONGONG COAL

GREENHOUSE GAS AND ENERGY ASSESSMENT

Russell Vale Revised Underground Expansion Project

FINAL

July 2019

GREENHOUSE GAS AND ENERGY ASSESSMENT

Russell Vale Revised Underground Expansion Project

FINAL

Prepared by
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on behalf of
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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	Malcolm Sedgwick	17 July 2019	Barbara Crossley	17 July 2019

Table of Contents

Figures

Tables

Appendices

1.0 Introduction

Wollongong Coal Limited (WCL) is proposing amendments to the Russell Vale Underground Expansion Project (UEP) in response to concern raised by government agencies, the Planning Assessment Commission (PAC) and the community. WCL has revised the UEP to address potential subsidence, biodiversity and water impacts within the Cataract Reservoir catchment and noise and traffic impacts associated with surface operations (Revised Preferred Project). The following Greenhouse Gas and Energy Assessment (GHGEA) quantifies the potential greenhouse gas (GHG) and energy impacts of the Revised Preferred Project (referred to herein as the Revised Project).

2.0 Assessment Framework

2.1 Objectives

The objective of this assessment is to evaluate the GHG and energy use implications of the Revised Project, as part of WCL's response to issues raised in the PAC Second Review Report.

2.2 Scope

The scope of the GHGEA includes:

- estimating direct and indirect (Scope 1, 2 and 3) GHG emissions associated with the Revised Project
- estimating energy use directly associated with the Revised Project.

2.3 Definitions

Table 2.1 contains concepts and a glossary of terms relevant to this GHGEA.

Table 2.1 Glossary of Terms[1]

Concept	Definition
Greenhouse gases	The GHG covered by the Kyoto Protocol and referred to in this GHGEA include: • Carbon dioxide; • Methane; • Nitrous oxide; • Hydrofluorocarbons; • Perfluorocarbons; and • Sulphur hexafluoride.
Scope 1 emissions	Direct emissions occur from sources that are owned or controlled by the Revised Project (in this case, the proponent, WCL) (e.g. fuel use, fugitive emissions). Scope 1 emissions are emissions over which the Revised Project has a high level of control.
Scope 2 emissions	Emissions from the generation of purchased electricity consumed by the Revised Project.
Scope 3 emissions	Indirect emissions that are a consequence of the activities of the Revised Project, but occur at sources owned or controlled by other entities (e.g. outsourced services). Scope 3 emissions can include emissions generated upstream of the Revised Project by providers of energy, materials and transport. Scope 3 emissions can also include emissions generated downstream of the Revised Project by transport providers and product use.

2.4 Impact Assessment Methodology

The GHGEA framework is based on the methodologies and emission factors contained in the National Greenhouse Accounts (NGA) Factors 2017. The assessment framework also incorporates the principles of The Greenhouse Gas Protocol 2004 (GHG Protocol).

[1] The GHG Protocol 2004

The GHG Protocol provides an internationally accepted approach to GHG accounting. The GHG Protocol provides guidance on setting reporting boundaries, defining emission sources and dealing with issues such as data quality and materiality.

Scope 1 and 2 emissions were calculated based on the methodologies and emission factors contained in the NGA Factors 2017 (DoEE 2017). Fugitive emissions have been calculated using the Method 1 approach, as described in the National Greenhouse Accounts (NGA) Factors 2017 (DoEE 2017).

Scope 3 emissions associated with product transport were calculated based on emission factors contained in the National Greenhouse Gas Inventory: Analysis of Recent Trends and Greenhouse Gas Indicators (AGO 2007). Other Scope 3 emissions were calculated using methodologies and emission factors contained in the NGA Factors 2017 (DoEE 2017).

2.5 Data Sources

The calculations in this report are based on activity data developed by WCL during the mine planning process. **Table 2.2** contains the source of activity data.

Table 2.2 Source of Activity Data Used for the Assessment

Activity data	Source
On-site fuel consumption	WCL - forecast diesel consumption
Electricity consumption	WCL - forecast electricity consumption
Fugitive emissions	WCL – Historical NGER data
Product transport	WCL - haulage distances

A detailed description of activity data and calculations are provided in **Appendix A**.

2.6 Assessment Boundary

The GHGEA boundary was developed to include all significant Scope 1, 2 and 3 emissions.

The GHG Protocol requires inventory data and methodologies to be relevant, consistent, complete, transparent and accurate. The relevance principle states that the GHG inventory should appropriately reflect GHG emissions and serve the decision-making needs of users – both internal and external [to the Revised Project] (GHG Protocol 2004).

An underground coal mine has a number of potential emission sources, however, the dominant emission sources, often targeted by mitigation measures and stakeholders can be summarised as:

- diesel use
- fugitive emissions
- electricity use
- product transport
- waste/reject transport
- product use.

The completeness principle states that all relevant emission sources within the chosen inventory boundary need to be accounted for so that a comprehensive and meaningful inventory is compiled (GHG Protocol 2004).

The emission sources listed in **Table 2.3** have been excluded from the GHGEA as activity data is not readily available, and modelling activity data is unlikely to generate sufficient emissions to materially change impacts or influence the decision making outcomes of stakeholders.

Table 2.3 Data Exclusions

Emissions source	Scope	Description
Combustion of fuel for energy	Scope 1	• Small quantities of fuels such as petrol and LPG.
Industrial processes	Scope 1	• Sulphur hexafluoride (high voltage switch gear). • Hydrofluorocarbon (commercial and industrial refrigeration).
Waste water handling (industrial)	Scope 1	• Methane emissions from waste water management.
Materials transport	Scope 3	• Delivery of diesel and other materials to site.
Solid waste	Scope 3	• Solid waste to landfill.
Business travel	Scope 3	• Employees travelling for business purposes.
Employee travel	Scope 3	• Employees travelling between their place of residence and the Russell Vale site.

3.0 Impact Assessment Results

GHG and energy use estimates have only been calculated for the operational stage of the Revised Preferred Project.

The following information and key assessment assumptions were used to estimate the GHG emissions from the operational stage of the Revised Project:

- Approximately 3.7 million tonne (Mt) of run-of-mine (ROM) coal will be recovered.
- The ventilation system will extract a flat rate of 270,000 t CO_2-e of fugitive emissions per annum (historical average).
- The mine will be classified as a "Gassy Mine" and generate post mining emissions from stockpiled ROM coal.
- Diesel use will average approximately 450 kL per annum.
- Electricity use will average approximately 90,000 GJ per annum (no longwall).
- Onsite ROM coal processing will generate 10% waste materials.
- Up to 80% of waste materials (coarse reject) will be transported off site as fill material.
- Waste materials will be transported an average of 15 kilometres (km).
- All product transport will be outsourced.
- Product transport will average 15 km.
- Product will be transported using road registered 19 metre (m) articulated vehicles such as semi-trailer or truck and dog trailers.
- All product will be exported to either India or China.
- All coal will be used to produce coke for steel production.

3.1 Greenhouse Gas Emissions

The Revised Project's GHG emissions are summarised in **Table 3.1**. Forecast GHG emissions are based on the Revised Project recovering approximately 3,700,000 ROM tonnes and extending the life of mine by 5 years.

The Revised Project is forecast to generate approximately 1,419,000 t CO_2-e of Scope 1 emissions from combusting diesel and releasing fugitive emissions. Approximately 284,000 t CO_2-e per annum of Scope 1 emissions are expected to be generated the Revised Project. Annual average Scope 1 emission estimates should not be used to benchmark annual performance, as annual emissions will vary significantly due to normal variations in annual activity.

The Revised Project is forecast to be associated with approximately 104,000 t CO_2-e of Scope 2 emissions from consuming electricity. Approximately 21,000 t CO_2-e per annum of Scope 2 emissions are expected to be associated with the Revised Project.

The Revised Project is forecast to be associated with approximately 9,624,000 t CO_2-e of Scope 3 emissions. Scope 3 emissions will be generated by third parties who transport and consume coal products. Approximately 1,925,000 t CO_2-e per annum of Scope 3 emissions are expected to be associated with the Revised Project.

Figure 3.1 demonstrates that the Revised Project's GHG inventory is dominated by Scope 3 emissions. Approximately 86% of the Revised Project's GHG emissions occur downstream of the project. Approximately 14% of the GHG associated with the Revised Project is related to on-site energy use and fugitive emissions (Scope 1 and 2 emissions).

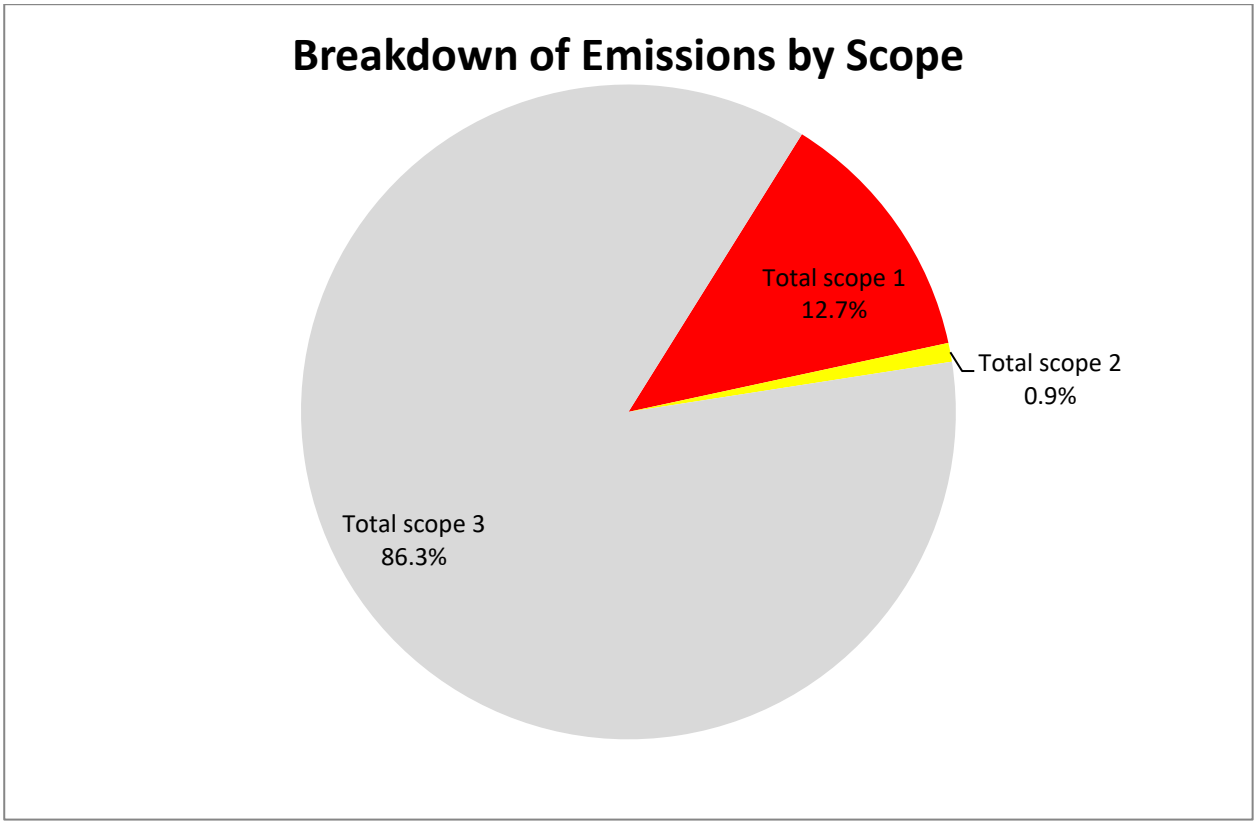

Figure 3.1 Breakdown of Emissions by Scope

Scope 2 and 3 emissions have been included in the GHGEA to demonstrate the potential upstream and downstream impacts of the Revised Project. All Scope 2 and 3 emissions identified in the GHGEA are attributable to, and may be reported by, other sectors.

