

EXTRACTS FOR THE ENVIRONMENT PROTECTION AUTHORITY

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2. RESPONSES TO ISSUES RAISED ABOUT THE AMENDED PROJECT

2.4 AIR QUALITY

2.4.4 Changes to Particulate Fraction Emission Ratios

2.4.4.1 Representative Comment(s)

Estimated emissions from the amended project differ significantly from the original project with consequent changes to the assessed impact on sensitive receptors. Reduction in coal processing reduces emissions from this component of the processing.

	2013 project		Amended project	
TSP emissions (T / yr)	Year 2.5	928.6	Year 1	267.8
	Year 4.25	1,206.0	Year 4	740.5
	Year 7.75	990.5	Year 7	1,079.9
	Year 13	822.8	Year 10	807.8

Emissions estimation has been done to greater detail than in the original application. For both estimates, emissions of PM₁₀ and of PM_{2.5} are calculated as a fraction of estimated TSP. In the original application, a single value for each was used for all sources. Emission estimation for the amended proposal applies source-specific ratios. The resulting total emission estimate has lesser contributions from PM_{2.5} and PM₁₀ to TSP. The fraction of TSP that is PM₁₀ reduces from 0.39 to 0.29 and that of PM_{2.5} from 0.047 to 0.040.

The estimated total annual emissions for the amendment show PM₁₀ emissions are a smaller fraction of TSP emissions than in the original assessment. Emissions are also reduced as there is less coal handling and preparation.

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Response

The use of lower contribution ratios (than used in the 2013 EIS) for PM_{2.5} and PM₁₀ as a proportion of TSP has not been raised as an issue in the EPA's submission. To the contrary, although NSW EPA has noted that there has been a change in the approach to calculating PM₁₀ and PM_{2.5} emissions within the AQA for the amended Project compared with the 2013 Air Quality Assessment (2013 AQA) (PAEHolmes, 2013a¹) their submission notes that the "emissions estimation has been done to greater detail than in the original application. ...In the original [2013] application, a single value for each [PM₁₀ and PM_{2.5}] was used for all sources. Emission estimation for the amended proposal applies source-specific ratios."

These changes in contribution ratios are consistent with the continued development of dispersion modelling methodologies that Pacific Environment undertakes on an ongoing basis, with adoption of source-specific ratios developed during the validation of the Upper Hunter

¹ Pacific Environment Limited (2013a), Rocky Hill Coal Project Air Quality Assessment, Part 2A of the Specialist Consultant Studies Compendium, Prepared on behalf of GRL

Particle Model (Pacific Environment, 2013b²) where it was found the application of source specific ratios in the dispersion modelling provided much better correlation with subsequent monitoring data than the original (i.e. single value) method. It is also consistent with the approach taken in other recent air quality assessments, including the recently approved Mount Owen Continued Operations Project (Pacific Environment, 2014³) and the Bylong Coal Mine currently under assessment (Pacific Environment, 2015⁴).

In the 2013 AQA, only a TSP emission inventory was developed and the modelling was based on the use of three particle-size categories, namely:

- 0µm to 2.5µm – referred to as fine particles [FP] or PM_{2.5};
- 2.5µm to 10µm – referred to as coarse matter [CM]; and
- 10µm to 30µm – referred to as the Rest.

In 2013, the modelling was undertaken (using just the TSP emissions) for each of the three size fractions with the distribution of particles in each particle size range as follows (State Pollution Control Commission (1986)⁵):

- PM_{2.5} (FP) is 0.0468 of TSP.
- PM_{2.5-10} (CM) is 0.3440 of TSP.
- PM₁₀₋₃₀ (Rest) is 0.6090 of TSP.

and deposit from the plume in accordance with the deposition rate appropriate for particles with an aerodynamic diameter equal to the geometric mass mean of the particle size range.

The resultant predicted concentrations were then combined as follows to determine the concentrations of each size fraction:

- PM_{2.5} = FP.
- PM₁₀ = FP + CM.
- TSP = FP + CM + Rest.

Since the 2013 AQA was completed, Pacific Environment has further developed the modelling approach adopted for the amended Project in order to represent the particles sizes more accurately, and thus allow the dispersion modelling to represent more appropriately the way the particles behave in the atmosphere, which in turn improves the reliability of the predicted concentrations. Therefore, in the AQA for the amended Project, emissions inventories were developed for TSP, PM₁₀ and PM_{2.5} and dispersion completed for three particle size categories, namely:

- TSP;

² Pacific Environment Limited (2013b), *Upper Hunter Air Quality Particle Model*, Prepared on behalf of NSW Environment Protection Authority

³ Pacific Environment (2014), *Air Quality Impact Assessment – Mount Owen Continued Operations*, Job No: 60436C. 29 October 2014

⁴ Pacific Environment (2015), *Bylong Coal Project – Air Quality and Greenhouse Gas Impact Assessment*, Job No: 5832. 1 July 2015

⁵ State Pollution Control Commission (1986) *Particle size distributions in dust from open cut coal mines in the Hunter Valley*, Report Number 10636-002-71, Prepared by Dames & Moore

- Coarse Matter (CM) = $PM_{10} - PM_{2.5}$; and
- $PM_{2.5}$.

The resultant predicted CM and $PM_{2.5}$ concentrations were then summed to determine the PM_{10} concentrations. It is considered that this revised approach provides a more accurate estimate of the predicted concentrations.

As detailed in Appendix A of the AQA for the amended Project, there are significant differences between the assumptions in the 2016 (amended Project) AQA compared with the 2013 AQA, including the following.

- Removal of processing activities at the Site
- Years assessed
- Production schedule
- Timing of operations
- Terrain
- Meteorology

It is therefore not possible to make a like-for-like comparison between the scenarios and outcomes of the two assessments as all of these changes will have influenced the predicted concentrations, not just total emissions.

The total TSP emissions are lower in the 2016 AQA in all years except for Year 7, which has a marginal increase in TSP when compared with Year 7.75 from the 2013 AQA. **Figure 2.4.3** shows the source locations used in the 2013 AQA for Year 7.75 compared with the source locations used in Year 7 of the 2016 AQA. It is apparent from this figure that the source locations in the 2013 AQA were closer to residences than those in the 2016 AQA. This alone explains the lower predicted concentrations for the amended Project compared with the 2013 Project.

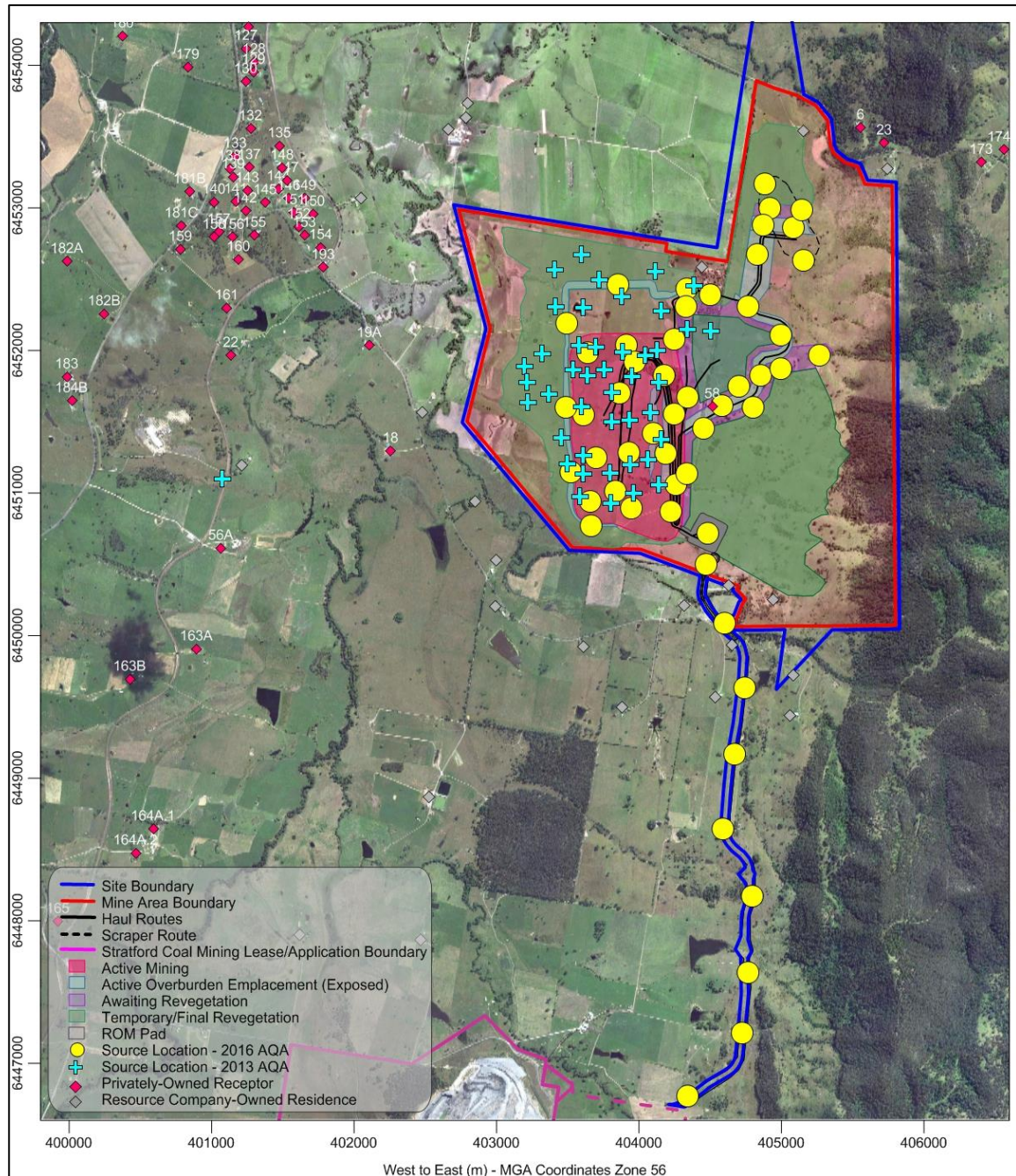


Figure 2.4.3 Year 7 (2016 AQA) Source Locations Compared with Year 7.75 (2013 AQA) Source Locations

2.4.13 Blast Fume

2.4.13.1 Representative Comment(s)

The EPA is concerned about the omission of information in the EIS and specialist studies regarding potential impacts from blast fume. The EPA is aware that because of the very stable meteorological conditions in the Gloucester Valley, that previous modelling (in 2013 for this proposal) had found that if blasting occurred between 9:00am to 10:00am or between 4:00 to 5:00pm that there was a risk of NO₂ criteria exceedances for nearby residents. The EPA is

concerned that the current EIS/specialist studies have made no mention of this risk. The only mention made is in section 11.4 of the air specialist studies where a statement is made that modelling was based on blasting occurring between the hours of 10:00am to 4:00pm in line with Rocky Hill's blast management measures. No further statements were found in the EIS or the specialist studies on the importance of restricting blasting to 10:00am to 4:00pm. The management measures identified in Section 5 of the EIS make no mention of the need to restrict times of blasting to prevent blast fume impacts. The EPA considers this lack of transparency a major deficiency in the EIS and specialist studies, particularly given the potential importance of the issue.

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Response

It was an inadvertent omission that the EIS did not include text relating to the proposed hours of blasting as outlined in the AQA (Section 11.4 Blast Fume Assessment). GRL in its 2014 Response to Submissions acknowledged the need to confine blasting to between 10:00am and 4:00pm to achieve compliance with the NO₂ criterion. GRL has incorporated this commitment in the amended consolidated Environmental Management and Monitoring Measures presented in Section 4 of this document.

As detailed in Section 11.4 of the AQA, blasting would only occur between the hours of 10:00am and 4:00pm with the dispersion modelling undertaken showing that within these hours there were no predicted exceedances of either the 1-hour average or annual average NO₂ criteria. As such, it is assessed that there would be no potential air quality impacts due to blasting.

It is also important to note that the dispersion modelling is considered to be extremely conservative as all blast fume emissions were assumed to be equivalent to a Rating 4 Fume category which, as detailed in Section 11.1 of the AQA, was only observed in a single blast out of almost 500 blasts (approximately 0.2%) during a ACARP monitoring study completed by CSIRO in 2013 (Day et. al 2013⁶). It is also worth noting that during the ACARP study, approximately 80% of the blasts that passed over the monitors did not detect any increase in NO₂ concentrations above ambient concentrations. GRL recognises the importance of correct blast design and, as such, is committed to the preparation and implementation of a comprehensive Blast Management Plan which would incorporate a Blast Fume Management Strategy (with related procedures) to manage the factors known to contribute to fume generation, including geology, moisture levels, meteorological conditions, blast design, production selection, duration charges remain in the ground, quality and blast crew education, on-bench practices and emergency response procedures.