3.2 Energy Use

The Revised Project is forecast to require approximately 537,000 GJ of energy from diesel and grid electricity. The Revised Project is expected to use approximately 108,000 GJ per annum.

The industry average energy use for underground coal mines in Australia ranges between 140 and 490 Megajoules (MJ)/Product tonne (Energetics 2009). The Revised Project is forecast to operate with an average energy use intensity of approximately 162 MJ/Product Tonne. The forecast energy use intensity of the Revised Project is within the normal operating range for Australian underground coal mines.

Table 3.1 GHG Emission Summary for the Revised Preferred Project

Stage	Scope	Source	Source Totals (t CO_2-e)	Scope Totals (t CO_2-e)
Life of Mine	Scope 1 (Direct)	Diesel use	6,097	1,418,997
		Fugitive emissions	1,412,900	
	Scope 2 (Indirect)	Electricity	103,500	103,500
	Scope 3 (Indirect)	Product use	9,192,798	9,623,427
		Associated with energy extraction and distribution	15,163	
		Product transport	415,117	
		Waste transport	349	
Total GHG Emissions for Operations				**11,145,924**

(refer to **Appendix A** for further detail)

4.0 Impact Assessment Summary

The GHG emissions generated by the Revised Project have the potential to impact the physical environment, and the GHG reduction objectives of national and international governing bodies. The following assessment makes the distinction between environment impacts and impacts on policy objectives.

4.1 Impact on the Environment

The Revised Project's GHG emissions will be highly mobile and generated across multiple policy jurisdictions along the product value chain. The accumulation of GHG or carbon in 'carbon sinks' is the primary impact of GHG emissions. Anthropogenic GHG emissions have accumulated in three major carbon sinks - the ocean (30%), terrestrial plants (30%) and the atmosphere (40%) (BOM and CSIRO, 2014).

The accumulation of GHG in the atmosphere is an important driver of global warming, sea level rise and climate change (IPCC 2013). Sea level rise and climate change may have many ramifications for the natural and built environment. The accumulation of GHG in the ocean is also an important driver of ocean acidification (IPCC 2013).

The Revised Project's direct emissions (Scope 1) are forecast to be approximately 284,000 t CO_2 –e per annum.

To put the Revised Project's emissions into perspective, under current policy settings, global GHG emissions are forecast to reach 56,200,000,000 t CO_2-e per annum by 2025 (UNEP 2016). During operation, the Revised Project will contribute approximately 0.0005% to global emissions per annum (based on its projected Scope 1 emissions). The relative environmental impact of the Revised Project is likely to be relative to its proportion of global GHG emissions.

4.2 Impact on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) define climate change as a change in the state of the climate that can be identified by changes in the mean and/or variability of its properties, and persists for an extended period, typically decades or longer (IPCC 2007).

Climate change is caused by changes in the energy balance of the climate system. The energy balance of the climate system is driven by atmospheric concentrations of GHG and aerosols, land cover and solar radiation (IPCC 2007).

Climate change models forecast many different climate change impacts, which are influenced by future GHG emission scenarios. Climate change forecasts also vary significantly from region to region.

A qualitative assessment of climate change requires a regional reference and future emission trajectory assumptions. The Revised Project, in isolation, is unlikely to influence global emission trajectories. Future emission trajectories will largely be influenced by global scale issues such as; technology, population growth and GHG mitigation policy. NSW climate change projections have been modelled by the NSW and ACT Regional Climate Modelling (NARCliM) project. NARCliM has modelled climate change projections for 2030 and 2070, using the IPCC high emissions A2 emission trajectory scenario. The A2 scenario assumes (IPCC 2000):

- relatively slow demographic transition and relatively slow convergence in regional fertility patterns
- relatively slow convergence in inter-regional GDP per capita differences

- relatively slow end-use and supply-side energy efficiency improvements (compared to other storylines)
- delayed development of renewable energy
- no barriers to the use of nuclear energy.

The proposed Revised Project is consistent with the A2 emissions trajectory scenario, therefore the climate change projections developed by NARCliM seem a reasonable basis for a qualitative climate change impact assessment. NARCliM makes the following climate change projections for NSW (Adapt NSW 2016):

- maximum temperatures are projected to increase
- minimum temperatures are projected to increase
- the number of hot days will increase
- the number of cold nights will decrease
- rainfall is projected to decrease in spring and winter
- rainfall is projected to increase in summer and autumn
- average fire weather is projected to increase in summer and spring
- number of days with severe fire danger is projected to increase in summer and spring.

The extent to which global emissions and atmospheric concentrations of GHG have a demonstrable impact on climate change will be largely driven by the global response to reducing total global emissions that includes all major emission sources and sinks.

4.3 Impact on Policy Objectives

The United Nations Framework Convention on Climate Change (UNFCCC) is the leading international forum for setting climate change targets and objectives. The UNFCCC has been responsible for developing internationally accepted GHG emission reporting methodologies, and has led the development of:

- the Kyoto Protocol
- the Paris Agreement
- specific directives and guidance to improve the implementation of the UNFCCC.

The Kyoto Protocol became international policy in 2005, and it committed the European Union (EU) plus 37 other member states to manage GHG emissions between 2008 and 2012. A second round of the Kyoto Protocol (the Doha Amendment) committed the EU plus 191 other member states to manage GHG emissions between 2013 and 2020. Australia was a signatory to both rounds of the Kyoto Protocol and Australia will meet its obligations under the Kyoto Protocol in 2020 (DoEE 2018).

In 2015 the UNFCCC successfully negotiated an international climate change agreement between 195 countries (the Paris Agreement). The Paris Agreement aims to:

- hold the increase in the global average temperature to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels

- increase the ability [of nations] to adapt to the adverse impacts of climate change and foster climate resilience and low GHG emissions development, in a manner that does not threaten food production
- make finance flows consistent with a pathway towards low GHG emissions and climate-resilient development.

The Paris Agreement seeks to meet its objectives by developing programs and mechanisms that:

- require participating Parties to prepare and communicate GHG mitigation contributions. Parties are expected to set mitigation targets for 2020, and then develop new targets every 5 years. Each successive target is expected to represent a larger mitigation effort than the previous target
- promote climate change resilience and adaptation
- provide mitigation and adaptation funding to developing countries
- foster mitigation and adaptation technology transfer between Parties
- require participating Parties to report progress towards their mitigation contributions on an annual basis.

Australia signed the Paris Agreement on 22 April 2016, and Australia's obligations under the Paris Agreement will drive national GHG policy between 2020 and 2030. Under the Paris Agreement, Australia is obliged to:

- prepare, communicate and maintain a Nationally Determined Contribution (NDC). An NDC outlines the size and type of mitigation contribution each member state will make to the international effort
- pursue domestic mitigation measures, with the aim of achieving the objectives of its NDC
- communicate an NDC every 5 years
- quantify its NDC in accordance with IPCC methodologies, which promote transparency and avoid double counting.

4.3.1 Australian Targets

Australia's commitment to the Paris Agreement includes reducing GHG emissions by 26 - 28 %, on 2005 levels, by 2030 (Commonwealth of Australia, 2015). To meet the requirements of the Paris Agreement, Australia will also have to develop interim targets for 2020 and 2025. Australia's NDC is summarised in **Table 4.1**.

Table 4.1 A summary of Australia's NDC

Emissions reduction target	Economy-wide target to reduce greenhouse gas emissions by 26 – 28% below 2005 levels by 2030
Coverage	Economy-wide
Scope	Energy Industrial processes and product use Agriculture Land-use, land-use change and forestry Waste
Gases	CO2, CH4, N2O, HFCs, PFCs, SF6, NF3

Australia's NDC prescribes an unconditional economy-wide target to reduce GHG emissions, and states that future policies will target emissions generated from:

- energy use
- industrial processes
- agriculture, land-use, land-use change and forestry
- waste.

Australia's NDC does not contain sector or state based targets, nor does it make any reference to the mining sector.

Australia's current national GHG mitigation policy framework caps facility level emissions via the Safeguard Mechanism, and funds mitigation projects through the Emissions Reduction Fund. The DoEE forecasts that the current national GHG policy will not be enough to achieve the level of mitigation contribution prescribed in Australia's NDC (DoEE 2018). **Table 4.2** is based on data produced by the DoEE in December 2018 (DoEE 2018). The table includes 2005 baseline emissions and a current forecast of 2030 emissions (using current policy settings).

Table 4.2 Forecast impact of current mitigation efforts (DEE 2018)

Sector	2005 GHG emissions (t CO2-e pa)	Current 2030 forecast (t CO2-e pa)
Electricity	197,000,000	163,000,000
Direct combustion	82,000,000	107,000,000
Transport	82,000,000	111,000,000
Fugitives	39,000,000	62,000,000
Industrial processes	32,000,000	33,000,000
Agriculture	76,000,000	78,000,000
Waste	14,000,000	9,000,000
LULUCF	82,000,000	-1,000,000
Total	605,000,000	563,000,000
% of 2005	100	93%

Table 4.2 demonstrates that current policy settings are expected to reduce emissions from the electricity generation and waste sectors, and achieve an overall 7% reduction from 2005 emissions by 2030.
If Australia is to achieve its 28% mitigation commitment under the Paris Agreement, annual national emissions must reach 447,700,000 t CO_2-e by 2030. Reducing the current 2030 forecast of 563,000,000 t CO_2-e to 447,700,000 t CO_2-e will require Australia to set a more aggressive mitigation trajectory between 2020 and 2030. To achieve the 28% 2030 Paris Agreement target, the DoEE estimates that the Australian economy must set a mitigation trajectory which will save approximately 762,000,000 t CO_2-e between 2021 and 2030.