In summary, with the adoption of these management measures and restrictions on blast hours, there are no residences/receivers predicted to experience NO₂ levels above the 1-hour or annual average criteria. The modelling therefore shows that no residences/receivers would experience adverse blast fume impacts, neither those closest residences/receivers presented in the blast fume assessment or others located at greater distances based on the size of blasts assessed. Smaller blasts would have a more frequent but lower individual contribution to air quality than larger ones. However, on the basis of the modelling outcomes and the often expressed

⁶ Day S., Azzi M., Fry R., Garland E., Jacyna D., Javanmard H., Patterson M. and Tibbett A. (2013), *Emission from Blasting in Open-Cut Coal Mining*, ACARP Project C18034

desirability that on mine sites fewer larger blasts are preferred to more frequent smaller blasts, it is not considered necessary to reduce the size of the blasts.

2.4.14 Spontaneous Combustion and Coal Mine Fires

2.4.14.1 Representative Comment(s)

The EIS notes that an assessment was undertaken that concluded that “based on historical information gathered from existing open cut operations in the Gloucester Basin and coal quality parameter analysis, the expected propensity for spontaneous combustion is low.”

Until recently, the EPA has not been aware of spontaneous combustion issues in the Gloucester Coal Measures. In the last year there has been spontaneous combustion issues at the Duralie Coal Mine (located south of the proposal), along with community complaints regarding odours.

Spontaneous combustion from coal stockpiles, active mining areas and historical reject emplacement areas may lead to significant environmental impacts to local air quality. Spontaneous combustion of coal is a major community concern for residents located near coal mines in the Upper Hunter Valley. The EPA and the companies concerned receive many community complaints stating that very bad odours are being experienced as a result of spontaneous combustion. Dealing with spontaneous combustion issues are extremely difficult and frustrating for coal mining companies. There are a number of spontaneous combustion situations that have burnt/smouldered for periods of years. Since at least 1998 the EPA has spent significant resources working with a number of Hunter Valley coal companies through formalised Pollution Reduction Programs to reduce the occurrence and area’s [sic] impacted by spontaneous combustion. These issues, while currently being managed, remain a concern for the EPA and local residents in the Hunter Valley.

The EPA notes the EIS has rated the risk of odours from spontaneous combustion impacting on residents and other sensitive receivers as low (s3.3.1 & App 6). Standard management methodologies have been proposed in the EIS to reduce the potential for spontaneous combustion.

The proximity of the proposed mine to Gloucester township, combined with the strong and frequent temperature inversions experienced in the Gloucester valley, combined with a predominance of southerly winds up the Valley (towards Gloucester township) means that potential effects from spontaneous combustion, should it occur, is an important consideration for DP&E when considering this development application.

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Response

The EIS concluded that the expected propensity for spontaneous combustion at the amended Rocky Hill Coal Project is low based on historical information gathered from existing open cut operations in the Gloucester Basin and coal quality parameter analyses. In addition, the EIS rates the risk of odours from spontaneous combustion impacting on residents and other sensitive residences/receivers as low. Standard management parameters as part of a Spontaneous Combustion Management Plan (SCMP) have been proposed in the EIS to reduce

the potential for spontaneous combustion in line with the relevant parts of technical guidelines related to this issue⁷.

It is recognised that the EPA's concerns about spontaneous combustion are largely influenced by ongoing issues at one or more coal mines in the Muswellbrook area where the minerology of the coal at those sites is substantially different to that proposed to be mined within the Rocky Hill Mine Area.

The occurrence of spontaneous combustion at the Duralie Coal Mine in 2006 cannot be directly compared with the amended Project as the geochemical characteristics of, and likelihood of spontaneous combustion from, the coal seams and breaker reject materials that would be produced are significantly different. Coal and coal reject materials from coal seams mined at the Duralie Coal Mine have relatively high sulfide sulfur content, which can cause sulfide oxidation and acid generation and, in doing so, also generate heat (sulfide oxidation is an exothermic (heat releasing) reaction) which can contribute to the propensity of these materials to spontaneously combust^{8,9}.

In contrast, the coal seams and breaker reject proposed to be mined and generated within the Rocky Hill Mine Area have a significantly lower sulfide sulfur content. Furthermore, the breaker reject would be greater than 120mm in size and separated from the coal material at the breaker station. The sulfide sulfur content of the breaker reject would typically be even less than that indicated by the coarse reject samples analysed from the washability trials reported in the Overburden and Reject Characterisation report (0.05% to 0.41%) given that sulfidic materials would tend to pass through the breaker station into the ROM coal to be transported to the Stratford CHPP. It is noted that Section 4.4.3 of the NSW technical guidelines associated with spontaneous combustion at underground coal mines states that sulfide sulfur (generally in the form of pyrite or marcasite) needs to be fine grained and "*must be present in concentrations >2% before it has a significant affect [sic]*" on the propensity of a material to spontaneously combust. Similarly, Section 2.1.1 of the spontaneous combustion management guidelines for open cut mines in Australia¹⁰ also suggests that the presence and oxidation of carbon rather than sulfide sulfur is a more important contributor to the propensity of coal to self-heat as the heat released by the oxidation of carbon is more than the oxidation of sulfide sulfur (as pyrite). The authors suggested that pyrite is not a major source of heat, except in cases where high proportions of the mineral are present. The geochemistry testing and analysis completed for the amended Project demonstrated that the sulfide sulfur content in both the coal and/or coal breaker reject from the Rocky Hill Mine Area is typically less than 0.5% sulfur. Therefore the likelihood of the pyrite content of the coal and breaker reject contributing to the risk of spontaneous combustion is negligible.

Notwithstanding this, most ROM coal generated for the amended Project would be transported to the Stratford CHPP within a relatively short period of time of being mined and management

⁷ Industry and Investment NSW (2011), "*Guidelines, MDG 1006 – Technical Reference, Technical Reference for Spontaneous Combustion Management Guideline*", Document produced by Mine Safety Operations Branch of Industry and Investment NSW, May 2011

⁸ EGi Document No. 6902/905, "*Geochemical Assessment of Co-Disposal Rejects and Tailings from the Duralie Extension Project and Stratford Coal Mine*", March 2010

⁹ EGi Document No. 6903/993, "*Geochemical Assessment of the Stratford Extension Project*", Appendix L of the *Stratford Extension Project Environmental Impact Statement*, Prepared for Stratford Coal, March 2012

¹⁰ ACARP (2008), *Spontaneous Combustion in Open Cut Coal Mines*, Report prepared by Stuart Day, CSIRO Energy Technology for Australian Coal Association Research Program Project C17006, May 2008

measures would be mainly focussed on management of ROM coal stockpiles and any build up at coal transfer points. Therefore, the only materials that may have some possible risk of spontaneous combustion in the longer term are remnant coal seam faces in open cut walls and breaker reject, if left unmanaged.

As the coal seams would be mined sequentially and continuously in each open cut pit prior to backfilling, the amount of time that remnant coal seam faces would be exposed to oxidising conditions would be limited, i.e. periods typically less than two months. If any coal seam faces are exposed to oxidising conditions for an extended period of time, thermal imaging (as part of the SCMP) could be used to detect any preliminary signs of self-heating, with management measures adopted such as sealing or temporarily covering exposed faces of non-active coal seams with inert materials, as necessary.

Breaker reject would make up a very small fraction (<0.7%) of the total overburden and breaker reject volume planned to be generated over the life of the amended Project. The blending of a relatively small amount of breaker reject with non-acid forming (NAF) overburden and preferential storage within the open cut pits (when storage capacity becomes available) would essentially generate a very low sulfur and NAF combined material, which has negligible propensity to spontaneous combustion. These blended materials would be covered (within one week) with reduced permeability NAF overburden materials limiting the exposure of the blended material to the oxidising conditions that are generally required to pose any risk of spontaneous combustion.

The referenced spontaneous combustion event at the Stratford Coal Mine occurred in 2003 as a result of exposures of the Glenview seam. These exposures had occurred as a result of major faulting within the highwall and not from the previous 8 years of mining activity at the mine. Following the implementation of a spontaneous combustion management plan in 2004, no further spontaneous combustion events have occurred and those from 2003 have been controlled. Notably, based on the content of the Annual Reviews for the Stratford Coal Mine, no community complaints have been received relating to spontaneous combustion since 2007. This demonstrates that spontaneous combustion of these coal seams can be effectively controlled or in the case of the Rocky Hill Mine Area - avoided. It is also noteworthy that the proposed operations at the Rocky Hill Coal Mine would include progressive backfilling of the open cuts and would not result in long-term exposures of coal seams.

In 2012, GRL Technical Services Department prepared a report to address the Director-General's Requirements associated with spontaneous combustion and air quality¹¹. The report identified that the ambient temperature is generally lower than at other topographically lower mining locations such as the Hunter Valley and in Central Queensland, which would also assist in reducing the likelihood of a spontaneous combustion event. The coal properties of rank; pyrite concentrations; chemical constituents and mineral matter and moisture were cited as theoretical indicators of spontaneous combustion propensity.

- **Rank:** The amended Project would produce a medium to high rank coal and it is generally recognised that lower rank coals are more susceptible to spontaneous combustion than higher rank coals.

¹¹ Gloucester Resources Limited Management, "Director General Environmental Assessment Requirements: Spontaneous combustion air quality assessment", Document prepared by GRL Technical Services Department, 31 May 2012 (806/15(CSI))

- **Pyrite Concentrations:** The amended Project coal and breaker reject has a pyrite content of less than 0.5%, which is very low compared to the pyrite content typically required to accelerate a spontaneous combustion process.
- **Chemical Constituents and Mineral Matter:** The petrographic and mineral composition of coal and coal reject materials can be used to predict their propensity to spontaneously combust. The mineral composition of the coal (and by extrapolation) breaker reject materials from the amended Project indicates a low propensity of spontaneous combustion due to high levels of silica and alumina and low levels of calcium, sodium and iron. Petrographic analyses of these materials also indicates a low propensity for spontaneous combustion due to the high vitrinites concentrations and low concentrations of liptinites, particularly porous inertinites.
- **Moisture:** Drying and wetting of coal can also be linked to propensity to spontaneously combust. The moisture content of the amended Project coal materials is relatively low compared to lower ranked coals.

Overall, the risk of spontaneous combustion from the amended Project is expected to be low and manageable. Nevertheless, GRL would develop a SCMP to ensure that this is the case. This plan would also include information on how any temporary ROM coal stockpiles would be managed and be integrated with the Plan. The key controls for the SCMP would include:

- inspection regimes for coal stockpiles, breaker reject areas and coal conveyancing areas;
- maintenance and removal of fine coal build up around any coal transfer points;
- required coal stockpile parameters for compaction (pile porosity), maximum allowable slope angle of side batters and water diversion;
- thermal imaging of open cut coal seams if any coal seam faces are exposed to oxidising conditions for an extended period of time; and
- allocated responsibilities for implementation of the SCMP and Trigger Action Response Plans, if required.

Control and mitigation strategies would initially be based on those successfully employed at Stratford Mining Complex and, where appropriate, other coal mines, and would be continuously improved in light of on-site operational experience.

Based on the information cited above, including that associated with an existing open cut operation mining with similar coal seams to the amended Project and coal quality parameter analysis, the expected propensity for coal and breaker reject materials to spontaneously combust is expected to be low. Furthermore, a number of control and mitigating measures will be implemented to minimise the risk of spontaneous combustion occurring and therefore there would be minimal potential for adverse impacts on air quality which can occur as a result of spontaneous combustion.

2.7 BLASTING

2.7.1 General

2.7.1.1 Representative Comment(s)

The EPA has included blasting limits for the proposal, however even when those limits are met DP&E needs to understand for its assessment of this proposal that blasts are likely to be audible in Gloucester and surrounding areas and the noise environment is likely to be affected by the semi-regular blasts that are required throughout the life of the mine.

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Response

At the outset, it needs to be recognised that audibility is not a blasting criterion, and the fact that some blast events may be audible at certain times and at certain locations does not mean the impacts are considered by the receiver to be unacceptable.

The NVBA (Section 10) presents a comprehensive blast assessment prepared in accordance with Director-General's Requirements (DGRs) dated 24 April 2012 including *blasting impacts on people, livestock and property*, based on the Australian and New Zealand Environment Council (ANZEC) guideline entitled, *Technical basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZEC, 1990)¹². Furthermore, the EPA's specific input to the DGRs are also addressed in NVBA (Section 10) by demonstrating that blasting during the life of the amended Project would be designed to comply with the requirements of the subject guideline. The following extracts from the NVBA (Section 10.6.1) present the outcomes of the blasting assessment, with the abbreviations within this extract having the following meanings.

- Maximum Instantaneous Charge (MIC) measured in kilograms (kg)
- Ground vibration velocity measured in millimetres per second (mm/s)
- Airblast level measured in peak linear deciles (dBLpk)

The predicted ground vibration and airblast levels at privately-owned residences and receivers in the vicinity of the Site (NVBA Table 60), show that:

- *For a typical lower overburden MIC of 414kg, compliance with the human comfort criteria of 5mm/s and 115dBLpk at all residences.*
- *For a typical upper overburden MIC of 828kg, compliance with the human comfort criteria of 5mm/s and 115dBLpk at all residences and receivers, except at 18 Collins & Barrett and 19A Boorer (when the closest point from each residence to the blast site is 1,430m or less).*
- *At 18 Collins & Barrett the closest to point from the residence to the blast site is 1,274m and restricting the MIC to 575kg would achieve compliance with the human comfort criteria of 5mm/s and 115dBLpk.*

¹² ANZEC (1990), *Technical basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration*, Australian and New Zealand Environment Council, September 1990

- Similarly, at 19A Boorer the closest to point from the residence to the blast site is 1,399m and restricting the MIC to 760kg would achieve compliance with the human comfort criteria of 5mm/s and 115dBLpk.

Blast Management Plan (BMP)

- Ground vibration and airblast emission levels would be managed by GRL in accordance with an approved Blast Management Plan (BMP) to ensure that ground vibration and potential blast emission impacts are minimised.

EIS Section 4.3.4.1 further describes the requirements of a Blast Management Plan (BMP) for the amended Project which would include blast design optimisation procedures aimed to minimise blast emission impacts. The BMP would be prepared by suitably qualified and experienced personnel and reviewed annually. The blast design procedures would involve the use of site-specific blast design formulae (or blast laws) which include the variables of MIC, distance and the measured ground vibration velocities and airblast levels. It is noted that development of the airblast law would capture any adverse meteorological effects on the noise propagation, which in turn, would enable future airblast levels to be predicted and noise impacts minimised at surrounding residences. These formulae can then be used to predict future emission levels and, for a known distance and target ground vibration velocity and airblast level, enable calculation of the appropriate MIC to achieve compliance with the approved human-comfort criteria.

As the EPA is aware, it would be possible for the amended Project to satisfy all human-comfort criteria for all blasts given the emphasis upon optimising blast designs to achieve compliance with the criteria as reflected by the site-specific blast laws developed for the amended Project. Whilst satisfying all human-comfort criteria, it is inevitable that a number of the blasts would be audible at locations around the Mine Area. It remains GRL's position that by ensuring compliance with the human-comfort criteria, the blast-related impacts would be acceptable.

2.16 GROUNDWATER

2.16.8 Groundwater Seepage

2.16.8.1 Representative Comment(s)

The proponent notes saline minewater would be managed in a closed water management system within an area referred to as the "Saline Water Zone", an area comprising all open cut pits and three Environmental Dams. It will be necessary to prevent seepage from the Saline Water Zone storages into the surrounding aquifers or watercourses. The EIS proposes that "detailed investigations into seepage potential from the Environmental Dams will be required to identify if prevention measures such as clay lining of the embankment and storages are necessary."

These investigations need to be provided as part of the EIS and/or a commitment provided regarding minimum permeability requirements for the Saline Water Zone storages to prevent pollution of waters.

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Response

The maximum modelled salinity in the saline water zone is 9 100 μ S/cm in Year 15 compared to an assumed 5820 μ S/cm for groundwater salinity (SWA – Section 4.4). This is approximately 1.6 times the natural groundwater salinity adopted for modelling (not twice the salt concentration).

This peak salinity was modelled in Main Pit, and is not typical of expected salinities throughout the saline water zone when inventories are high. Stored water salinity would vary depending on the prevailing climate conditions, with stormwater inflows diluting the salt during wet periods, and concentrations increasing during dry periods. This is illustrated in **Figure 2.16.6** and **Figure 2.16.7**, which show percentile traces of modelled salinity in Main Pit and ED1 respectively. **Figure 2.16.6** shows that salinity within the Main Pit would be expected to rarely exceed 7 000 μ S/cm and would generally be less than the groundwater salinity. It is not a fact that this water would seep into the underlying groundwater system and into the adjacent creek/river systems.

Figure 2.16.7 shows that the maximum modelled salinity within Environmental Dam ED1 within the saline water zone is in Year 11. The maximum 1%ile salinity is 7 208 μ S/cm (maximum salinity 7 295 μ S/cm) compared to an assumed 5 820 μ S/cm for groundwater salinity (SWA – Table 3.11). This predicted increase in salinity would occur gradually over time (see Table 4.6 in Section 4.4 of the SWA). **Figure 2.16.7** shows that salinity within ED1 would also be expected to rarely exceed 7 000 μ S/cm and would generally be less than the groundwater salinity.

Geotechnical engineering investigations into the suitability of in-situ material to be used for the clay lining of embankments and storages have not yet been carried out. These studies¹³ typically consider the nature of materials, design of the infrastructure and a risk assessment. Such investigations would be carried out as part of any detailed design or engineering studies and would be completed in accordance with the required Australian Standards and NSW guidelines and requirements.

Any water storages used to contain saline water would be suitably engineered and constructed to minimise seepage, including compliance with EPA requirements. The storages would be maintained and operated in accordance with the Site Water Management Plan.

¹³ These studies will be included in the Water Management Plan for the amended Project.

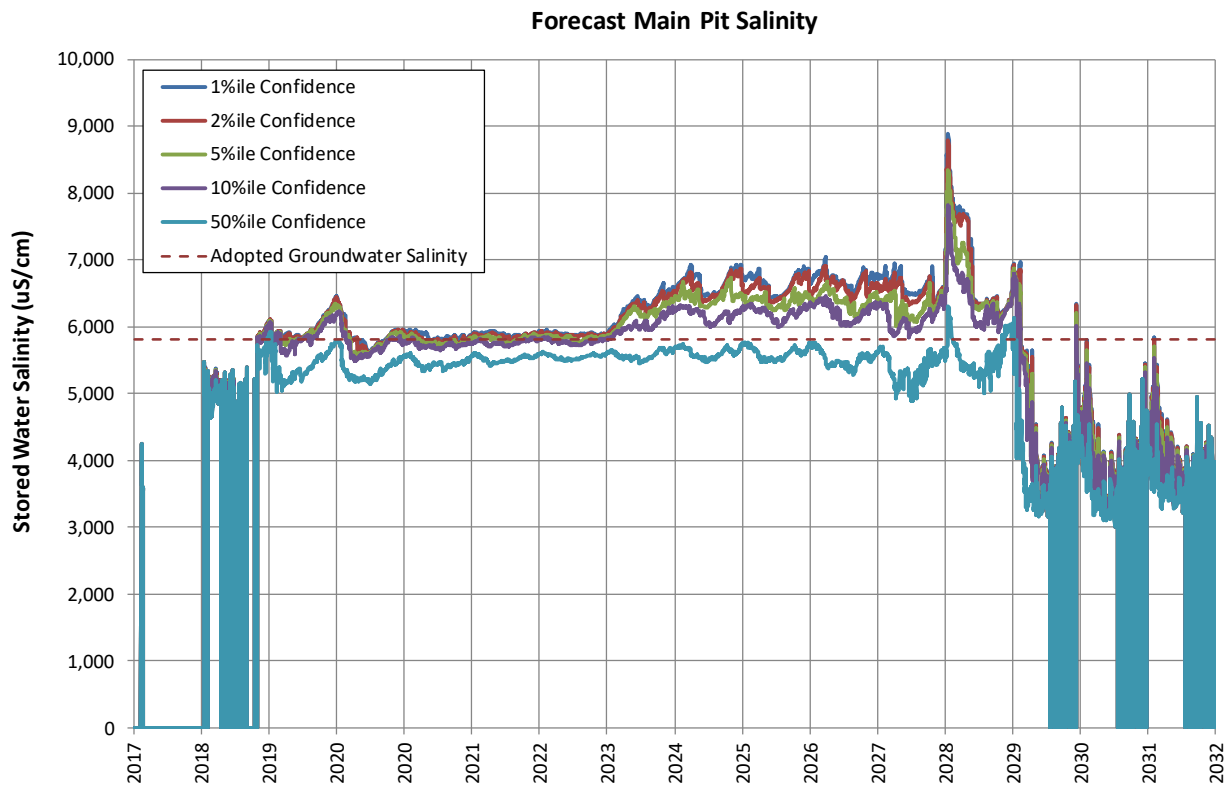


Figure 2.16.6 Modelled Salinity in Main Pit

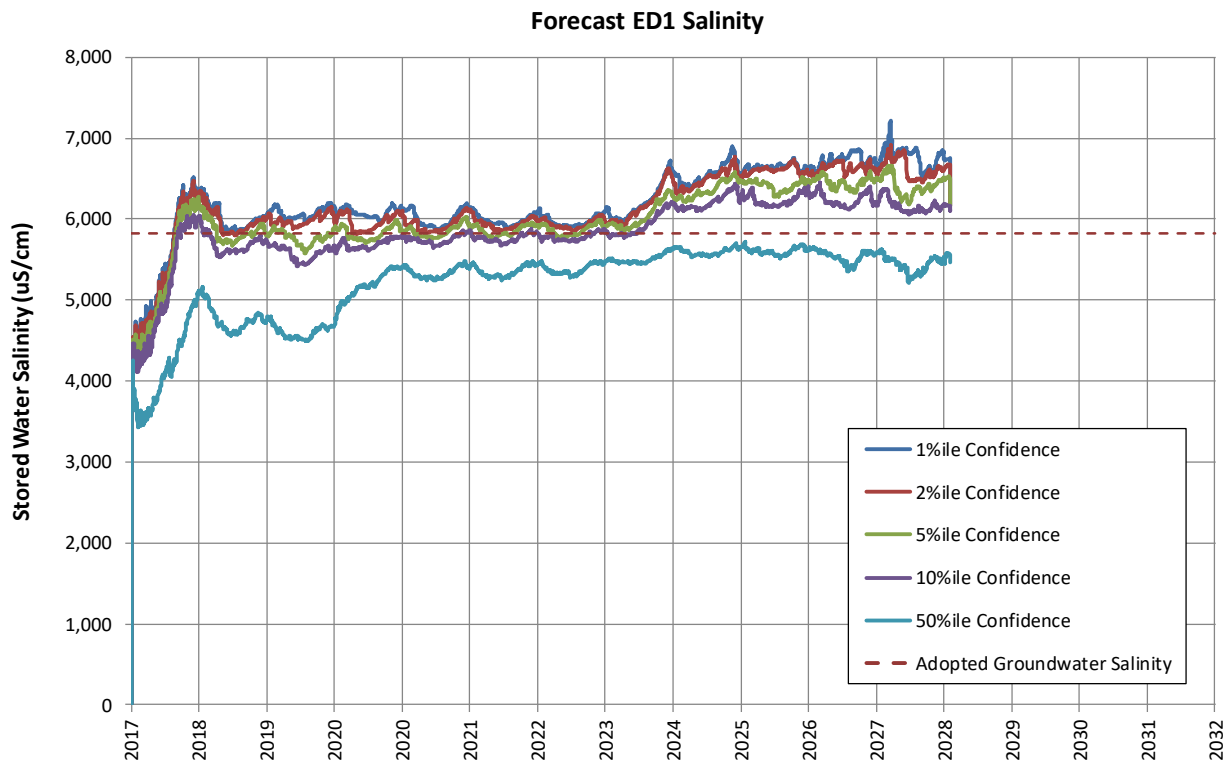


Figure 2.16.7 Modelled Salinity in ED1

2.20 MATERIALS CHARACTERISATION

2.20.1 Breaker Reject

2.20.1.1 Representative Comment(s)

The proposal includes the use of a rotary breaker at the Run of Mine coal pad. This breaker will produce a coarse “reject”. The Appendix “Overburden and Reject Characterisation” by RGS Environmental highlights the coarse reject from the breaker will often have a high sulphur content and some will be likely to generate acidic leachate, which the soils will not have sufficient capacity to neutralise. Additionally this “breaker reject” may on occasions have salinity issues and have concentrations of heavy metals that could cause environmental issues.

The EPA cannot find where this issue has been adequately addressed in the EIS and is not comfortable with the recommendation of the consultant in the Appendix “Overburden and Reject Characterisation” by RGS Environmental. RGS Environmental has proposed “Potentially Acid Forming (PAF) breaker reject materials should be disposed within the open cut pits (where possible) or randomly blended with other overburden materials within the western and northern amenity barrier and permanent out-of-pit overburden emplacement area at least 5 metres form the final batters or upper surfaces” (underlining added by the EPA). The EPA is not willing to take the risk that PAF material will be managed as described above. ...

If achieving below the water table disposal for PAF material is an issue for the proponent (particularly in the early years of the project), then the proponents should explore disposal of PAF materials at the Stratford Coal Mine, which already has systems in place to deal with such materials.

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Response

The breaker reject would be greater than 120mm in size and comprise predominantly rock originating from the floor or roof of the coal seams mined or thin stone bands interbedded between the plies in the coal seams that could not be selectively removed during mining.

The O&RC (Section 2.2.1 – page 6-19) explains that the testing relied upon for the amended Project was that undertaken for the 2012 washability trials undertaken for the Project in which reject samples generated were either fine or coarse grained. The “coarse grained” reject tested was less than 10mm in size and contained both coal and a small amount of pyrite. The average total sulfide sulfur concentration in the coarse reject was approximately 0.5%. However, given it was not practical to produce some breaker reject for analysis, RGS Environmental adopted a conservative position by relying upon the higher sulfide sulfur content in the <10mm coarse reject. Whilst some breaker reject would have a higher sulfide sulfur content than the background concentrations typical of overburden, it would still be relatively low and even less than indicated by the <10mm size coarse reject samples. This is especially the case given that sulfidic materials would invariably be within the fraction <120mm in size and would tend to pass through the breaker station into the ROM coal transported to the Stratford CHPP. Furthermore, as the exposed surface area of a coarse reject material passing a 10mm sieve size is several orders of magnitude greater than the breaker reject material (>120mm), the results of the testing of <10mm coarse rejects presented in the O&RC for static and kinetic tests are therefore highly conservative and represent a “worst case” scenario.