The GHG emissions modelling completed by the DoEE anticipates growth in the Australian economy, and the DoEE forecasts an increase in emissions generated from direct consumption, transport and fugitive emissions (presumably from additional projects like the Revised Project). It is difficult to determine whether the Revised Project's emissions are included in the 2030 projections (i.e. the DoEE has assumed a certain number of new coal projects will be developed) or whether the Revised Project's emissions will inflate 2030 projections.

If as a worst case, it is assumed that the none of the Revised Project's Scope 1 emissions have been included in DoEE's forecast (and all other assumptions hold true), then the Revised Project's cumulative Scope 1 emissions (1,419,000 t CO_2-e) will increase the required national mitigation effort by approximately 0.19%.

The Revised Project may increase the national effort required to reach Australia's 2030 GHG mitigation target, however, the Revised Project in isolation is unlikely to affect Australia achieving its national mitigation targets in any material way. Small fluctuations in the performance of the electricity generation and transport sectors offer a far greater potential to influence the achievement of national targets than single facilities.

The Revised Project's Scope 2 and 3 emissions will be generated by Australian facilities and/or in international jurisdictions with environmental approval to generate GHG emissions.

4.3.2 NSW Policy

The NSW Government has developed its NSW Climate Change Policy Framework, which aims to deliver net-zero emissions by 2050, and a State that is more resilient and responsive to climate change (OEH 2016).

Under the NSW Climate Change Policy Framework, NSW has committed to both follow the Paris Agreement and to work to complement national action. The key policy directions under the NSW Climate Change Policy Framework are summarised in the **Table 4.3**.

Table 4.3 A summary of the NSW Climate Change Policy Framework

Policy Direction	Rationale/Goals
Creating an investment environment that manages the emissions reduction transition	Energy will be transformed and investment/job opportunities will be created in emerging industries of advanced energy, transport and carbon farming and environmental services
Boost energy productivity and put downward pressure on energy bills	Boosting energy and resource productivity will help reduce prices and the cost of transitions to net-zero emissions
Grow new industries and capitalise on competitive advantages	Capitalising on the competitive advantage and growth of industries in professional services, advanced energy technology, property management and financial services
Reduce risks and damage to public and private assets arising from climate change	Embed climate change considerations into asset and risk management as well as support the private sector by providing information and supportive regulatory frameworks for adaptation
Reduce climate change impacts on health and wellbeing	Recognise the increased demand for health and emergency services due to climate change and identify ways to better support more vulnerable communities to health impacts
Manage impacts on natural resources and communities	Coordinate efforts to increase resilience of primary industries and rural communities as climate change impacts water availability, water quality, habitats, weeds and air pollution

The policy framework is being delivered through:

- the Climate Change Fund
- developing an economic appraisal methodology to value GHG emissions mitigation

- embedding climate change mitigation and adaptation across government operations
- building on NSW's expansion of renewable energy
- developing action plans and strategies.

The Revised Project is unlikely to affect the objectives of the NSW Climate Change Policy Framework in a material way.

5.0 Conclusion

The Revised Project is a small scale coal operation that will produce energy commodities over 5 years. The Revised Project's forecast energy use intensity is considered to fall within the normal operating range for an Australian underground coal mine, and expected to generate approximately 1,523,000 t CO_2-e of Scope 1 and 2 emissions.

The Revised Project is also forecast to be associated with approximately 9,624,000 t CO_2-e of Scope 3 emissions. The Revised Project's Scope 3 emissions are beyond the operational control of WCL, and the majority of Scope 3 emissions will be generated downstream of the Revised Project, when coal products are combusted to produce coke.

6.0 References

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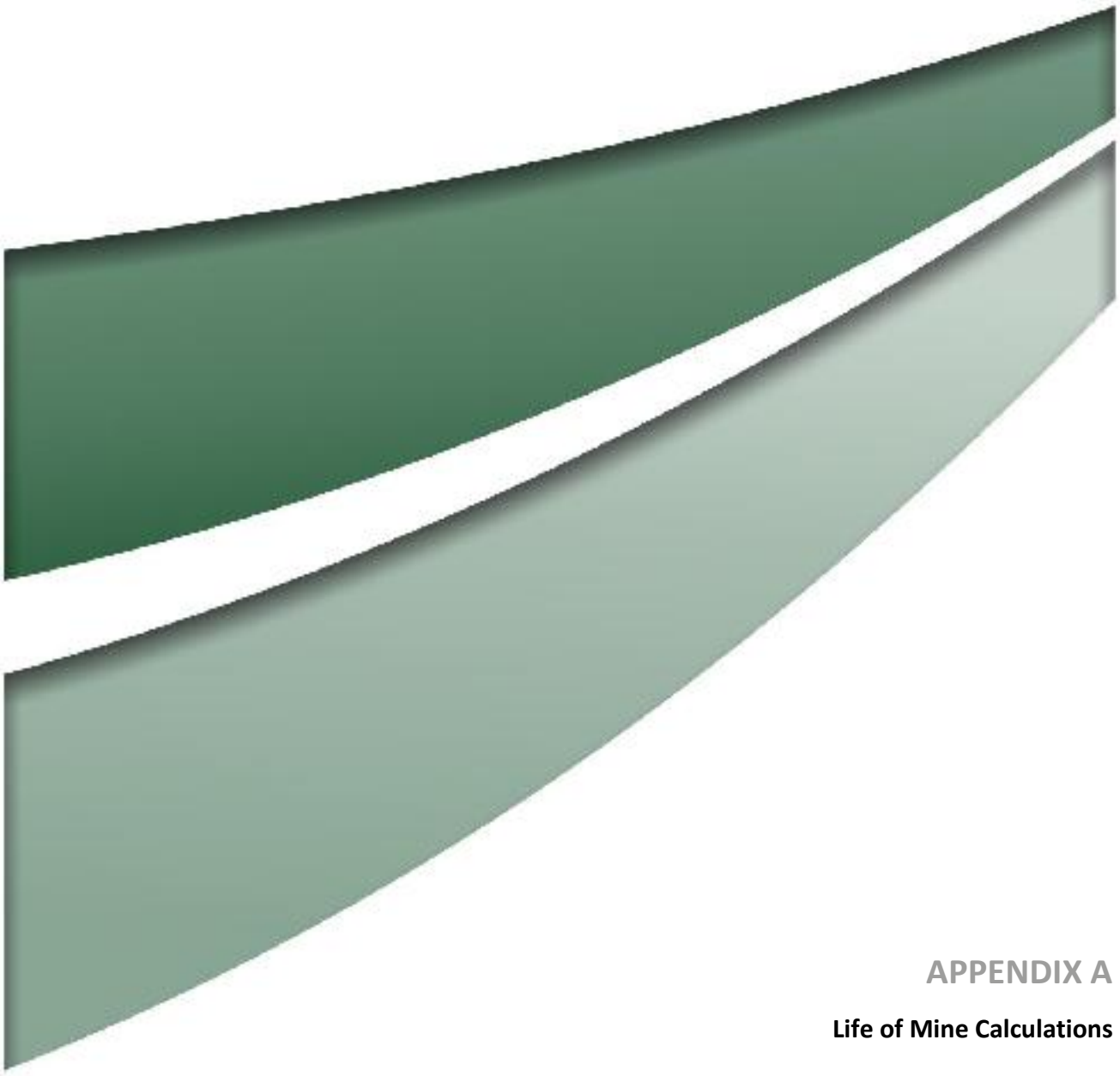


APPENDIX A

Life of Mine Calculations

Stationary Diesel Use

Activity Data		Energy Use	Emission Factors		
			CO_2	CH_4	N_20
kL	GJ/kL	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
2,250	38.6	86,850	69.9	0.1	0.2
			t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)			6,071	9	17
				Total GHG Emissions (t CO_2-e)	6,097

Fugitive Emissions

Activity Data	Emission Factors		
	CO_2	CH_4	N_20
ROM (t)	kg CO_2-e/ROM t	kg CO_2-e/ROM t	kg CO_2-e/ROM t
3,700,000 – VAM	N/A	365	N/A
3,700,000 – Post mining	N/A	17	N/A
	t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)	N/A	1,412,900	N/A
		Total GHG Emissions (t CO_2-e)	1,412,900

Electricity use

Activity Data	Energy Use	Emission Factors		
		CO_2	CH_4	N_20
GJ	GJ	kg CO_2-e / GJ	kg CO_2-e / GJ	kg CO_2-e / GJ
450,000	450,000	230	N/A	N/A
		t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)		103,500	N/A	N/A
			Total GHG Emissions (t CO_2-e)	103,500

Product Use

Activity Data		Energy Production		Emission Factors		
				CO_2	CH_4	N_20
Product	Product (t)	GJ/Product t	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Thermal coal	0	27.0	0	90	0.03	0.2
Coking coal	3,330,000	30.0	99,900,000	91.8	0.02	0.2
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				9,170,820	1,998	19,980
					Total GHG Emissions (t CO_2-e)	9,192,798

Extraction, Production and Distribution of Energy Purchased

Activity Data		Emission Factors		
		CO_2	CH_4	N_20
Purchased energy	**GJ**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**
Diesel	86,850	3.6	N/A	N/A
Electricity	450,000	33	N/A	N/A
		t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)		15,163	N/A	N/A
			Total GHG Emissions (t CO_2-e)	**15,163**