There is a possibility that a proportion of the breaker reject may generate acidic leachate if stored in a single location exposed to oxidising conditions and without blending with Non-Acid Forming (NAF) overburden with excess acid neutralising capacity (ANC). However, the testing of the overburden materials comprehensively established that these materials contain excess ANC and blending would be more than sufficient to buffer the relatively small amount of acidity that could be generated from any acid leachate producing breaker reject. In addition, there is absolutely no reliance on, or need, for “soils” to provide any neutralising capacity. The NAF overburden generated would be more than sufficient to achieve the required neutralisation.

Breaker reject would make up a very small fraction (<0.7%) of the total overburden and breaker reject volume planned to be generated throughout the life of the amended Project. The blending of a relatively small amount of breaker reject with a large amount of NAF overburden possessing excess ANC, and preferential storage within the open cuts (when storage capacity becomes available), would essentially generate a very low sulfur and NAF combined material, which would have negligible propensity to generate acidity and excess alkalinity. This blended material would be covered (within one week) by reduced permeability NAF overburden materials limiting the exposure of the blended material to the oxidising conditions that would be required to pose any conceivable risk of acid generation.

Any potential for salinity issues and elevated concentrations of heavy metals associated with some breaker reject materials and which could potentially cause environmental issues, could only arise if breaker reject materials were stored in a single location and not blended with NAF

overburden materials as highlighted in the EIS (Sections 2.3.3.3 and 2.8.4) and the O&RC report (Executive Summary and Section 5.2). The resultant mixture of a very small amount of breaker reject blended with a large amount of NAF overburden material would result in a NAF mixed material. This NAF mixed material would subsequently be covered by reduced permeability NAF overburden material within the western and northern amenity barrier and permanent out-of-pit overburden emplacement within one week and would be located at least 5m from the final batters or upper surfaces. Lime dosing of PAF breaker reject materials would also be considered in the unlikely event that water quality monitoring indicate a pH <5.0 (the pH of any seepage and surface runoff is expected to be pH neutral to slightly alkaline).

This approach has been successfully used at Bengalla Coal Mine in the Hunter Valley, for example, over the past 15 years for reject materials with significantly higher sulfur content and acid producing potential than the Rocky Hill breaker reject materials. A similar approach has also been successfully applied at a number of coal mines in Queensland (e.g. Middelmont Coal Mine) where Potentially Acid Forming (PAF) coarse reject and tailings are successfully encapsulated within a larger volume of NAF overburden materials.

Regular visual monitoring for sulfur containing (pyritic) material and geochemical testing would be undertaken for breaker reject materials. In addition, monitoring of surface runoff reporting to the ROM pad sump; seepage reporting to sediment dams from any out-of-pit overburden emplacement areas used to store breaker reject, and seepage reporting to sediment dams and sumps within the open cut pits from areas of emplaced overburden and breaker rejects would be undertaken on a regular basis.

The above management and monitoring approach developed for breaker reject materials is contained in both the Executive Summary section and main body of the O&RC report (Section 5.2, Recommended Management Measures) and is also summarised in Sections 2.3.3.3 and 2.8.4 of the EIS and would form part of the conditions of any development consent. This management approach would be the most appropriate method for managing breaker rejects given the geochemical characteristics of these materials and overburden materials. It is a conservative “multiple lines of defence” strategy that reduces the low level of risk to a negligible residual level.

It is noted that the EPA’s submission suggests transferring PAF breaker reject materials to Stratford Coal Mine until sufficient capacity is available to accommodate this material within the open cut pits at the Rocky Hill Mine Area. Whilst at face value, this suggestion may have some merit, it would need to be balanced against the low level of risk currently posed by the very small proportion (<0.7 %) of the total overburden and breaker reject volume planned to be generated and managed within the Rocky Hill Mine Area as discussed above. In addition, breaker reject material would need to be stockpiled prior to transfer to the Stratford Coal Mine and then potentially stockpiled again prior to disposal, which increase the risk of both acid generation and spontaneous combustion at these locations, and makes overall management and responsibility more difficult, expensive and complex as well as generating more unnecessary greenhouse gas emissions.

2.23 NOISE

2.23.1 General

2.23.1.1 Representative Comment(s)

Though noise modelling predicts the majority of residents will experience noise less than the proposed noise limits... it is important for DP&E to understand that many residents and visitors to Gloucester will experience a changed noise environment if the proposal is approved.

If this project is approved, mining noise will be audible in Gloucester for the first time. Given the quiet nature of Gloucester and surrounding areas, the changed noise environment should be an important consideration for DP&E in its assessment of this application.

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Response

This issue is addressed in the amended Project NVBA (Section 7.5.4), that states (with supplementary text [in brackets] to provide clarification):

The operational intrusive $L_{Aeq(15minute)}$ noise contours for daytime Year 0.5, evening Year 4, evening Year 7 and daytime Year 10 and are presented in Appendices O1 to O4 [of the NVBA]. During the evening Year 4 and Year 7, intrusive $L_{Aeq(15minute)}$ noise levels range from 50dBA (within the Mine Area) down to 25dBA within the Gloucester urban area. Note, [individual] buildings within the Gloucester urban area have not been incorporated into the noise model, so operational noise levels (in the urban area) are likely to be demonstrably lower by comparison with those shown on the noise contour plans. Notwithstanding, from Year 4 operational noise levels may be audible (but unlikely to be noticeable) during noise enhancing 2m/s to 3m/s southerly winds (i.e. appropriately 6% of winter evenings) when observed external to a residential building enclosed by the 25dBA noise contour (i.e. the eastern portion of the Gloucester urban area as shown on Appendices O2). Whereas, operational noise levels are unlikely to be audible (or noticeable) when observed internal to a residential building within the Gloucester urban area.

GRL has taken into consideration the concerns expressed by the EPA and members of the local community regarding the potential audibility of the activities within the Mine Area when designing the amended Project and establishing the hours of operation and identifying the required range of other noise mitigation measures. In particular, GRL has restricted the mine operating hours as follows.

- Mining (Year 1 to 3) - Monday to Saturday daytime only (7:00am to 6:00pm);
- Mining (Year 4 onwards) - Monday to Saturday daytime and evening (7:00am to 10:00pm); and
- Breaker Station and Coal Despatch - Monday to Saturday only (7:00am to 6:00pm).

These restrictions have eliminated all night-time (10:00pm to 7:00am) mining operations for the amended Project by comparison with the 2013 Project, therefore minimising potential changes to noise levels in the Gloucester township and any associated noise impacts.

Furthermore, the NVBA (Section 4.2) describes the two broad objectives presented in the NSW Industrial Noise Policy (INP), as follows:

- *Controlling intrusive noise levels in the short-term; and*
- *Maintaining noise amenity levels for particular land uses over the medium to long-term.*

The INP prescribes detailed calculation routines for establishing project specific noise levels (PSNLs) (i.e. intrusive $L_{Aeq(15\text{minute})}$ noise criteria and $L_{Aeq(\text{period})}$ noise amenity criteria) at potentially affected receivers for an industrial development. Ideally, the intrusive noise level from the amended Project should not exceed the background level by more than 5dBA. Similarly, the amenity noise level should not exceed the specified INP “acceptable” or “maximum” noise level appropriate for the particular land use...

The project specific noise levels (PSNLs) for the amended Project are presented in the NVBA (Table 19). The INP states that the PSNLs are based on preserving the amenity of at least 90% of the population living in the vicinity of industrial noise sources by limiting the adverse effects of noise for at least 90% of the time. Provided the PSNLs are achieved, then most people would consider the resultant noise levels acceptable. In those cases where the PSNLs are not achieved, it does not automatically follow that all people exposed to the noise would find the noise “unacceptable”.

It is also noteworthy that the predicted intrusive $L_{Aeq(15\text{ minute})}$ noise levels from the Mine Area of a daytime or evening within Gloucester township are typically well below the daytime background $L_{Aeq(11\text{ hour})}$ noise amenity levels of 50dB(A) to 51dB(A) and evening $L_{Aeq(4\text{ hour})}$ noise amenity levels 41dB(A) to 42dB(A) (NVBA Table 14). Therefore, whilst mine-related intrusive noise may be audible from time to time, the existing (i.e. pre-project) noise sources that contribute towards the background levels in Gloucester township would predominate.

It is further noted that in accordance with the DGRs dated 24 April 2012, all feasible noise mitigation measures have been investigated (NVBA – Section 5.4) and those identified as reasonable implemented by GRL for the amended Project. The package of noise mitigation measures aim to ensure that the daytime and evening PSNLs are met when assessed in accordance with the requirements of the INP.

2.23.3 Construction Noise

2.23.3.1 Representative Comment(s)

The assessment states that construction noise levels will be more than 5dBA above noise management levels at 56 privately owned residences in the vicinity of the Jacks Road upgrade for up to one week.

The expected level of construction noise can be dealt with by any approval requiring the proponent to develop and implement a construction noise management plan including all feasible and reasonable measures to minimise construction noise impacts on residents. This condition is included the EPA's draft conditions of approval.

The assessment also stated that construction activities would occur during standard hours, except for some activities between 6pm and 10pm "under limited circumstances". The EPA recommends that any approval for the project includes conditions limiting construction to standard hours. The EPA has included a condition in this regard as part of the EPA's draft conditions of approval.

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Response

GRL generally agrees with the EPA's recommended construction noise conditions (as set-out in the EPA's Draft Conditions of Approval dated 29 September 2016) in any approval for the amended Project. It is noted that the EPA's Draft Conditions of Approval relating to construction noise (i.e. *Conditions 23 and 24*) sets out an approval process for conducting construction work outside standard hours. GRL's response to these proposed conditions (see Section 3.2.1 of this document) which expresses a preference that construction activities are not audible at any privately-owned residence and that under all circumstances, the $L_{Aeq(15\text{ min})}$ noise level remains below 35dB(A).

2.23.4 Operational Noise Modelling

2.23.4.1 Representative Comment(s)

The EPA notes from the noise modelling conducted that despite the changes made to the project since 2013 the predicted noise contour representing the intrusive noise criterion ($L_{Aeq(15m;n)}$ 35dBA) just skirts around the Avon River and Thunderbolt Estates for two of the modelled scenarios.

There is always some uncertainty in noise modelling. The EPA highlights to DP&E that the number of residences receiving noise above the intrusive noise criterion could be significantly greater than predicted if:

- *noise levels were slightly under-predicted, or*
- *not all necessary mitigation measures are implemented to meet the noise limits.*

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Response

The Noise, Vibration and Blasting Assessment undertaken for the 2013 Project by Wilkinson Murray adopted a noise impact assessment methodology (i.e. the upper decile noise level exceedance approach) which is an accepted deviation from the requirements of the INP. However, given the interaction between the amended Project and the SMC as approved under SSD-4966, a consistent noise impact assessment approach was considered an imperative for the two applications. Accordingly, the noise impact assessment methodology adopted by SLR for the amended Project is in accordance with the INP. The assessment of exceedances undertaken as part of that assessment identified that southerly winds up to 3m/s are considered a feature of the Site during winter evenings and therefore likely to enhance mine operating noise levels to the nearest privately-owned residences along Jacks Road.

In accordance with the DGRs, all feasible noise mitigation measures were documented in the NVBA (Section 5.4) and those identified as reasonable adopted by GRL for the amended Project. The package of noise mitigation measures aims to ensure that the daytime and evening

PSNLs are met when assessed in accordance with the requirements of the INP. As presented in NVBA (Table 24), the proposed package of noise mitigation measures is summarised as follows.

- a) Restricted mine operating hours to daytime and evening (i.e. no night-time mine operations).
- b) Noise Source Control – use of noise attenuated mobile fleet and fixed plant.
- c) Noise Propagation Path – Installation of acoustic barriers (i.e. western and northern amenity barrier and interim amenity barriers).
- d) Operational Controls – re-scheduling of intrusive activities to less sensitive times of the day.
- e) Operational Controls – use of real time predictive meteorological forecasting to understand likely meteorological conditions on the following day that may influence noise propagation and continuous weather and noise monitoring to identify appropriate plant and equipment shutdowns, if required.

Within the area of the Thunderbolt and Avon River Estates, the nearest representative privately-owned residences are property ID 36 Doherty (to the south) and property ID 33 Seale (to the north). As presented in NVBA Section 5.4 (Table 25), following the implementation of noise mitigation measures a, b, c and d above, the predicted evening intrusive noise level is 37dB(A) during Year 4 (out-of-pit) and Year 7 (out-of-pit) operations at both 36 Doherty and 33 Seale, and therefore 2dB(A) above the PSNL of 35dB(A).

GRL accepts that predictive meteorological forecasting and real-time monitoring to inform equipment shutdowns are feasible, reasonable and necessary to achieve the PSNL of 35dB(A) (i.e. noise mitigation measure ‘e’) with the extent of the equipment shutdowns dependent on the location and elevation of the noise sources (equipment) and the prevailing weather conditions. The NVBA (Table 25) presents example shutdown scenarios to five key residences.