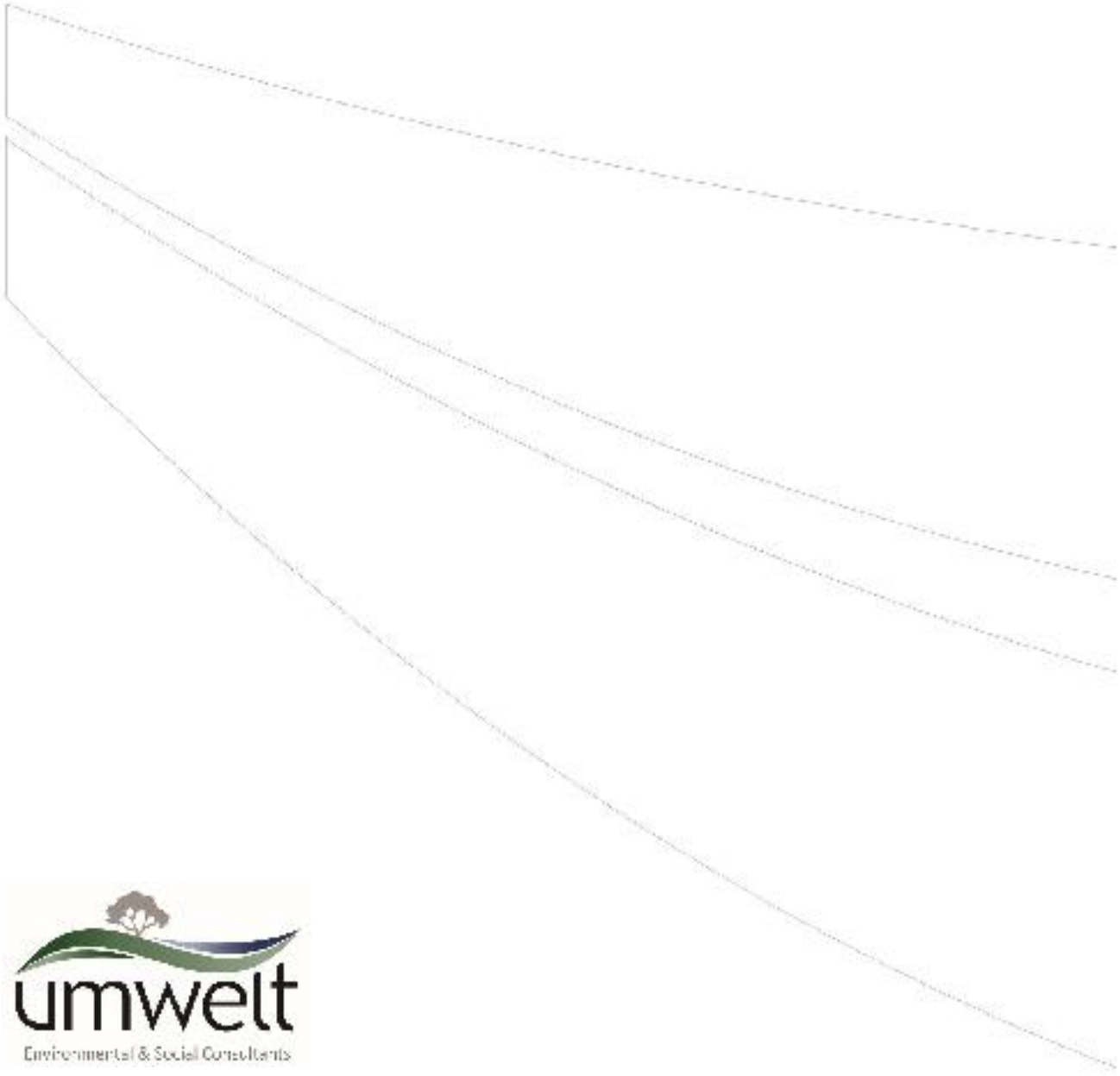
Product Transport

Activity Data				Emission Factors		
				CO_2	CH_4	N_20
Transport mode	**Product (t)**	**Distance (km)**	**Tonne km (tkm)**	**kg CO_2-e/tkm**	**kg CO_2-e/tkm**	**kg CO_2-e/tkm**
Ship	3,330,000	9,800	32,634,000,000	0.0126	N/A	N/A
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				411,188	N/A	N/A
					Total GHG Emissions (t CO_2-e)	**411,188**

Activity Data				Emission Factors		
				CO_2	CH_4	N_20
Transport mode	**Product (t)**	**Return Distance (km)**	**Diesel use (kL)**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**
Truck	3,330,000	30	1,374	73.5	0.1	0.5
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				3,897	5	27
					Total GHG Emissions (t CO_2-e)	**3,929**

Waste Transport

Activity Data				Emission Factors		
				CO_2	CH_4	N_20
Transport mode	**Product (t)**	**Return Distance (km)**	**Diesel use (kL)**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**
Truck	296,000	30	122	73.5	0.1	0.5
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				346	0	3
					Total GHG Emissions (t CO_2-e)	**349**



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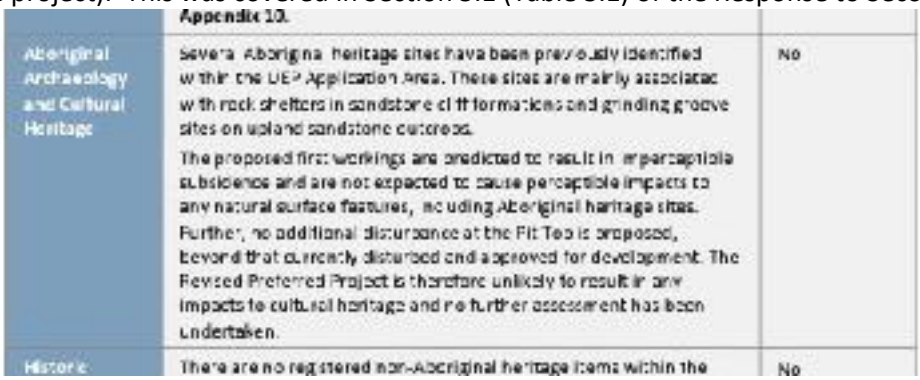
From: David Holmes <dholmes@umwelt.com.au>
Sent: Tuesday, 20 April 2021 3:28 PM
To: s. 22(1)(a)(ii) wayne.sly@wcl.net.au
Cc: s. 22(1)(a)(ii) richard.sheehan@wcl.net.au; Barbara Crossley
Subject: RE: Russell Vale Colliery Revised UEP - additional information [SEC=OFFICIAL]
Attachments: 3687_R08_GHGReport_Final.pdf

Hi s. 22(1)(a)(ii)

I have attached a copy of the GHG Report for the Russell Vale UEP which was included with the Response to the Second PAC Review Report.

There is no specific specialist assessment report on potential impacts to items of Aboriginal Heritage from the proposed Action as the predicted levels of subsidence were not considered likely to impact any previously identified Aboriginal sites (which were comprehensively surveyed as part of the previous assessments of earlier iteration of the project). This was covered in Section 5.1 (Table 5.1) of the Response to Second PAC Review Report as follows:



	Appendix 10.	
Aboriginal Archaeology and Cultural Heritage	Several Aboriginal heritage sites have been previously identified within the UEP Application Area. These sites are mainly associated with rock shelters in sandstone cliff formations and grinding groove sites on upland sandstone outcrops. The proposed first workings are predicted to result in imperceptible subsidence and are not expected to cause perceptible impacts to any natural surface features, including Aboriginal heritage sites. Further, no additional disturbance at the Fit Top is proposed, beyond that currently disturbed and approved for development. The Revised Preferred Project is therefore unlikely to result in any impacts to cultural heritage and no further assessment has been undertaken.	No
Historic	There are no registered non-Aboriginal heritage items within the	No

Section 4.6.2 of the Response to Submissions Report Part A (link here: https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=MP09_0013%2120200915T085510.369%20GMT) specifically addressed a request for further information from the NSW DPIE – Environment, Energy and Science (Biodiversity and Conservation Division). This section includes a full list of Aboriginal Sites within the study area and Figure 4.1 shows the locations of sites as recorded in the SW database AHIMS.

In recognition of the low likelihood of any impact, the NSW Development Consent (Appendix E to the PER) conditions included the following performance measures including a specific obligation in relation to Aboriginal heritage.

SUBSIDENCE

Performance Measures – Natural and Heritage Features etc

C1 The Applicant must ensure that the development does not cause any exceedances of the performance measures in Table 6, to the satisfaction of the Secretary.

Table 6: Subsidence Impact Performance Measures – Natural and Heritage Features, etc

Feature	Performance Measures
Watercourses	
Watercourses, including Cataract River, Cataract Creek and associated tributaries	• Negligible subsidence impacts or environmental consequences including: - negligible diversion of flows or changes in the natural drainage behaviour of pools; - negligible gas releases; - negligible increase in water cloudiness; - negligible increase in bank erosion; and - negligible increase in sediment load.
Water Supply	
Cataract Reservoir	• Negligible leakage from reservoir • Negligible reduction in water quality of reservoir • No connective cracking between the reservoir surface and the underground workings
Land	
Cliffs, steep slopes and rock face features	• Negligible environmental consequences (including subsidence induced rockfalls, displacement or dislodgement of boulders or slabs, or fracturing)
Swamps	
Upland swamps identified in the figure in Appendix 5	• Negligible environmental consequences including negligible change to the structural integrity of the bedrock base or any controlling rockbar of the swamp
Biodiversity	
Threatened species, threatened populations, or endangered ecological communities	• Negligible environmental consequences
Heritage sites	
Aboriginal heritage sites identified in the figure in Appendix 6	• Negligible subsidence impacts and environmental consequences • Negligible loss of heritage value
Historic heritage sites identified in the figure in Appendix 7	• Negligible subsidence impacts and environmental consequences • Negligible loss of heritage value
Other Aboriginal and historic heritage sites	• Negligible subsidence impacts and environmental consequences • Negligible loss of heritage value
Mine workings	
First workings and Second workings	• To remain long-term stable and non-subsiding

Notes:

- *The Applicant will be required to define more detailed performance indicators (including impact assessment criteria) for each of these performance measures in the various management plans that are required under this consent.*

Appendix 6 of the NSW Development Consent includes a figure showing the location of Aboriginal heritage items. Note that this figure shows sites in slightly different locations to the AHIMS data base (Fig 4,1 in the Response to Submissions Report A).

An Aboriginal Cultural Heritage Management Plan for the Russell Vale Colliery will be prepared to reflect the mining approved by the NSW Development Consent (see Condition B24 of the NSW Development Consent). As part of the implementation of this plan, updated baseline recording of all sites in the vicinity of the proposed bord and pillar mining operations will be undertaken and monitoring to confirm the Proposed Action has had no more than a negligible impact on these sites will be undertaken. This process of baseline recording will include confirmation of site locations. The monitoring to be undertaken throughout the course of the project will be documented in the Heritage Management Plan prepared as part of the detailed Extraction Plan processes detailed in condition C10 of the NSW Development Consent.

Please let me know if you require any further information to assist in this aspect of the assessment.

Regards

David Holmes
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Sent: Tuesday, 20 April 2021 12:04 PM
To: wayne.sly@wcl.net.au
Cc: s. 22(1)(a)(ii) @environment.gov.au>; David Holmes <dholmes@umwelt.com.au>; richard.sheehan@wcl.net.au
Subject: Russell Vale Colliery Revised UEP - additional information [SEC=OFFICIAL]

Hi Wayne,

I hope you're doing well. I am an assessment officer here at DAWE working on Russell Vale Colliery Revised UEP. I am writing to request copies of the aboriginal heritage information and greenhouse gas emissions information for the project.

Information you have provided to NSW on these topics would be acceptable.