Based on the implementation of noise mitigation measures a, b, c, d and e, SLR has compiled predicted L_{Aeq} noise levels at each residence in the NVBA (Tables 30, 32, 34 and 36) and a sequence of noise contours for daytime Year 0.5, evening Year 4 (out-of-pit), evening Year 7 (out-of-pit) and daytime Year 10 and are presented in the NVBA (Appendices O1 to O4 respectively). With the implementation of the identified noise mitigation measures, the noise levels at the individual residences and noise contours demonstrate compliance with the evening PSNL of 35dB(A) at the Thunderbolt and Avon River Estates in accordance with DGRs and INP requirements.

In the unlikely event that evening intrusive noise levels have been “*slighting under-predicted*” (i.e. say up to 2dB(A) higher by comparison with the NVBA), then this would result in 22 residences in the Estates with a predicted evening intrusive noise level of 37dB(A), and an additional 10 residences in the Estates with a predicted evening intrusive noise level of 36dB(A). In accordance with the NVBA (Table 21), an increase of 1dB(A) to 2dB(A) above the PSNL of 35dB(A) is considered to have a negligible noise impact.

The amended Project noise model has been prepared using Renzo Tonin & Associates (RTA) Environmental Noise Model (ENM for Windows, Version 3.06), a commercial software system developed in conjunction with the NSW EPA and endorsed as one of the most appropriate prediction methodologies available.

The algorithms used in the ENM have been verified and documented in technical acoustic papers which generally conclude that the noise model provides a consistent prediction of off-site noise emissions from continuous on-site noise sources and typically within $\pm 3\text{dB(A)}$ (75% confidence). However, both accuracy and confidence can be improved by enhancing the quality and integrity of the key input data. The key inputs are listed below together with the basis of the amended Project ENM source data.

- Topographic Data – The surrounding terrain and receivers, mine layouts (i.e. open-cuts, overburden emplacement areas, haul routes, etc.) and associated mine infrastructure is based on high resolution digital data.
- Barriers – The creation of the proposed earthen embankments to create acoustic barriers (i.e. increasing the noise propagation path) along coal and overburden emplacement haul routes.
- Mobile Equipment Source Sound Power Levels (SWLs) – The adopted SWLs have been sourced from noise measurements of equivalent equipment or from the equipment suppliers, together with adjustments applied for noise mitigation commitments.
- All mobile equipment is represented by multiple points over the operating routes (e.g. a single haul truck is represented by typically 20 source points distributed over the haul road). The amended Project ENM contains up to approximately 200 individual plant and equipment noise source points per scenario.
- Fixed Plant Source Sound Power Levels (SWLs) – The adopted SWLs are based on measurements of installed noise performance together with the proposed noise mitigation.
- Meteorological Parameters – are derived from the on-site automatic weather station and processed in accordance with the NSW INP procedures to determine the assessable ($> 30\%$ occurrence) noise enhancing meteorological conditions.

The amended Project ENM was used to predict the off-site noise emissions from five representative mine operating scenarios over the life of mine (i.e. Years 0.5, 3, 4, 7 and 10). Each scenario was conservatively selected aimed to capture the maximum potential noise impact to surrounding receivers over the life of mine. Further, it is assumed that each scenario is operating at full capacity and utilisation (i.e. all plant and equipment operating concurrently to simulate the overall maximum energy equivalent $L_{\text{Aeq(Period)}}$ amenity and $L_{\text{Aeq(15minute)}}$ intrusive noise levels).

It follows, that the predicted noise levels presented in the NVBA represent the (noise mitigated) typical maximum operating noise levels likely to be experienced by the surrounding residences under INP assessable weather conditions. In addition, the foregoing noise modelling procedure aims to improve the accuracy and confidence of the predicted off-site noise levels from the operation of the amended Project to within typically $\pm 2\text{dB(A)}$ (90% confidence), however this outcome has not been statistically verified by SLR.

2.23.5 Temperature Inversions

2.23.5.1 Representative Comment(s)

Temperature inversions are expected to occur about 20% of evenings in winter (one evening in every five), and this means that noise levels may have been under-predicted:

- Strong temperature inversions are a feature of the Gloucester Valley. Temperature inversions have the effect of increasing noise levels at receivers compared to “normal” conditions.*
- The Industrial Noise Policy states that where inversion conditions are predicted to occur for at least 30% of the time on winter nights, the inversion effects on noise are significant.*
- The previous EIS noted that temperature inversion conditions were predicted to occur on about 60% of nights in winter in the local area, and about 40% of nights over the entire year. This is a significant percentage of time for inversions to occur.*
- As noted in the current EIS, the Industrial Noise Policy only requires inversions to be considered when night-time operation is proposed, and because mining operations were assumed to finish at 10:00pm inversions were not included in any modelled noise scenarios.*
- The 2013 EIS suggested that inversions would occur in the evening period (6:00pm to 10:00pm) in Gloucester about 20% of the time in winter.*
- The EPA highlights that although the noise assessment has been conducted in line with the Industrial Noise Policy, due to the expected strength and frequency of inversion conditions in the Gloucester Valley, the modelling may have under-predicted noise levels at residential sensitive receivers up to about 20% of the time, or for one winter evening in every five.*

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Response

GRL notes the DPE’s and EPA’s acknowledgements that the amended Project noise assessment has been prepared in accordance with the requirements of the INP, as specified in the DGRs and that the amended Project has restricted mine operating hours to daytime and evening only (i.e. no night-time mine operations). As a consequence of these matters, no further analysis of the atmospheric stability conditions and the associated frequency of occurrence of temperature inversions is technically required during the daytime and evening periods as the INP Section 5.3 states:

Assessment of impacts is confined to the night noise assessment period (10pm to 7am), as this is the time likely to have the greatest impact—that is, when temperature inversions usually occur and disturbance to sleep is possible.

It is noted that, while the EPA’s Draft Industrial Noise Guideline (DING) is yet to be finalised, the current draft Fact Sheet D, Table D1, defines daytime and evening period’s noise-enhancing meteorological conditions as follows:

- Daytime/evening: stability categories A–E with light winds (0.5–3m/s).

Hence, during the daytime and evening periods, the DING defines noise enhancing meteorological conditions to include temperature inversions up to 1.5°C/100m (i.e. stability class E) coinciding with light winds from any direction, based on a significance threshold of occurrence of 30% determined in accordance with the provisions of the DING.

Notwithstanding the preceding comments, the frequency of occurrence of atmospheric stability classes in the vicinity of the Mine Area has been investigated based on an analysis of air temperature measurements conducted for the calendar year 2014. The Automatic Weather Stations (AWS) is located at 123m AHD within the Mine Area and a second air temperature station (at 228m AHD) located in an elevated position to the north on a ridgeline. The air temperature differences have been used to determine the estimated frequency of occurrence of atmospheric stability classes for the daytime (7:00am to 6:00pm) and evening (6:00pm to 10:00pm) periods as presented in the **Table 2.23.4** and **Table 2.23.5**.

Table 2.23.4

Estimated Frequency of Occurrence Stability Classes – Daytime (7:00am to 6:00pm) Year 2014

Stability Class	Daytime Frequency of Occurrence					Estimated ELR °C/100 m ¹	Qualitative Description
	Annual	Summer	Autumn	Winter	Spring		
A	16%	3%	18%	26%	16%	<-1.9	Lapse
B	2%	1%	2%	3%	2%	-1.9 to -1.7	Lapse
C	2%	1%	2%	3%	3%	-1.7 to -1.5	Lapse
D	19%	20%	20%	16%	18%	-1.5 to -0.5	Neutral
E	47%	66%	45%	30%	47%	-0.5 to 1.5	Weak inversion
F	12%	8%	12%	18%	12%	1.5 to 4	Moderate inversion
G	2%	2%	1%	4%	1%	>4.0	Strong inversion

Note 1: Environmental Lapse Rate (ELR), °C/100 m = Degrees Celsius per 100 metres.

Table 2.23.5

Estimated Frequency of Occurrence Stability Classes – Evening (6:00pm to 10:00pm) Year 2014

Stability Class	Evening Frequency of Occurrence					Estimated ELR °C/100 m ¹	Qualitative Description
	Annual	Summer	Autumn	Winter	Spring		
A	2%	4%	0%	1%	0%	<-1.9	Lapse
B	1%	1%	0%	1%	0%	-1.9 to -1.7	Lapse
C	1%	1%	0%	0%	1%	-1.7 to -1.5	Lapse
D	33%	63%	28%	8%	34%	-1.5 to -0.5	Neutral
E	40%	29%	43%	43%	43%	-0.5 to 1.5	Weak inversion
F	20%	0%	24%	38%	18%	1.5 to 4	Moderate inversion
G	4%	1%	4%	8%	3%	>4.0	Strong inversion

Note 1: Environmental Lapse Rate (ELR), °C/100 m = Degrees Celsius per 100 metres.

During the winter daytime, weak temperature inversions (i.e. up to 1.5°C/100m – stability class E) occur on average for approximately 30% of the daytime period (any wind speed or direction) typically between 7:00am to 8:30am and 4:30pm to 6:00pm. When considered in conjunction with southerly winds, coincident E class stability (i.e. up to 1.5°C/100m) and southerly winds ($\pm 45^\circ$) of 1m/s, 2m/s and 3m/s occur for approximately 2%, 3% and 1% respectively of the time during the winter daytime (with 2m/s being relatively most frequent).

Moderate temperature inversions (i.e. 1.5°C/100m to 4°C/100m – stability classes F) occur for approximately 18% of the winter daytime period (any wind speed or direction) and typically between 7:00am to 8:30am, and 4:30pm to 6:00pm. When considered in conjunction with southerly winds, coincident F class stability (i.e. 3°C/100m) and south winds ($\pm 45^\circ$) of 1m/s, 2m/s and 3m/s occur for approximately 1%, 2% and 1% respectively during the winter daytime, (with 2m/s being relatively most frequent).

Strong temperature inversions (i.e. greater than 4°C/100m – stability classes G) occur for approximately 4% of the winter daytime period (any wind speed or direction), are not considered significant and would not be assessable under the INP or DING.

During winter evenings, weak temperature inversions (i.e. up to 1.5°C/100m) occur for approximately 43% of the evening period (any wind speed or direction). When considered in conjunction with southerly winds, coincident E class stability (i.e. up to 1.5°C/100m) and south winds ($\pm 45^\circ$) of 1m/s, 2m/s, or 3m/s occur for approximately 4%, 6% and 2% respectively during the winter evening, (with 2m/s being relatively most frequent).

Moderate temperature inversions (i.e. 1.5°C/100m to 4°C/100m – stability classes F) occur for approximately 38% of the winter evening period (any wind speed or direction). When considered in conjunction with southerly winds, coincident F class stability (i.e. 3°C/100m) and south winds ($\pm 45^\circ$) of 1m/s, 2m/s and 3m/s occur for approximately 5%, 5% and 1% respectively during the winter evening (with 2m/s being relatively most frequent).

Strong temperature inversions (i.e. greater than 4°C/100m – stability classes G) occur for approximately 8% of the winter evening period (any wind speed or direction) and is not considered significant and would not be assessable under the INP or DING.

Based on the information presented in **Tables 2.23.4** and **2.23.5**, the amended Project INP daytime and evening noise modelling meteorological parameters are presented in **Table 2.23.6**, together with the DING and Non-standard noise modelling meteorology.

Table 2.23.6
Amended Project INP, DING and Non-standard Noise Modelling Meteorology

Period	Policy	Meteorological Parameter and Estimated Frequency of Occurrence (%)	Air Temperature	Relative Humidity	Wind Velocity	Temperature Gradient
Daytime	INP	Calm	20°C	66%	0 m/s	0°C/100 m
	DING	E class stability (30%)	15°C	69%	0 m/s	1.5°C/100 m
		E class stability plus south wind (3%)	15°C	69%	S 2 m/s	1.5°C/100 m
	Non-standard	F class stability (18%)	15°C	69%	0 m/s	3°C/100 m
		F class stability plus south wind (2%)	15°C	69%	S 2 m/s	3°C/100 m
Evening	INP	Calm	19°C	74%	0 m/s	0°C/100 m
		South wind (29%)	13°C	77%	S 3 m/s	0°C/100 m
	DING	E class stability (43%)	13°C	77%	0 m/s	1.5°C/100 m
		E class stability plus south wind (6%)	13°C	77%	S 2 m/s	1.5°C/100 m
	Non-standard	F class stability (38%)	13°C	77%	0 m/s	3°C/100 m
		F class stability plus south wind (5%)	13°C	77%	S 2 m/s	3°C/100 m

As discussed in Section 2.23.4.1 of this document, NVBA (Section 5.4) describes the implementation of all feasible and reasonable noise mitigation measures. NVBA (Table 25) presents representative privately-owned residences in the vicinity of the Thunderbolt and Avon River Estates (i.e. off Jacks Road) including properties ID 33 Seale and ID 36 Doherty and ID 25C Green (i.e. off Waukivory Road).

The three privately-owned residences have been used to demonstrate the predicted daytime mine operating intrusive $L_{Aeq(15\text{minute})}$ noise levels under the meteorological conditions presented in **Table 2.23.6** for daytime Years 0.5 and 3 (**Table 2.23.7**), and daytime Years 4, 7 and 10 (**Table 2.23.8**), together with the adopted noise control and management measures.

Table 2.23.7
Representative Privately-owned Residences - Daytime Years 0.5 and 3 - Intrusive Noise Levels under INP, DING and Non-standard Adverse Meteorological Conditions (dB(A) re 20µPa)

Landholder ID and Abbreviated Name		Daytime Year 0.5 (Out-of-pit) ^{5,6}					Daytime Year 3 (Out-of-pit) ^{5,6}					Intrusive PSNL ⁴
		INP	DING		Non-standard		INP	DING		Non-standard		
		Calm ¹	Temp Inversion ¹	Inversion + wind ²	Temp Inversion ¹	Inversion + wind ²	Calm ¹	Temp Inversion ¹	Inversion + wind ³	Temp Inversion ¹	Inversion + wind ³	
33	Seale	25	31	34	34	35	19	27	36	34	37	35
36	Doherty	26	28	27	29	29	20	27	36	33	37	35
25C	Green	23	30	33	33	34	19	28	34	33	35	35
Note 1: No equipment shutdowns												
Note 2: Shutdown Haul Route 2 Overburden Fleet												
Note 3: Shutdown Haul Route 1 Overburden Fleet												
Note 4 Intrusive L _{Aeq(15minute)} project specific noise level (PSNL)												
Note 5: Predicted L _{Aeq(15minute)} noise level complies with the intrusive PSNL												
Note 6: Predicted negligible noise exceedance (1 to 2dB(A) above intrusive PSNL)												

As shown in **Table 2.23.7**, the predicted daytime Years 0.5 and 3 mine operating noise levels comply with PSNL of 35dB(A) under INP, DING and Non-standard meteorological conditions, except:

- in Year 3, during DING (E class stability plus 2m/s south wind - 3% frequency of occurrence) resulting in a negligible 1dB(A) exceedance of the PSNL of 35dB(A) at 33 Seale and 36 Doherty; and
- in Year 3, during Non-standard (F class stability plus 2m/s south winds - 2% frequency of occurrence) resulting in a negligible 2dB(A) exceedance of the PSNL of 35dB(A) at 33 Seale and 36 Doherty.

Table 2.23.8
Representative Privately-owned Residences - Daytime Years 4, 7 and 10 - Intrusive Noise Levels under INP, DING and Non-standard Adverse Meteorological Conditions (dB(A) re 20µPa)

Landholder ID and Abbreviated Name	Daytime Year 4 (Out-of-pit) ^{6,7}					Daytime Year 7 (Out-of-pit) ^{6,7}					Daytime Year 10 (In-pit) ^{6,7}					Intrusive PSNL ⁵
	INP		DING		Non-standard	INP		DING		Non-standard	INP		DING		Non-standard	
	Calm ¹	Inver. ¹	Inversion + wind ²	Inver. ¹	Inversion + wind ²	Calm ¹	Inver. ¹	Inversion + wind ³	Inver. ¹	Inversion + wind ³	Calm ¹	Inver. ¹	Inversion + wind ⁴	Inver. ¹	Inversion + wind ⁴	
33 Seale	25	31	36	35	37	26	31	35	33	37	19	27	35	32	37	35
36 Doherty	25	31	35	35	37	26	32	35	34	37	20	26	34	30	36	35
25C Green	24	30	34	34	35	25	30	35	33	37	18	28	34	31	37	35
Note 1: No equipment shutdowns Note 2: Shutdown as per the NVBA Table 25 (Example 2) plus drill Note 3: Shutdown Haul Route 1 Overburden Fleet Note 4: Shutdown as per the NVBA Table 25 (Example 1) Note 5: Intrusive L _{Aeq(15minute)} project specific noise level (PSNL) Note 6: Predicted L _{Aeq(15minute)} noise level complies with the intrusive PSNL Note 7: Predicted negligible noise exceedance (1 to 2dB(A) above intrusive PSNL)																

As shown in **Table 2.23.8**, the predicted daytime Years 4, 7 and 10 mine operating noise levels comply with PSNL of 35dB(A) under INP, DING and Non-standard meteorological conditions, except:

- in Year 4, during DING (E class stability plus 2m/s south wind - 3% frequency of occurrence) resulting in a negligible 1dB(A) exceedance of the PSNL of 35dB(A) at 33 Seale;
- in Year 4, during Non-standard (F class stability plus south wind - 2% frequency of occurrence) resulting in a negligible 2dB(A) exceedance of the PSNL of 35dB(A) at 33 Seale and 36 Doherty; and
- in Years 7 and 10, during Non-standard (F class stability plus south wind - 2% frequency of occurrence) resulting in a negligible 2dB(A) exceedance of the PSNL of 35dB(A) at 33 Seale, 36 Doherty and 25C Green.

In summary, the predicted daytime Years 0.5, 3, 4, 7 and 10 mine operating noise levels comply with the PSNL of 35dB(A) when assessed under the INP meteorological conditions. During Years 3 and 4, mine operating noise levels would exceed the PSNL of 35dB(A) by a negligible 1dB(A) when assessed under the DING meteorological conditions. During Years 3, 4, 7 and 10, negligible mine noise exceedances of up to 2dB(A) are predicted when assessed under non-standard meteorological conditions. Based on the foregoing, it is likely that similar (but negligible) noise exceedances would be predicted at some of the other privately-owned residences located off Jacks Road and Waukivory Road.

The same three privately-owned residences have been used to demonstrate the predicted evening mine operating intrusive L_{Aeq(15minute)} noise levels under the meteorological conditions presented in **Table 2.23.6** for evening Year 4 (**Table 2.23.9**), and evening Years 7 and 10 (**Table 2.23.10**), together with the adopted noise control and management measures.

Table 2.23.9

Representative Privately-owned Residences - Evening Year 4 - Intrusive Noise Levels under INP, DING and Non-standard Adverse Meteorological Conditions (dB(A) re 20µPa)

Landholder ID and Abbreviated Name		Year 4 (Out-of-pit) ^{5,6}						Year 4 (In-pit) ^{5,6}						Intrusive PSNL ⁴
		INP		DING		Non-standard		INP		DING		Non-standard		
		Calm ¹	Wind ²	Inver. ¹	Inversion + wind ²	Inver. ¹	Inversion + wind ²	Calm ¹	Wind ³	Inver. ¹	Inversion + wind ³	Inver. ¹	Inversion + wind ³	
33	Seale	25	35	30	35	33	36	17	35	25	34	32	36	35
36	Doherty	25	35	31	34	33	35	17	35	24	34	31	35	35
25C	Green	23	34	29	33	32	34	17	34	26	34	31	35	35

Note 1: No equipment shutdowns.

Note 2: Shutdown as per the NVBA Table 25 (Example 2)

Note 3: Shutdown as per the NVBA Table 25 (Example 1)

Note 4: Intrusive L_{Aeq(15minute)} project specific noise level (PSNL)

Note 5: Predicted L_{Aeq(15minute)} noise level complies with the intrusive PSNL

Note 6: Predicted negligible noise exceedance (1 to 2dB(A) above intrusive PSNL)

As shown in **Table 2.23.9**, the predicted daytime Year 4 mine operating noise levels comply with PSNL of 35dB(A) under INP, DING and Non-standard meteorological conditions, except:

- in Year 4 (out-of-pit) and Year 4 (in-pit), during Non-standard (F class stability plus 2m/s south wind - 5% frequency of occurrence) resulting in a negligible 1dB(A) exceedance of the PSNL of 35dB(A) at 33 Seale.

Table 2.23.10

Representative Privately-owned Residences - Evening Years 7 and 10 – Intrusive Noise Levels under INP, DING and Non-standard Adverse Meteorological Conditions (dB(A) re 20µPa)

Landholder ID and Abbreviated Name		Year 7 (Out-of-pit) ^{4,5}						Year 7 (In-pit) ^{4,5}						Year 10 (In-pit) ^{4,5}						Intrusive PSNL ³
		INP		DING		Non-standard		INP		DING		Non-standard		INP		DING		Non-standard		
		Calm ¹	Wind ²	Inver. ¹	Inv. + wind ²	Inver. ¹	Inv. + wind ²	Calm ¹	Wind ²	Inver. ¹	Inv. + wind ²	Inver. ¹	Inv. + wind ²	Calm ¹	Wind ²	Inver. ¹	Inv. + wind ²	Inver. ¹	Inv. + wind ²	
33	Seale	21	35	27	34	32	36	15	35	21	34	27	36	15	34	20	33	26	35	35
36	Doherty	22	34	27	33	32	35	15	35	21	32	26	34	16	34	20	33	26	35	35
25C	Green	21	35	27	33	31	35	14	35	22	34	28	35	14	35	21	33	27	36	35
Note 1:		No equipment shutdowns.																		
Note 2:		Shutdown as per the NVBA Table 25 (Example 2)																		
Note 3:		Intrusive L _{Aeq(15minute)} project specific noise level (PSNL)																		
Note 4:		Predicted L _{Aeq(15minute)} noise level complies with the intrusive PSNL.																		
Note 5:		Predicted negligible noise exceedance (1 to 2dB(A) above intrusive PSNL)																		

As shown in **Table 2.23.10**, the predicted daytime Years 7 and 10 mine operating noise levels comply with PSNL of 35dB(A) under INP, DING and Non-standard meteorological conditions, except:

- in Year 7 (out-of-pit), Year 7 (in-pit) and Year 10 (in-pit), during Non-standard (F class stability plus 2m/s south wind - 5% frequency of occurrence) resulting in a negligible 1dB(A) exceedance of the PSNL of 35dB(A) at 33 Seale and 25C Green.

In summary, the predicted evening Years 4, 7 and 10 mine operating noise levels comply with the PSNL of 35dB(A) when assessed under the INP meteorological conditions. During Years 4, 7 and 10, mine operating noise levels comply with the PSNL of 35dB(A) when assessed under

the DING meteorological conditions. During Years 4, 7 and 10, negligible mine noise exceedances of up to 1dB(A) are predicted when assessed under non-standard meteorological conditions. Based on the foregoing, it is likely that similar (but negligible) noise exceedances would be predicted at some of the other privately-owned residences located off Jacks Road and Waukivory Road.

From the outset of the amended Project design, GRL has recognised that compliance with any approved noise (and air quality) limits through the use of real-time monitoring along with extended wet weather periods or other operational factors, would have the potential at times to reduce plant and equipment utilisation (i.e. to necessitate equipment items or fleet shutdowns) for various periods throughout the year, therefore curtailing production levels on those days.

In recognition of these variables, the equipment fleet (EIS Table 2.6) has been selected to achieve the planned level of production (EIS Table 2.5) in a five day week in the absence of these factors. However, as noted in EIS (Table 2.12), approval is sought for Saturday work, with the Saturday work to be undertaken in the event of lost operational time during the nominal five day week due to these various factors. The ability to work on Saturdays to cover such circumstances therefore provides GRL with the flexibility to compensate for appropriately 20% lost time (i.e. all equipment equivalent throughout the year) relative to the nominal five day week, a situation considered highly unlikely based on the modelling undertaken. GRL placed emphasis upon achieving the annual production levels nominated in EIS (Table 2.5) rather than achieving a daily or weekly production level.

The actual manner in which the potential curtailments would be managed operationally and the extent to which they occur would be determined at the time by the cause or the likelihood of occurrence. Reliance would be placed upon predictive meteorological forecasts to assist the planning of all activities. Management could involve the operators being employed on miscellaneous or specifically identified downtime tasks, and/or the adjustment of shift arrangements/durations for some operators, with this situation more likely during the winter months when strong temperature inversion conditions in the morning, late afternoon or evening is more likely to impact plant and equipment utilisation and mine operations. Such adjustments would be readily achieved as, in Years 1 to 3, shifts for all operators would be 7.00am to 5.30pm and a similar shift arrangement is nominated for operators more than 50% of mining plant and equipment operators and approximately 70% of all on-site personnel from Year 4 onwards. Any lost time during the nominal five day week would then be compensated by the catch-up production on Saturdays. GRL recognises that the higher frequency of temperature inversions during the colder months may result in weekly production falling below the planned average weekly level. However, this could be compensated for by above average weekly production during the warmer months.

It is noted that the impact of inversions on air quality issues are addressed in Section 2.4.17.1 of this document.

2.23.6 Low Frequency Noise and Other Characteristics

2.23.6.1 Representative Comment(s)

Any approval for the project should adopt DEFRA-based criteria for low frequency noise, and corrections to measured noise levels

The assessment states that the $L_{Ceq} - L_{Aeq}$ was modelled at the project's closest sensitive receivers and was less than 15dB. It also states that the Broner criteria should be used to guard against a "perverse outcome" where a correction applies at farther receivers but not at closer receivers.

The EPA agrees that the approach in the INP is not consistent with current science, but do not support the Broner criteria.