Kind regards

s. 22(1)(a)(ii)

Northern NSW Assessments

Environment Approvals Division
Department of Agriculture, Water and the Environment
GPO Box 858 | Canberra ACT 2601 | Australia
☎ s. 22(1)(a)(ii)
✉

I acknowledge the Traditional Owners of country throughout Australia, their rich cultural connection to land, water and community, and pay my respects to them and their Elders past, present and emerging.

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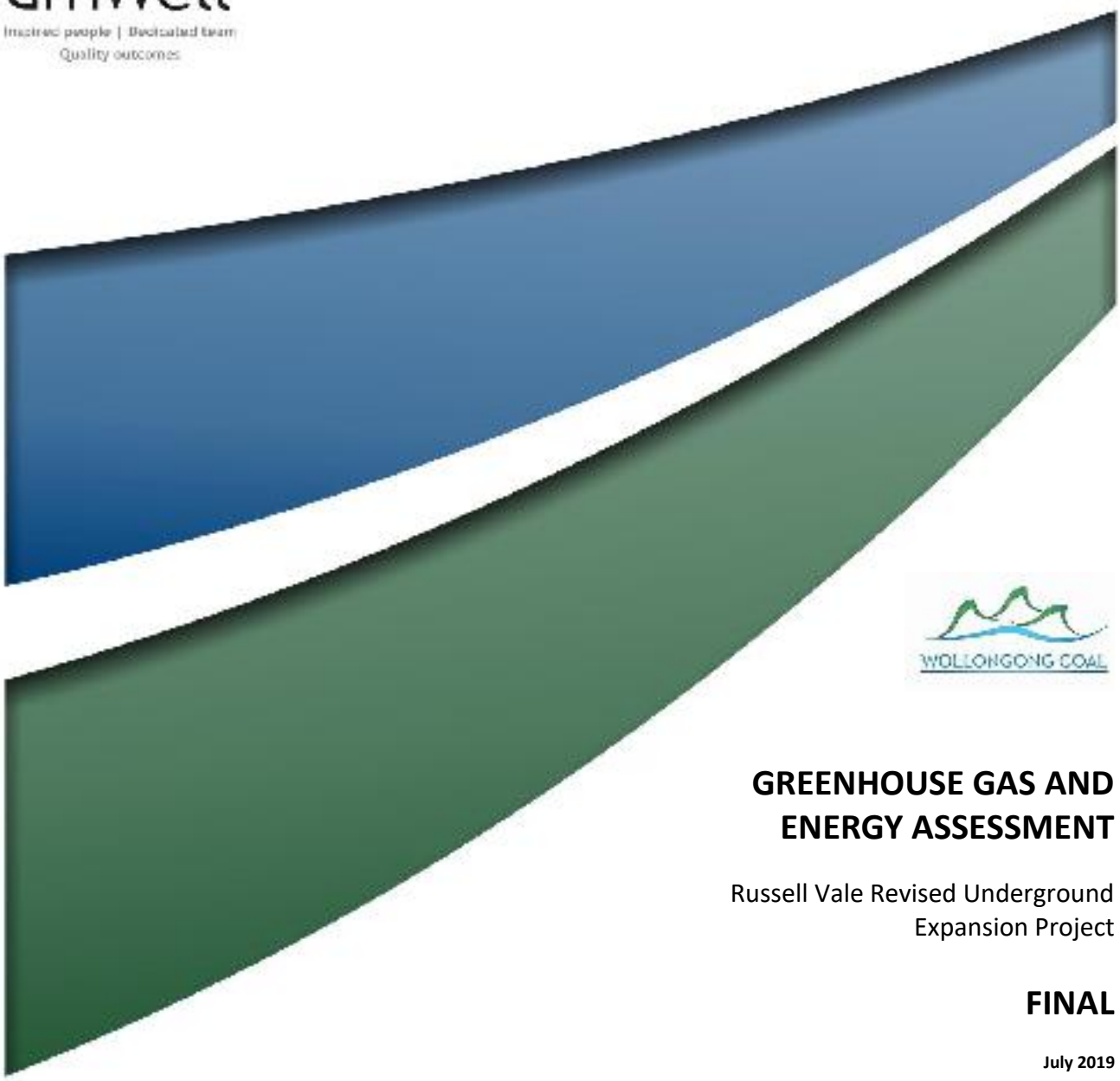

WOLLONGONG COAL

GREENHOUSE GAS AND ENERGY ASSESSMENT

Russell Vale Revised Underground Expansion Project

FINAL

July 2019

GREENHOUSE GAS AND ENERGY ASSESSMENT

Russell Vale Revised Underground Expansion Project

FINAL

Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Wollongong Coal Limited

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Report No.	3687/R08
Date:	July 2019

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Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	Malcolm Sedgwick	17 July 2019	Barbara Crossley	17 July 2019

Table of Contents

Figures

Tables

Appendices

1.0 Introduction

Wollongong Coal Limited (WCL) is proposing amendments to the Russell Vale Underground Expansion Project (UEP) in response to concern raised by government agencies, the Planning Assessment Commission (PAC) and the community. WCL has revised the UEP to address potential subsidence, biodiversity and water impacts within the Cataract Reservoir catchment and noise and traffic impacts associated with surface operations (Revised Preferred Project). The following Greenhouse Gas and Energy Assessment (GHGEA) quantifies the potential greenhouse gas (GHG) and energy impacts of the Revised Preferred Project (referred to herein as the Revised Project).

2.0 Assessment Framework

2.1 Objectives

The objective of this assessment is to evaluate the GHG and energy use implications of the Revised Project, as part of WCL's response to issues raised in the PAC Second Review Report.

2.2 Scope

The scope of the GHGEA includes:

- estimating direct and indirect (Scope 1, 2 and 3) GHG emissions associated with the Revised Project
- estimating energy use directly associated with the Revised Project.

2.3 Definitions

Table 2.1 contains concepts and a glossary of terms relevant to this GHGEA.

Table 2.1 Glossary of Terms[1]

Concept	Definition
Greenhouse gases	The GHG covered by the Kyoto Protocol and referred to in this GHGEA include: • Carbon dioxide; • Methane; • Nitrous oxide; • Hydrofluorocarbons; • Perfluorocarbons; and • Sulphur hexafluoride.
Scope 1 emissions	Direct emissions occur from sources that are owned or controlled by the Revised Project (in this case, the proponent, WCL) (e.g. fuel use, fugitive emissions). Scope 1 emissions are emissions over which the Revised Project has a high level of control.
Scope 2 emissions	Emissions from the generation of purchased electricity consumed by the Revised Project.
Scope 3 emissions	Indirect emissions that are a consequence of the activities of the Revised Project, but occur at sources owned or controlled by other entities (e.g. outsourced services). Scope 3 emissions can include emissions generated upstream of the Revised Project by providers of energy, materials and transport. Scope 3 emissions can also include emissions generated downstream of the Revised Project by transport providers and product use.

2.4 Impact Assessment Methodology

The GHGEA framework is based on the methodologies and emission factors contained in the National Greenhouse Accounts (NGA) Factors 2017. The assessment framework also incorporates the principles of The Greenhouse Gas Protocol 2004 (GHG Protocol).

[1] The GHG Protocol 2004

The GHG Protocol provides an internationally accepted approach to GHG accounting. The GHG Protocol provides guidance on setting reporting boundaries, defining emission sources and dealing with issues such as data quality and materiality.

Scope 1 and 2 emissions were calculated based on the methodologies and emission factors contained in the NGA Factors 2017 (DoEE 2017). Fugitive emissions have been calculated using the Method 1 approach, as described in the National Greenhouse Accounts (NGA) Factors 2017 (DoEE 2017).

Scope 3 emissions associated with product transport were calculated based on emission factors contained in the National Greenhouse Gas Inventory: Analysis of Recent Trends and Greenhouse Gas Indicators (AGO 2007). Other Scope 3 emissions were calculated using methodologies and emission factors contained in the NGA Factors 2017 (DoEE 2017).

2.5 Data Sources

The calculations in this report are based on activity data developed by WCL during the mine planning process. **Table 2.2** contains the source of activity data.

Table 2.2 Source of Activity Data Used for the Assessment

Activity data	Source
On-site fuel consumption	WCL - forecast diesel consumption
Electricity consumption	WCL - forecast electricity consumption
Fugitive emissions	WCL – Historical NGER data
Product transport	WCL - haulage distances

A detailed description of activity data and calculations are provided in **Appendix A**.

2.6 Assessment Boundary

The GHGEA boundary was developed to include all significant Scope 1, 2 and 3 emissions.

The GHG Protocol requires inventory data and methodologies to be relevant, consistent, complete, transparent and accurate. The relevance principle states that the GHG inventory should appropriately reflect GHG emissions and serve the decision-making needs of users – both internal and external [to the Revised Project] (GHG Protocol 2004).

An underground coal mine has a number of potential emission sources, however, the dominant emission sources, often targeted by mitigation measures and stakeholders can be summarised as:

- diesel use
- fugitive emissions
- electricity use
- product transport
- waste/reject transport
- product use.

The completeness principle states that all relevant emission sources within the chosen inventory boundary need to be accounted for so that a comprehensive and meaningful inventory is compiled (GHG Protocol 2004).

The emission sources listed in **Table 2.3** have been excluded from the GHGEA as activity data is not readily available, and modelling activity data is unlikely to generate sufficient emissions to materially change impacts or influence the decision making outcomes of stakeholders.

Table 2.3 Data Exclusions

Emissions source	Scope	Description
Combustion of fuel for energy	Scope 1	• Small quantities of fuels such as petrol and LPG.
Industrial processes	Scope 1	• Sulphur hexafluoride (high voltage switch gear). • Hydrofluorocarbon (commercial and industrial refrigeration).
Waste water handling (industrial)	Scope 1	• Methane emissions from waste water management.
Materials transport	Scope 3	• Delivery of diesel and other materials to site.
Solid waste	Scope 3	• Solid waste to landfill.
Business travel	Scope 3	• Employees travelling for business purposes.
Employee travel	Scope 3	• Employees travelling between their place of residence and the Russell Vale site.

3.0 Impact Assessment Results

GHG and energy use estimates have only been calculated for the operational stage of the Revised Preferred Project.

The following information and key assessment assumptions were used to estimate the GHG emissions from the operational stage of the Revised Project:

- Approximately 3.7 million tonne (Mt) of run-of-mine (ROM) coal will be recovered.
- The ventilation system will extract a flat rate of 270,000 t CO_2-e of fugitive emissions per annum (historical average).
- The mine will be classified as a "Gassy Mine" and generate post mining emissions from stockpiled ROM coal.
- Diesel use will average approximately 450 kL per annum.
- Electricity use will average approximately 90,000 GJ per annum (no longwall).
- Onsite ROM coal processing will generate 10% waste materials.
- Up to 80% of waste materials (coarse reject) will be transported off site as fill material.
- Waste materials will be transported an average of 15 kilometres (km).
- All product transport will be outsourced.
- Product transport will average 15 km.
- Product will be transported using road registered 19 metre (m) articulated vehicles such as semi-trailer or truck and dog trailers.
- All product will be exported to either India or China.
- All coal will be used to produce coke for steel production.

3.1 Greenhouse Gas Emissions

The Revised Project's GHG emissions are summarised in **Table 3.1**. Forecast GHG emissions are based on the Revised Project recovering approximately 3,700,000 ROM tonnes and extending the life of mine by 5 years.

The Revised Project is forecast to generate approximately 1,419,000 t CO_2-e of Scope 1 emissions from combusting diesel and releasing fugitive emissions. Approximately 284,000 t CO_2-e per annum of Scope 1 emissions are expected to be generated the Revised Project. Annual average Scope 1 emission estimates should not be used to benchmark annual performance, as annual emissions will vary significantly due to normal variations in annual activity.

The Revised Project is forecast to be associated with approximately 104,000 t CO_2-e of Scope 2 emissions from consuming electricity. Approximately 21,000 t CO_2-e per annum of Scope 2 emissions are expected to be associated with the Revised Project.

The Revised Project is forecast to be associated with approximately 9,624,000 t CO_2-e of Scope 3 emissions. Scope 3 emissions will be generated by third parties who transport and consume coal products. Approximately 1,925,000 t CO_2-e per annum of Scope 3 emissions are expected to be associated with the Revised Project.

Figure 3.1 demonstrates that the Revised Project's GHG inventory is dominated by Scope 3 emissions. Approximately 86% of the Revised Project's GHG emissions occur downstream of the project. Approximately 14% of the GHG associated with the Revised Project is related to on-site energy use and fugitive emissions (Scope 1 and 2 emissions).

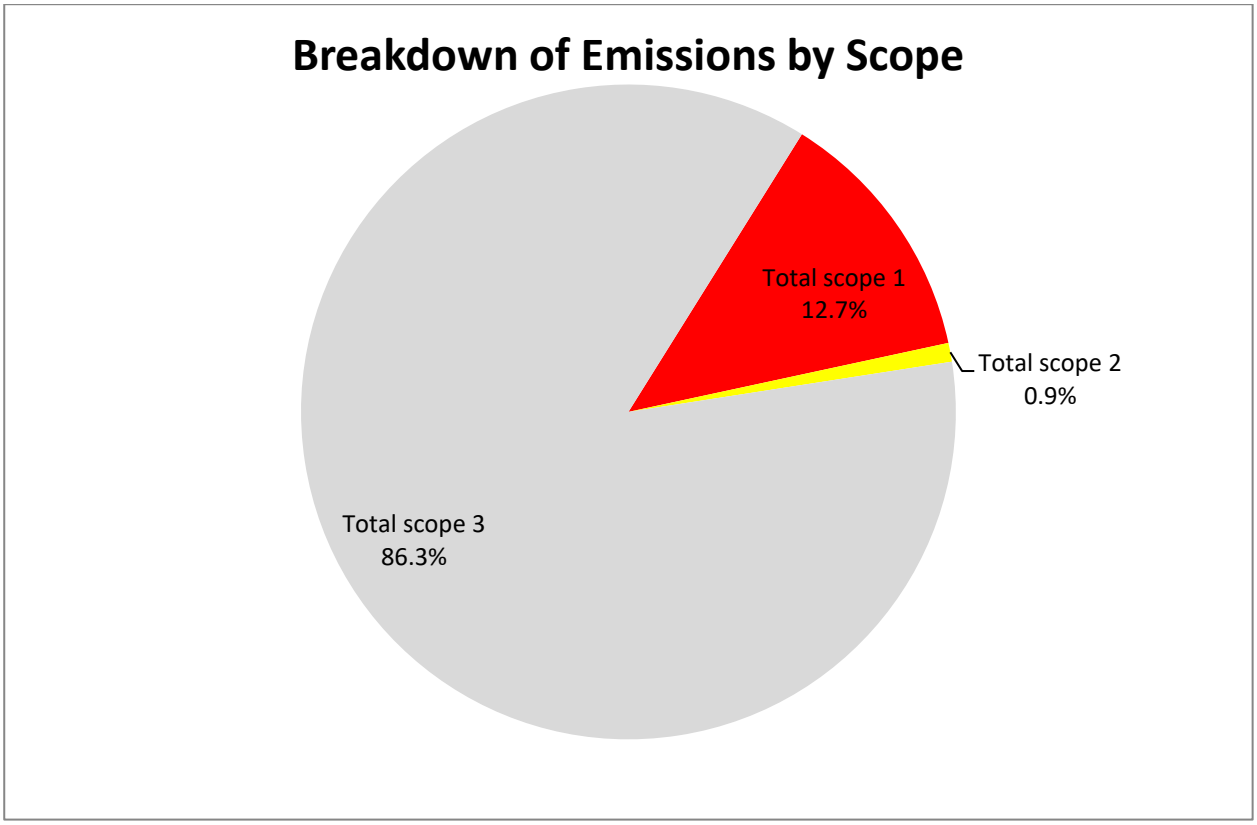

Figure 3.1 Breakdown of Emissions by Scope

Scope 2 and 3 emissions have been included in the GHGEA to demonstrate the potential upstream and downstream impacts of the Revised Project. All Scope 2 and 3 emissions identified in the GHGEA are attributable to, and may be reported by, other sectors.

3.2 Energy Use

The Revised Project is forecast to require approximately 537,000 GJ of energy from diesel and grid electricity. The Revised Project is expected to use approximately 108,000 GJ per annum.

The industry average energy use for underground coal mines in Australia ranges between 140 and 490 Megajoules (MJ)/Product tonne (Energetics 2009). The Revised Project is forecast to operate with an average energy use intensity of approximately 162 MJ/Product Tonne. The forecast energy use intensity of the Revised Project is within the normal operating range for Australian underground coal mines.

Table 3.1 GHG Emission Summary for the Revised Preferred Project

Stage	Scope	Source	Source Totals (t CO_2-e)	Scope Totals (t CO_2-e)
Life of Mine	Scope 1 (Direct)	Diesel use	6,097	1,418,997
		Fugitive emissions	1,412,900	
	Scope 2 (Indirect)	Electricity	103,500	103,500
	Scope 3 (Indirect)	Product use	9,192,798	9,623,427
		Associated with energy extraction and distribution	15,163	
		Product transport	415,117	
		Waste transport	349	
Total GHG Emissions for Operations				**11,145,924**

(refer to **Appendix A** for further detail)

4.0 Impact Assessment Summary

The GHG emissions generated by the Revised Project have the potential to impact the physical environment, and the GHG reduction objectives of national and international governing bodies. The following assessment makes the distinction between environment impacts and impacts on policy objectives.

4.1 Impact on the Environment

The Revised Project's GHG emissions will be highly mobile and generated across multiple policy jurisdictions along the product value chain. The accumulation of GHG or carbon in 'carbon sinks' is the primary impact of GHG emissions. Anthropogenic GHG emissions have accumulated in three major carbon sinks - the ocean (30%), terrestrial plants (30%) and the atmosphere (40%) (BOM and CSIRO, 2014).

The accumulation of GHG in the atmosphere is an important driver of global warming, sea level rise and climate change (IPCC 2013). Sea level rise and climate change may have many ramifications for the natural and built environment. The accumulation of GHG in the ocean is also an important driver of ocean acidification (IPCC 2013).

The Revised Project's direct emissions (Scope 1) are forecast to be approximately 284,000 t CO_2 –e per annum.

To put the Revised Project's emissions into perspective, under current policy settings, global GHG emissions are forecast to reach 56,200,000,000 t CO_2-e per annum by 2025 (UNEP 2016). During operation, the Revised Project will contribute approximately 0.0005% to global emissions per annum (based on its projected Scope 1 emissions). The relative environmental impact of the Revised Project is likely to be relative to its proportion of global GHG emissions.

4.2 Impact on Climate Change

The Intergovernmental Panel on Climate Change (IPCC) define climate change as a change in the state of the climate that can be identified by changes in the mean and/or variability of its properties, and persists for an extended period, typically decades or longer (IPCC 2007).

Climate change is caused by changes in the energy balance of the climate system. The energy balance of the climate system is driven by atmospheric concentrations of GHG and aerosols, land cover and solar radiation (IPCC 2007).

Climate change models forecast many different climate change impacts, which are influenced by future GHG emission scenarios. Climate change forecasts also vary significantly from region to region.

A qualitative assessment of climate change requires a regional reference and future emission trajectory assumptions. The Revised Project, in isolation, is unlikely to influence global emission trajectories. Future emission trajectories will largely be influenced by global scale issues such as; technology, population growth and GHG mitigation policy. NSW climate change projections have been modelled by the NSW and ACT Regional Climate Modelling (NARCliM) project. NARCliM has modelled climate change projections for 2030 and 2070, using the IPCC high emissions A2 emission trajectory scenario. The A2 scenario assumes (IPCC 2000):

- relatively slow demographic transition and relatively slow convergence in regional fertility patterns
- relatively slow convergence in inter-regional GDP per capita differences

- relatively slow end-use and supply-side energy efficiency improvements (compared to other storylines)
- delayed development of renewable energy
- no barriers to the use of nuclear energy.

The proposed Revised Project is consistent with the A2 emissions trajectory scenario, therefore the climate change projections developed by NARCliM seem a reasonable basis for a qualitative climate change impact assessment. NARCliM makes the following climate change projections for NSW (Adapt NSW 2016):

- maximum temperatures are projected to increase
- minimum temperatures are projected to increase
- the number of hot days will increase
- the number of cold nights will decrease
- rainfall is projected to decrease in spring and winter
- rainfall is projected to increase in summer and autumn
- average fire weather is projected to increase in summer and spring
- number of days with severe fire danger is projected to increase in summer and spring.

The extent to which global emissions and atmospheric concentrations of GHG have a demonstrable impact on climate change will be largely driven by the global response to reducing total global emissions that includes all major emission sources and sinks.

4.3 Impact on Policy Objectives

The United Nations Framework Convention on Climate Change (UNFCCC) is the leading international forum for setting climate change targets and objectives. The UNFCCC has been responsible for developing internationally accepted GHG emission reporting methodologies, and has led the development of:

- the Kyoto Protocol
- the Paris Agreement
- specific directives and guidance to improve the implementation of the UNFCCC.