The EPA recommends that any project approval, require the proponent to apply a correction to any measured noise level, before comparison to limits, where the $L_{Ceq} - L_{Aeq}$ exceeds 15dB and:

- *where any of the 1/3 octave noise levels in Table A are exceeded by up to 5dB, a 2dBA positive adjustment to measured A weighted levels applies in the evening and night periods.*
- *where any of the 1/3 octave noise levels in Table A are exceeded by more than 5dB, a 5dBA positive adjustment to measured A weighted levels applies for the evening and night periods, and a 2dBA positive adjustment applies for the daytime period.*

Table A: One-third octave low frequency noise thresholds

Centre frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
One-third octave $L_{Zeq}(15min)$ threshold level (dB)	92	89	86	77	69	61	54	50	50	48	48	46	44

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Response

In its submission, the EPA has requested that low frequency noise (LFN) modifying factors be assessed in accordance with DEFRA-based criteria (i.e. guided by the requirements of the DING Fact Sheet C in particular Table C1 and Table C2). GRL accepts the EPA's recommendation that any development consent for the amended Project adopt the DEFRA-based criteria for LFN corrections to the measured noise levels.

The DPE has also requested that GRL re-assess the predicted noise impacts of the (amended) Project in accordance the EPA's recommended LFN assessment procedure where the $L_{Ceq} - L_{Aeq}$ noise levels exceed 15dB. As identified in the EPA's submission, the first step in the procedure is to determine if the difference in the mine operating intrusive $L_{Ceq} - L_{Aeq}$ noise levels exceed 15dB. This first step in the procedure is already presented in NVBA (Section 5.5), which states:

Three of the nearest rural residences, namely 25C Green, 33 Seale and 36 Doherty, were selected for low frequency analysis and associated calculation of the intrusive $L_{Ceq}(15minute)$ noise level for the comparison with the corresponding intrusive $L_{Aeq}(15minute)$ noise level (as presented in Table 25) in the absence of any

equipment shutdowns and following alternative 2 equipment shutdowns. The resulting A and C weighted intrusive noise levels differences are presented in Table 26. ...

As shown in Table 26, the resulting A and C weighted intrusive noise levels differences ranges from 12dB to 13dB, i.e. less than 15dB. Hence, a 5dB correction to the predicted mine operational intrusive noise levels would not be triggered under the INP. Given the degree of compliance at the nearest rural residences with the low frequency assessment criterion (i.e. a difference up to 13dB) and their proximity to other residences, it is reasonable to anticipate similar compliance outcomes at other nearby localities including the Gloucester urban area, elsewhere in the Thunderbolt Estate, the Avon River and Forbesdale Estates.

As shown in the NVBA (Table 26) (reproduced as **Table 2.23.11**), the resulting A and C weighted intrusive noise levels differences range from 12dB to 13dB (i.e. less than 15dB). Hence compliance with the requirements of Table C1 is achieved and no further assessment in accordance with Table C2 is warranted.

Table 2.23.11
C and A Weighted Intrusive Noise Level Differences (dB re 20µPa)

Operational Year	Evening Operating Intrusive Noise Levels - Southerly wind with no equipment shut downs								
	Year 4 Out-of-pit			Year 7 Out-of-pit			Year 10 In-pit		
Residence	25C Green	33 Seale	36 Doherty	25C Green	33 Seale	36 Doherty	25C Green	33 Seale	36 Doherty
C Weighted	49.5	48.9	47.7	50.1	49.7	49.3	47.9	47.8	47.7
A Weighted	37.0	36.7	35.6	37.1	36.9	36.6	34.9	34.9	35.6
Difference	12.5	12.1	12.1	12.9	12.8	12.6	13.1	12.9	12.1
Operational Year	Evening Operational Intrusive Noise Levels - Southerly wind with alternative 2 equipment shut downs								
	Year 4 Out-of-pit			Year 7 Out-of-pit			Year 10 In-pit		
Residence	25C Green	33 Seale	36 Doherty	25C Green	33 Seale	36 Doherty	25C Green	33 Seale	36 Doherty
C Weighted	45.9	48.2	47.6	46.5	47.2	46.7	47.1	47.4	47.3
A Weighted	33.7	35.2	35.1	34.6	34.9	34.4	35.1	34.2	34.2
Difference	12.2	13.0	12.5	11.9	12.3	12.3	12.0	13.2	13.1
Note 1: Representative residences 25C Green, 33 Seale and 36 Doherty.									
Note 2: Predicted $L_{Aeq(15\text{minute})}$ noise level complies with the intrusive PSNL 35dB(A).									
Note 3: Predicted negligible noise exceedance 1 to 2dB(A) above intrusive PSNL 35dB(A).									
Source: NVBA (Table 26)									

2.23.7 Noise Mitigation Measures

2.23.7.1 Representative Comment(s)

Proposed mitigation measures for noise may not be practical to implement for the likely times required (one evening in five in winter for inversions and also during the predominant southerly breezes which are predicted to occur about 29% of the time during winter evenings, although some of these occurrences might coincide):

- To ensure the proposal can meet the noise criteria the proponents have said they will implement multiple layers of operational noise mitigation measures.

- *The EPA previously raised concern about the practicality of regularly limiting mining activities in an operational mine, and is concerned the modelling for this project is optimistic about the available noise mitigation measures.*
- *The noise impact assessment in the EIS describes a range of possible measures such as equipment shutdowns, “switching off the coal fleet and associated mobile equipment”, restricting some dozers to 1st gear “dependent on the time and location of operation”, and not operating “out-of-pit” in certain noise enhancing conditions.*
- *It is not entirely clear which mitigation measures were adopted for each noise model scenario, but certain scenarios seem to include a minimum of “switching off the coal fleet and associated mobile equipment” and restricting some dozers to 1st gear operation.*
- *As temperature inversion conditions are likely to be experienced in one evening out of every five in winter, combined with the need for additional controls during the predominant southerly breezes in the Gloucester Valley, the EPA questions whether the assumed and restrictive operational controls would be regularly put into practice on a large mine with a workforce of in excess of 100 employees.*
- *DP&E, when weighing up all relevant considerations, needs to consider the risk of additional residences being adversely impacted by noise if all proposed measures are not practical to implement at a real life operational mine.*

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Response

Refer to the response in Section 2.23.4.1 of this document, with the key points reiterated, as follows.

In accordance with the DGRs, all feasible noise mitigation measures were documented in the NVBA (Section 5.4) and those identified as reasonable would be implemented by GRL for the amended Project in accordance with the conditions of development consent. The package of noise mitigation measures aim to ensure that the daytime and evening PSNLs are met when assessed in accordance with the requirements of the INP. As presented in NVBA (Table 24), the proposed package of noise mitigation measures is summarised as follows.

- a) Restricted mine operating hours to daytime and evening (i.e. no night-time mine operations).
- b) Noise Source Control - use of noise attenuated mobile fleet and fixed plant.
- c) Noise Propagation Path - Installation of acoustic barriers (i.e. western and northern amenity barrier and interim amenity barriers).
- d) Operational Controls – re-scheduling of intrusive activities to less sensitive times of the day.
- e) Operational Controls - Noise and Weather Monitoring to identify appropriate plant and equipment shutdowns if required.

GRL accepts that equipment shutdowns are feasible, reasonable and necessary to achieve the PSNL of 35dB(A) (i.e. noise mitigation measure ‘e’) and is committed to their implementation.

The extent of the equipment shutdowns would be dependent on the location and elevation of the equipment and the prevailing weather conditions.

The NVBA (Table 25) presents example equipment shutdowns to five key residences. **Table 2.23.12** presents a simplified version of NVBA (Table 25), showing the example equipment shutdowns to the five key residences adopted for each of the operational noise modelling scenarios presented in the NVBA Section 7.

Table 2.23.12
Evening Operational Intrusive $L_{Aeq(15\text{minute})}$ Noise Levels (dBA re 20 μ Pa)

Operational Year	Year 4 Out-of-pit (Southerly wind 3m/s)					Year 4 In-pit (Southerly wind 3m/s)					Year 7 Out-of-pit (Southerly wind 3m/s)					Year 7 In-pit (Southerly wind 3m/s)					Year 10 In-pit (Southerly wind 3m/s)				
Landowner ID ¹	6	7	25C	33	36	6	7	25C	33	36	6	7	25C	33	36	6	7	25C	33	36	6	7	25C	33	36
Noise level before equipment shutdown ^{2,3,4,5}	40	37	36	37	37	36	37	36	36	36	41	38	37	37	37	24	38	36	37	36	30	36	36	35	35
Equipment shutdowns adopted for operational noise modelling presented in Section 7 of the NVBA	Switch off Coal Fleet (1 x Komatsu PC1250 Excavator; plus 3 x Haulmax 3900EQ trucks); plus Tiger 690 Rubber Tyre Dozer					Switch off Coal Fleet (1 x Komatsu PC1250 Excavator; plus 3 x Haulmax 3900EQ trucks)					Switch off Coal Fleet (1 x Komatsu PC1250 Excavator; plus 4 x Haulmax 3900EQ trucks); plus Tiger 690 Rubber Tyre Dozer; plus CAT D11XQ Dozer (DZ2)					Switch off Coal Fleet (1 x Komatsu PC1250 Excavator; plus 3 x Haulmax 3900EQ trucks); plus Tiger 690 Rubber Tyre Dozer; plus CAT D11XQ Dozer(DZ2)					Switch off Coal Fleet (off 3 of the 4 Haulmax 3900EQ trucks)				
Noise level after equipment shutdown ^{2,3,4}	39	36	34	35	35	35	36	34	35	35	40	36	35	35	34	24	36	35	35	35	28	35	35	34	34
Note 1: Representative residences 6 Campbell, 7 Ansell & Murray, 25C Green, 33 Seale and 36 Doherty.																									
Note 2: Predicted $L_{Aeq(15\text{minute})}$ noise level complies with the intrusive PSNL 35dBA.																									
Note 3: Predicted negligible noise exceedance 1 to 2dBA above intrusive PSNL 35dBA.																									
Note 4: Predicted moderate noise exceedance 3 to 5dBA above intrusive PSNL 35dBA.																									
Note 5: Predicted significant noise exceedance >5dBA above intrusive PSNL 35dBA.																									

Section 2.23.5.1 of this document identifies that the potential for a curtailment of daily production levels and reduced equipment utilisation due to factors including adverse winds from the south and/or temperatures inversions and predictive meteorological forecasting and real-time monitoring have been built into the design of the amended Project in terms of production scheduling, equipment selection and operational days for which approval is sought. Effectively, mine planning provides 20% additional operational hours each week to accommodate the potential curtailment activities.

It is considered that the proposed package of noise mitigation measures ‘a, b, c, d and e’ represent current best industry practice in relation to the control and management of environmental noise emissions, are achievable and can be implemented in practice during the proposed mining operations.

2.23.9 Noise from Public Roads

2.23.9.1 Representative Comment(s)

The assessment states that Jacks Road and Waukivory Road are local roads but will be upgraded, and modelled those roads as “principal haulage routes”. As stated in the NSW Road Noise Policy (DECCW 2011), principal haulage routes are identified by local authorities rather than by proponents.

The EPA recommends that DP&E, prior to approval, require the proponent demonstrate either:

- The local authority has identified Jacks Road and Waukivory Road as principal haulage routes, or*
- The project will meet the road noise policy criteria for local roads at receivers affected by noise from Jacks Road and Waukivory Road.*

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Response

As discussed in the NVBA (Section 9.1), Jacks Road (SR18) and Waukivory Road (SR17) are both currently classified as local roads. However, as discussed in the NVBA (Section 2.3.2), the primary access route to the Mine Area would be established by upgrading Jacks Road and Waukivory Road (east of Jacks Road), as follows.

The key off-site establishment and construction stage activities are associated with upgrading and improving the safety of the public road network, and include the following:

- The construction of an upgraded intersection at the corner of Jacks Road and The Bucketts Way to provide deceleration lanes approaching the intersection.*
- Upgrading and widening the pavement along the full length of Jacks Road.*
- Construction of a new bridge across the Avon River on Jacks Road.*
- Upgrading the 1.3km section of Waukivory Road from Jacks Road to McKinleys Lane.*
- Construction of an upgraded intersection at the junction of Jacks and Waukivory Roads.*
- Upgrading the intersection of Waukivory Road and McKinleys Lane and the approximately 50m section of McKinleys Lane to the Mine Area access road.*

With the implementation of these works, Section 2.2.2 of the NSW Road Noise Policy (RNP) encourages local government authorities to apply “good planning practice”, and states:

Some industries such as mines and extractive industries are, by necessity, in locations that are often not served by arterial roads. Heavy vehicles must be able to access these often more remote sites and this may mean travelling on local public roads. Good planning practice acknowledges this type of road use and develops ways of managing any associated adverse noise impacts. Principal haulage routes are distinct from private haul roads – further guidance on private haul roads is provided in Appendix C4.

Where local authorities identify a ‘principal haulage route’, the noise criteria for the route should match those for arterial/sub-arterial roads, recognising that they carry a different level and mix of traffic to local roads.

The NVBA (Section 9) was prepared on the reasonable assumption that “good planning practice” would be endorsed by both the EPA and Mid-Coast Council, and where subject to the road upgrade works, Jacks Road and Waukivory Road (east of Jacks Road) would form the primary access route to the Mine Area and therefore be recognised as sub-arterial roads rather than local roads. Notwithstanding, the road traffic noise along the primary access route to the Mine Area has been reassessed against the RNP’s local road criteria, as follows.