The Kyoto Protocol became international policy in 2005, and it committed the European Union (EU) plus 37 other member states to manage GHG emissions between 2008 and 2012. A second round of the Kyoto Protocol (the Doha Amendment) committed the EU plus 191 other member states to manage GHG emissions between 2013 and 2020. Australia was a signatory to both rounds of the Kyoto Protocol and Australia will meet its obligations under the Kyoto Protocol in 2020 (DoEE 2018).

In 2015 the UNFCCC successfully negotiated an international climate change agreement between 195 countries (the Paris Agreement). The Paris Agreement aims to:

- hold the increase in the global average temperature to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels

- increase the ability [of nations] to adapt to the adverse impacts of climate change and foster climate resilience and low GHG emissions development, in a manner that does not threaten food production
- make finance flows consistent with a pathway towards low GHG emissions and climate-resilient development.

The Paris Agreement seeks to meet its objectives by developing programs and mechanisms that:

- require participating Parties to prepare and communicate GHG mitigation contributions. Parties are expected to set mitigation targets for 2020, and then develop new targets every 5 years. Each successive target is expected to represent a larger mitigation effort than the previous target
- promote climate change resilience and adaptation
- provide mitigation and adaptation funding to developing countries
- foster mitigation and adaptation technology transfer between Parties
- require participating Parties to report progress towards their mitigation contributions on an annual basis.

Australia signed the Paris Agreement on 22 April 2016, and Australia's obligations under the Paris Agreement will drive national GHG policy between 2020 and 2030. Under the Paris Agreement, Australia is obliged to:

- prepare, communicate and maintain a Nationally Determined Contribution (NDC). An NDC outlines the size and type of mitigation contribution each member state will make to the international effort
- pursue domestic mitigation measures, with the aim of achieving the objectives of its NDC
- communicate an NDC every 5 years
- quantify its NDC in accordance with IPCC methodologies, which promote transparency and avoid double counting.

4.3.1 Australian Targets

Australia's commitment to the Paris Agreement includes reducing GHG emissions by 26 - 28 %, on 2005 levels, by 2030 (Commonwealth of Australia, 2015). To meet the requirements of the Paris Agreement, Australia will also have to develop interim targets for 2020 and 2025. Australia's NDC is summarised in **Table 4.1**.

Table 4.1 A summary of Australia's NDC

Emissions reduction target	Economy-wide target to reduce greenhouse gas emissions by 26 – 28% below 2005 levels by 2030
Coverage	Economy-wide
Scope	Energy Industrial processes and product use Agriculture Land-use, land-use change and forestry Waste
Gases	CO2, CH4, N2O, HFCs, PFCs, SF6, NF3

Australia's NDC prescribes an unconditional economy-wide target to reduce GHG emissions, and states that future policies will target emissions generated from:

- energy use
- industrial processes
- agriculture, land-use, land-use change and forestry
- waste.

Australia's NDC does not contain sector or state based targets, nor does it make any reference to the mining sector.

Australia's current national GHG mitigation policy framework caps facility level emissions via the Safeguard Mechanism, and funds mitigation projects through the Emissions Reduction Fund. The DoEE forecasts that the current national GHG policy will not be enough to achieve the level of mitigation contribution prescribed in Australia's NDC (DoEE 2018). **Table 4.2** is based on data produced by the DoEE in December 2018 (DoEE 2018). The table includes 2005 baseline emissions and a current forecast of 2030 emissions (using current policy settings).

Table 4.2 Forecast impact of current mitigation efforts (DEE 2018)

Sector	2005 GHG emissions (t CO2-e pa)	Current 2030 forecast (t CO2-e pa)
Electricity	197,000,000	163,000,000
Direct combustion	82,000,000	107,000,000
Transport	82,000,000	111,000,000
Fugitives	39,000,000	62,000,000
Industrial processes	32,000,000	33,000,000
Agriculture	76,000,000	78,000,000
Waste	14,000,000	9,000,000
LULUCF	82,000,000	-1,000,000
Total	605,000,000	563,000,000
% of 2005	100	93%

Table 4.2 demonstrates that current policy settings are expected to reduce emissions from the electricity generation and waste sectors, and achieve an overall 7% reduction from 2005 emissions by 2030.
If Australia is to achieve its 28% mitigation commitment under the Paris Agreement, annual national emissions must reach 447,700,000 t CO_2-e by 2030. Reducing the current 2030 forecast of 563,000,000 t CO_2-e to 447,700,000 t CO_2-e will require Australia to set a more aggressive mitigation trajectory between 2020 and 2030. To achieve the 28% 2030 Paris Agreement target, the DoEE estimates that the Australian economy must set a mitigation trajectory which will save approximately 762,000,000 t CO_2-e between 2021 and 2030.

The GHG emissions modelling completed by the DoEE anticipates growth in the Australian economy, and the DoEE forecasts an increase in emissions generated from direct consumption, transport and fugitive emissions (presumably from additional projects like the Revised Project). It is difficult to determine whether the Revised Project's emissions are included in the 2030 projections (i.e. the DoEE has assumed a certain number of new coal projects will be developed) or whether the Revised Project's emissions will inflate 2030 projections.

If as a worst case, it is assumed that the none of the Revised Project's Scope 1 emissions have been included in DoEE's forecast (and all other assumptions hold true), then the Revised Project's cumulative Scope 1 emissions (1,419,000 t CO_2-e) will increase the required national mitigation effort by approximately 0.19%.

The Revised Project may increase the national effort required to reach Australia's 2030 GHG mitigation target, however, the Revised Project in isolation is unlikely to affect Australia achieving its national mitigation targets in any material way. Small fluctuations in the performance of the electricity generation and transport sectors offer a far greater potential to influence the achievement of national targets than single facilities.

The Revised Project's Scope 2 and 3 emissions will be generated by Australian facilities and/or in international jurisdictions with environmental approval to generate GHG emissions.

4.3.2 NSW Policy

The NSW Government has developed its NSW Climate Change Policy Framework, which aims to deliver net-zero emissions by 2050, and a State that is more resilient and responsive to climate change (OEH 2016).

Under the NSW Climate Change Policy Framework, NSW has committed to both follow the Paris Agreement and to work to complement national action. The key policy directions under the NSW Climate Change Policy Framework are summarised in the **Table 4.3**.

Table 4.3 A summary of the NSW Climate Change Policy Framework

Policy Direction	Rationale/Goals
Creating an investment environment that manages the emissions reduction transition	Energy will be transformed and investment/job opportunities will be created in emerging industries of advanced energy, transport and carbon farming and environmental services
Boost energy productivity and put downward pressure on energy bills	Boosting energy and resource productivity will help reduce prices and the cost of transitions to net-zero emissions
Grow new industries and capitalise on competitive advantages	Capitalising on the competitive advantage and growth of industries in professional services, advanced energy technology, property management and financial services
Reduce risks and damage to public and private assets arising from climate change	Embed climate change considerations into asset and risk management as well as support the private sector by providing information and supportive regulatory frameworks for adaptation
Reduce climate change impacts on health and wellbeing	Recognise the increased demand for health and emergency services due to climate change and identify ways to better support more vulnerable communities to health impacts
Manage impacts on natural resources and communities	Coordinate efforts to increase resilience of primary industries and rural communities as climate change impacts water availability, water quality, habitats, weeds and air pollution

The policy framework is being delivered through:

- the Climate Change Fund
- developing an economic appraisal methodology to value GHG emissions mitigation

- embedding climate change mitigation and adaptation across government operations
- building on NSW's expansion of renewable energy
- developing action plans and strategies.

The Revised Project is unlikely to affect the objectives of the NSW Climate Change Policy Framework in a material way.

5.0 Conclusion

The Revised Project is a small scale coal operation that will produce energy commodities over 5 years. The Revised Project's forecast energy use intensity is considered to fall within the normal operating range for an Australian underground coal mine, and expected to generate approximately 1,523,000 t CO_2-e of Scope 1 and 2 emissions.

The Revised Project is also forecast to be associated with approximately 9,624,000 t CO_2-e of Scope 3 emissions. The Revised Project's Scope 3 emissions are beyond the operational control of WCL, and the majority of Scope 3 emissions will be generated downstream of the Revised Project, when coal products are combusted to produce coke.

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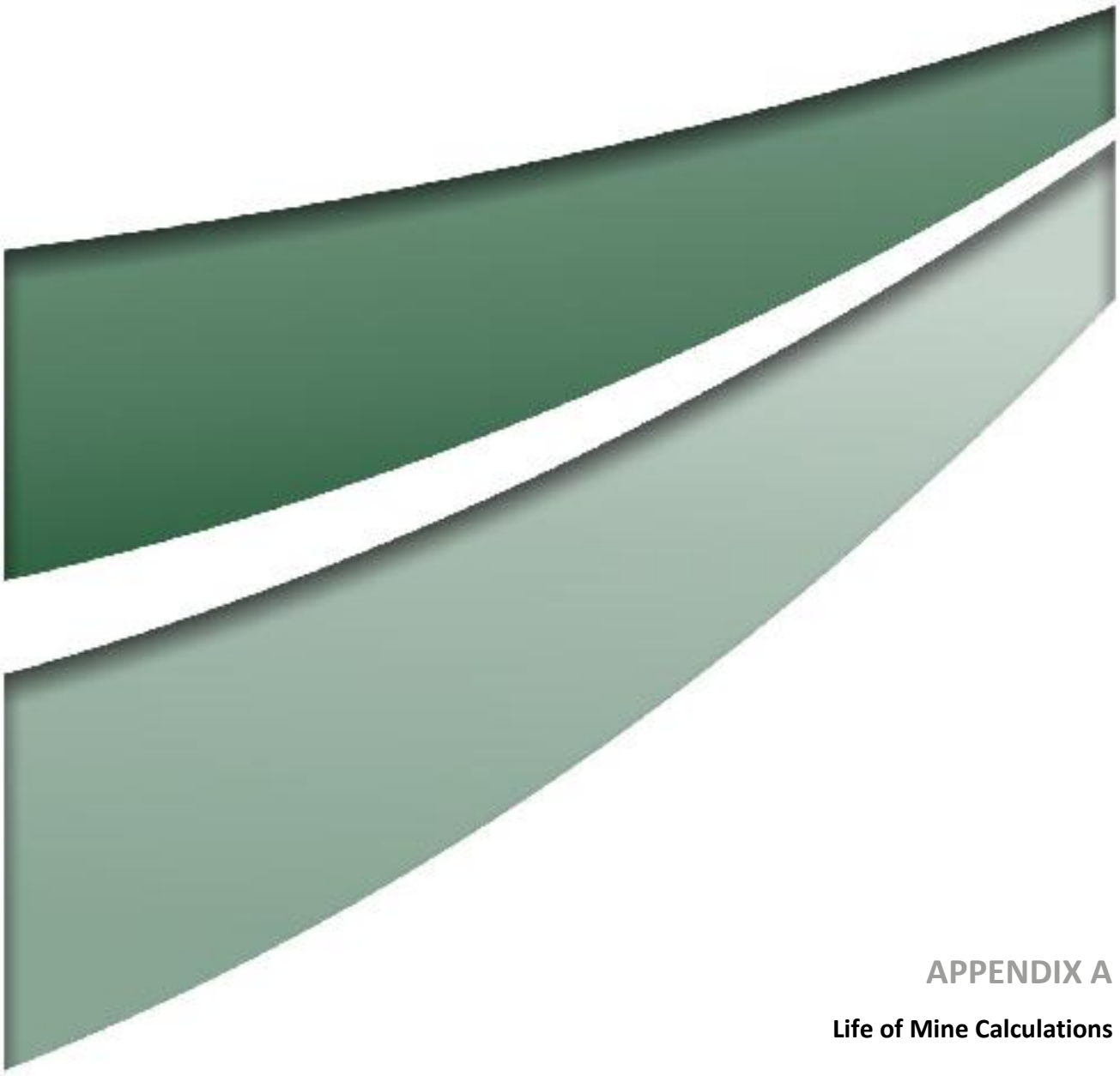


APPENDIX A

Life of Mine Calculations

Stationary Diesel Use

Activity Data	Energy Use		Emission Factors		
			CO_2	CH_4	N_20
kL	GJ/kL	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
2,250	38.6	86,850	69.9	0.1	0.2
			t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)			6,071	9	17
				Total GHG Emissions (t CO_2-e)	6,097

Fugitive Emissions

Activity Data	Emission Factors		
	CO_2	CH_4	N_20
ROM (t)	kg CO_2-e/ROM t	kg CO_2-e/ROM t	kg CO_2-e/ROM t
3,700,000 – VAM	N/A	365	N/A
3,700,000 – Post mining	N/A	17	N/A
	t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)	N/A	1,412,900	N/A
		Total GHG Emissions (t CO_2-e)	1,412,900

Electricity use

Activity Data	Energy Use	Emission Factors		
		CO_2	CH_4	N_20
GJ	GJ	kg CO_2-e / GJ	kg CO_2-e / GJ	kg CO_2-e / GJ
450,000	450,000	230	N/A	N/A
		t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)		103,500	N/A	N/A
			Total GHG Emissions (t CO_2-e)	103,500

Product Use

Activity Data		Energy Production		Emission Factors		
				CO_2	CH_4	N_20
Product	Product (t)	GJ/Product t	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Thermal coal	0	27.0	0	90	0.03	0.2
Coking coal	3,330,000	30.0	99,900,000	91.8	0.02	0.2
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				9,170,820	1,998	19,980
					Total GHG Emissions (t CO_2-e)	9,192,798

Extraction, Production and Distribution of Energy Purchased

Activity Data		Emission Factors		
		CO_2	CH_4	N_20
Purchased energy	**GJ**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**
Diesel	86,850	3.6	N/A	N/A
Electricity	450,000	33	N/A	N/A
		t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)		15,163	N/A	N/A
			Total GHG Emissions (t CO_2-e)	**15,163**

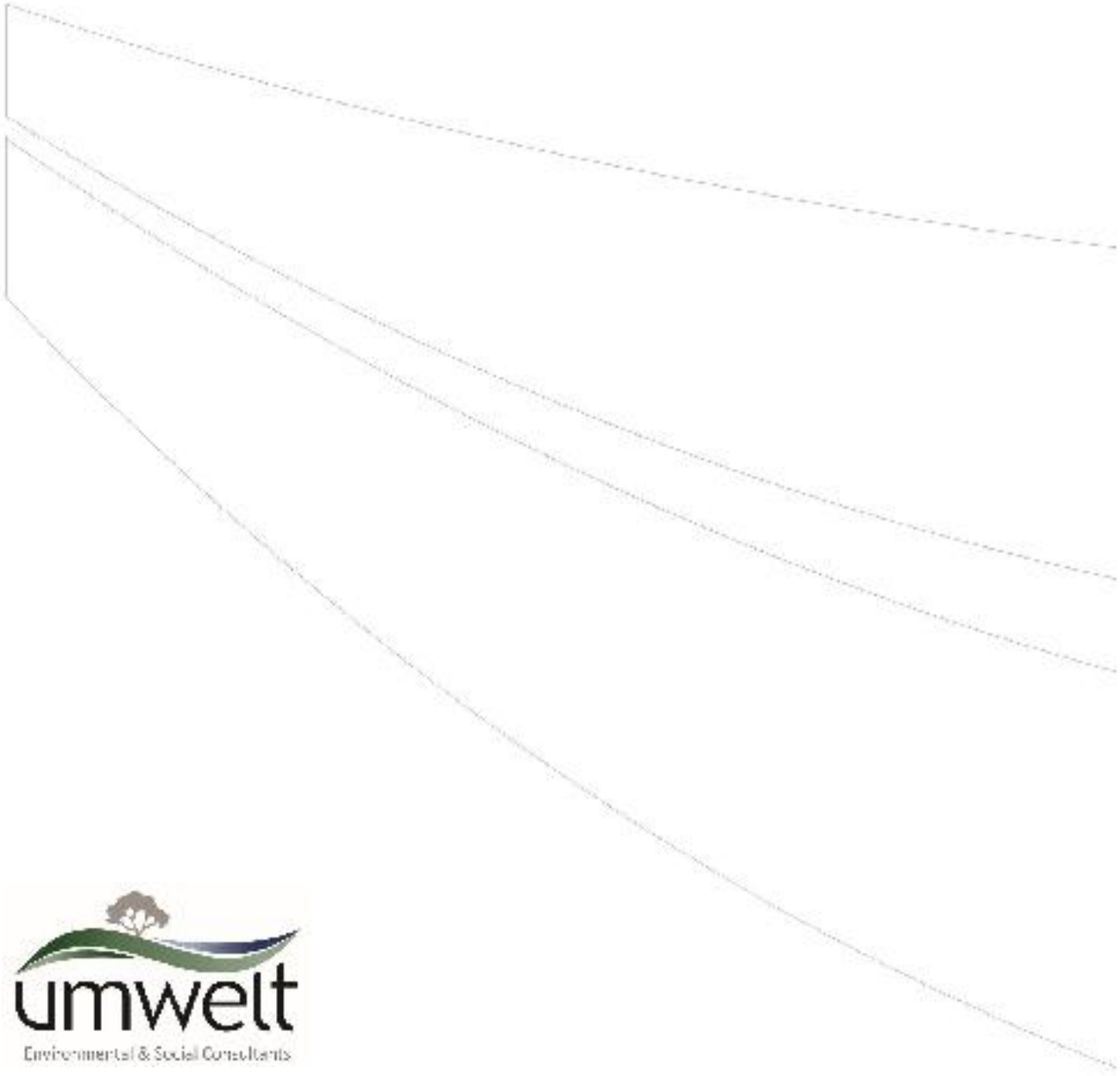
Product Transport

Activity Data				Emission Factors		
				CO_2	CH_4	N_20
Transport mode	**Product (t)**	**Distance (km)**	**Tonne km (tkm)**	**kg CO_2-e/tkm**	**kg CO_2-e/tkm**	**kg CO_2-e/tkm**
Ship	3,330,000	9,800	32,634,000,000	0.0126	N/A	N/A
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				411,188	N/A	N/A
					Total GHG Emissions (t CO_2-e)	**411,188**

Activity Data				Emission Factors		
				CO_2	CH_4	N_20
Transport mode	**Product (t)**	**Return Distance (km)**	**Diesel use (kL)**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**
Truck	3,330,000	30	1,374	73.5	0.1	0.5
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				3,897	5	27
					Total GHG Emissions (t CO_2-e)	**3,929**

Waste Transport

Activity Data				Emission Factors		
				CO_2	CH_4	N_20
Transport mode	**Product (t)**	**Return Distance (km)**	**Diesel use (kL)**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**	**kg CO_2-e/GJ**
Truck	296,000	30	122	73.5	0.1	0.5
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG Emissions (t CO_2-e)				346	0	3
					Total GHG Emissions (t CO_2-e)	**349**



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MS21-006009

To: Minister for the Environment (For Decision)

STATEMENT OF REASONS FOR DECISION TO APPROVE THE RUSSELL VALE COLLIERY REVISED UNDERGROUND EXPANSION PROJECT, RUSSELL VALE, NSW (EPBC 2020/8702)

Timing: 2 September 2021 – so that it can be publicly released with the approval decision notice for this project.

Recommendations:

1. That you consider the draft statement of reasons (**Attachment A**) and make any modifications you consider necessary to ensure the statement reflects your reasons for your decision dated 31 August 2021 to approve the Russel Vale Colliery Revised Underground Expansion Project with conditions (**Attachment B**).

Considered/ Please discuss

2. That you agree that the draft statement of reasons at **Attachment A** accurately reflects your reasoning for your decision at **Attachment B**.

Agreed / Not agreed

3. If you agree with recommendation 2, that you sign the draft statement of reasons at **Attachment A**.

Signed / Not signed

4. That you agree to the Department's recommendation that the statement of reasons be published on the Department's website.

Agreed / Not agreed

Minister: Date: 2/9/21

Comments:

Clearing Officer: Sent: 2/9/2021	Louise Vickery	Assistant Secretary, Environment Assessments (NSW, ACT) Branch	s. 22(1)(a)(ii)
Contact Officer:	s. 22(1)(a)(ii)	Principal Legal Officer, Environment, Employment and Litigation Practice	s. 22(1)(a)(ii)

Key Points:

1. On 31 August 2021, you approved the Russell Vale Colliery Revised Underground Expansion Project (**EPBC 2020/8702**) (**Approval**) under sections 130(1) and 133(1) of the *Environment Protection and Biodiversity Conservation Act 1999* subject to conditions (**Attachment B**).

2. The statement of reasons was prepared against the briefing package on which your decision was made.

    a. For your information, the final decision and proposed decision packages (**Attachment B**) are available electronically in PDMS (see **MS21-000894**) and hard copies of both packages have been delivered to your Office.

3. The Department notes you may make any modifications you consider necessary to ensure the statement reflects your reasoning.

4. Although it is not mandatory, we recommend you publish the statement of reasons on the Department's website.

    a. There is high level of public interest in this decision following the Federal Court's judgment in *Sharma v Minister for the Environment*.

    b. Publishing the statement of reasons is consistent with the government's policies on transparency in decision-making and the department's EPBC Act policy statement for statement of reasons.

Consultation:

5. Legal Division and Australian Government Solicitor.

Attachments:

A: The statement of reasons—FOR SIGNATURE
B: Final decision brief dated 31 August 2021 (including the proposed decision briefing package) (MS21-000894)