Traffic Noise Assessment Procedure

The RNP describes a number of process steps for applying the local road traffic noise criteria to Jacks Road and Waukivory Road (east of Jacks Road). In general accordance with these steps, this assessment has:

- identified a Study Area for the proposed access route to the Mine Area and the nearest privately-owned residences adjacent to Jacks Road and Waukivory Road (east of Jacks Road);
- tabulated road traffic flows within the Study Area, due to the projected base traffic and the additional traffic from the amended Project (i.e. Year 1 and Year 10) sourced from the Transport Assessment;
- calculated traffic noise levels (from existing traffic noise measurements) due to the projected base traffic and the additional traffic from the amended Project (i.e. Year 1¹⁴ and Year 10¹⁵) for comparison with the predicted increase against the Relative Increase Criteria as applicable; and
- compared the predicted cumulative noise levels against the Total Traffic Noise Criteria as applicable to Jacks Road and Waukivory Road (east of Jacks Road).

The nearest privately-owned residences to Jacks Road and Waukivory Road east of Jacks Road are listed in **Table 2.23.13**.

Table 2.23.13
Nearest Privately-owned Residences Adjacent to the Primary Access Route

Landholder ID ¹	Abbreviated Name ¹	Distance to Road Centre	Landholder ID ¹	Abbreviated Name ¹	Distance to Road Centre
Jacks Road and Waukivory Road (east of Jacks Road)²					
99	Maurer & Kilipikoski	16m	21A.2	Robinson	86m
107A	Genoli	21m	43	Waller	90m
85	Elliott	23m	87	Yates & Moore	91m
88	Heffernan	23m	76	Atkins	93m
77	Krestensen	23m	89	Roser	95m
78	Higgins	25m	75	Moore	100m
86	West	26m	38	Hornsby	115m
21A.1	Robinson	29m	36	Doherty	126m
90	Keyte	35m	40	Fallon	129m
107B	Genoli	37m	44	Mason	134m
108	Ballard	39m	203	Swilks	135m
42	Ellis & Buckman	40m	39	Ejea	138m
82	Mulhall	41m	83A	Jarvis & Relf	149m
81	Bradbury & Richardson	60m	200	Sweikert	154m
80	Schneider	63m	74	Perry	155m
24	Bardwell	66m	-	-	-
Note 1: Refer to NVBA - Appendix C2 for Residence Ownership Details.					
Note 2: There are no privately-owned residences adjacent to Waukivory Road (east of Jacks Road) along the primary access route.					

¹⁴ Assumed to be 2019 throughout this response

¹⁵ Assumed to be 2029 throughout this response

In relation to situations where exceedances of the road traffic noise assessment criteria are predicted, the NSW RNP relevantly provides:

Where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through feasible and reasonable measures to meet the assessment criteria. A secondary objective is to protect against excessive decreases in amenity as the result of a project by applying the relative increase criteria.

In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

...For existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'.

In practice, noise level increases of less than 2dB(A) are generally achieved when the percentage increase to the existing light and heavy traffic is no greater than 60%.

Existing and Projected Traffic Noise on Jacks Road in the Vicinity of the Site

Existing traffic noise levels were established in July 2010 and July 2011 based upon measurements taken at two locations set back from The Bucketts Way (south of Jacks Road) (Location 11) and Jacks Road and Waukivory Road (east of Jacks Road) (Location 2). The results of the road traffic noise monitoring are summarised in **Table 2.23.14** for Location 2 (July 2010).

Table 2.23.14
Unattended Road Traffic Noise Monitoring Results – Location 2 July 2010 (dB(A) re 20µPa)

Road Traffic Location	ID ¹	Offset Distance ²	Daytime L _{eq} (15hour)	Night-time L _{eq} (9hour)	Daytime Peak L _{eq} (1hour)	Night-time Peak L _{eq} (1hour)
Jacks Road and Waukivory Road (east of Jacks Road)	2	54m	46dB(A)	38dB(A)	51dB(A)	43dB(A)
Note 1: Road traffic noise monitoring Location 2 (refer NVBA Appendix G2).						
Note 2: Free field offset distance from centre of roadway to Location 2.						

The measured road traffic noise levels (**Table 2.23.14**) have been used to calculate the nominal minimum offset distances (**Table 2.23.15**) from the centre of the primary access route to the Mine Area (i.e. Jacks Road and Waukivory Road east of Jacks Road) to meet the daytime peak LA_{eq}(1hour) and night-time peak LA_{eq}(1hour) total traffic noise criteria identified in the RNP, based on the projected base Year 1 (2019) and Year 10 (2029) traffic flows as presented in **Table 2.23.16**.

Table 2.23.15
Projected Base Traffic Minimum Offset Distance to Meet Total Traffic Noise Criteria

Access Route to the Mine Area (as local road)	Projected Year 1 Base Offset Distance ^{1,2}		Projected Year 10 Base Offset Distance ^{1,2}	
	Daytime Peak ³ 55dB(A) L _{eq} (1hour)	Night-time Peak ⁴ 50dB(A) L _{eq} (1hour)	Daytime Peak ³ 55dB(A) L _{eq} (1hour)	Night-time Peak ⁴ 50dB(A) L _{eq} (1hour)
Jacks Road	90m	49m	122m	66m
Waukivory Road (east of Jacks Road)	47m	25m	63m	34m
Note 1: Total traffic noise level inclusive of 2.5dB(A) facade correction.				
Note 2: Offset distance from centre of roadway.				
Note 3: Daytime peak hour 4:00pm to 5:00pm.				
Note 4: Night-time peak hour 6:00am to 7:00am.				

Based on the projected traffic noise levels (in the absence of the amended Project) (as presented in **Table 2.23.16** during daytime peak hour 4:00pm to 5:00pm and night-time peak hour 6:00am to 7:00am), some residences adjacent to Jacks Road would be impacted by projected traffic noise in the absence of the amended Project as discussed below.

Table 2.23.16
Projected Base and Amended Project Traffic Flows – Jacks Road and Waukivory Road

Road Traffic Location and Time Period	Projected Base Year 1 ^{1,2}	Amended Project Year 1 ^{3,4}	Cumulative Year 1 (% increase)	Projected Base Year 10 ^{1,2}	Amended Project Year 10 ^{5,6}	Cumulative Year 10 (% increase)
Jacks Road						
Daytime 1 hour traffic	104	19	124 (18%)	141	44	185 (32%)
Night-time 1 hour traffic	43	19	62 (45%)	57	22	80 (39%)
24 hour traffic	548	90	638 (16%)	737	198	935 (27%)
Waukivory Road (east of Jacks Road)						
Daytime 1 hour traffic	54	28	82 (51%)	73	64	136 (87%)
Night-time 1 hour traffic	22	28	50 (125%)	30	32	62 (108%)
24 hour traffic	284	130	413 (45%)	381	284	664 (74%)
Note 1: Projected base daytime 1 hour (4:00pm to 5:00pm) traffic based on 22% of the 15 hour traffic.						
Note 2: Projected base night-time 1 hour (6:00am to 7:00am) traffic based on 52% of the 9 hour traffic.						
Note 3: Amended Project Year 1 daytime 1 hour (4:00pm to 5:00pm) traffic based on 43% of the 15 hour traffic.						
Note 4: Amended Project Year 1 night-time 1 hour (6:00am to 7:00am) traffic based on 43% of the 9 hour traffic.						
Note 5: Amended Project Year 10 daytime 1 hour (4:00pm to 5:00pm) traffic based on 45% of the 15 hour traffic.						
Note 6: Amended Project Year 10 night-time 1 hour (6:00am to 7:00am) traffic based on 23% of the 9 hour traffic.						
Source: Transport Assessment (Constructive Solutions Pty Ltd, 2016) ¹⁶ – Table 7 and Table 8 and notes 1 to 6 above.						

In Year 1¹⁷ (or 2019), seventeen residences would be located at distances of less than 90m (**Table 2.23.13**) from Jacks Road and therefore noise levels from these residences are predicted to be above the daytime peak LA_{eq}(1hour) total traffic noise criteria of 55dB(A). Similarly, thirteen residences are located at distances of less than 49m (**Table 2.23.13**) from Jacks Road and therefore predicted to be above the night-time peak LA_{eq}(1hour) total traffic noise criteria 50dB(A).

¹⁶ Constructive Solutions Pty Ltd (2016), *Amended Rocky Hill Coal Project Transport Assessment*, Part 9 of the *Specialist Consultant Studies Compendium*, Prepared on behalf of GRL

¹⁷ Assuming no further residences are constructed

In Year 10¹⁸ (or 2029) (in the absence of the amended Project), at least twenty three residences would be located at distances of less than 122m (**Table 2.23.13**) from Jacks Road and therefore traffic noise levels are predicted to be above the daytime peak LAeq(1hour) total traffic noise criteria of 55dB(A). Similarly, fifteen residences are located at distances of less than 66m (**Table 2.23.13**) from the Jacks Road and therefore traffic noise levels are predicted to be above the night-time peak LAeq(1hour) total traffic noise criteria 50dB(A).

It should be noted that both the daytime peak LAeq(1hour) total traffic noise criterion of 55dB(A) and the night-time peak LAeq(1hour) total traffic noise criterion of 50dB(A) are generally conservative and are currently exceeded commonly at dwellings adjacent to local roads in rural and regional settings.

There are no privately-owned residences adjacent to Waukivory Road (east of Jacks Road) along the primary access route.

Amended Project Traffic Noise Impact Assessment on Jacks Road

The projected Year 1 (2019) and Year 10 (2029) base traffic flows together with the additional traffic from the amended Project on the primary access route to the Mine Area (i.e. Jacks Road and Waukivory Road, east of Jacks Road) are presented in **Table 2.23.16** with the relative percentage increase shown in parentheses.

Relative Increase Assessment

The maximum relative increase in peak hour traffic flow on Jacks Road due to the amended Project would be approximately 32% (Year 10 daytime) and approximately 45% (Year 1 night-time). This increase corresponds to a negligible 1.2dB(A) (Year 10 daytime) and negligible 1.6dB(A) (Year 1 night-time) increase relative to the projected base peak hour traffic noise levels.

Both the daytime and night-time relative increases in traffic noise on Jacks Road due to the amended Project are less than 2dB(A) and, in accordance with the RNP, represent a minor impact that is considered barely perceptible.

The maximum relative increase in peak hour traffic flow on Waukivory Road (east of Jacks Road) due to the amended Project is approximately 87% (Year 10 daytime) and approximately 125% (Year 1 night-time). This increase corresponds to a moderate 2.7dB(A) (Year 10 daytime) and moderate 3.5dB(A) (Year 1 night-time) increase relative to the projected base peak hour traffic noise levels. However, there are no privately-owned residences adjacent to Waukivory Road (east of Jacks Road) along the primary access route. Hence, such predicted exceedances are not relevant.

Total Traffic Noise Assessment

The relative increases arising from the amended Project traffic have been used to update the nominal minimum offset distances from the centre of the primary access route to the Mine Area required to meet the daytime and night-time total traffic noise criteria and are presented in **Table 2.23.17**. Further discussion is provided following the presentation of the predicted noise levels with respect to the acceptability of the predicted levels.

¹⁸ Assuming no further residences are constructed

Table 2.23.17
Minimum Offset Distance to Meet Total Traffic Noise Criteria – Jacks Roads

Jacks Road	Projected Year 1 Base Offset Distance ^{1,2}		Projected Year 10 Base Offset Distance ^{1,2}	
	Daytime Peak ³ 55dB(A) L _{eq} (1hour)	Night-time Peak ⁴ 50dB(A) L _{eq} (1hour)	Daytime Peak ³ 55dB(A) L _{eq} (1hour)	Night-time Peak ⁴ 50dB(A) L _{eq} (1hour)
Projected Base Traffic	90m	49m	122m	66m
Cumulative Traffic	107m	71m	160m	92m
Offset Increase relative to base traffic	17m	22m	38m	26m
Note 1: Total traffic noise level inclusive of 2.5dB(A) facade correction. Note 2: Offset distance from centre of roadway. Note 3: Daytime peak hour 4:00pm to 5:00pm. Note 4: Night-time peak hour 6:00am to 7:00am.				

As discussed previously, based on the projected Year 1 (2019) and Year 10 (2029) traffic noise levels, some residences adjacent to Jacks Road would be impacted by projected traffic noise in the absence of the amended Project.

As a result of the amended Project in Year 1 (2019), an additional five residences (IDs 43, 87, 76, 89 and 75) would be located at a distance of less than 107m and therefore predicted to be above the daytime peak L_{Aeq}(1hour) criteria of 55dB(A) criteria. Similarly, an additional three residences (IDs 81, 80 and 24) would be located at distances of less than 71m and therefore predicted to be above the night-time peak L_{Aeq}(1hour) criteria of 50dB(A).

Further, as a result of the amended Project in Year 10 (2029), an additional eight residences (IDs 36, 40, 44, 203, 39, 83A, 200 and 74) would be located at a distance of less than 160m and therefore predicted to be above the daytime peak L_{Aeq}(1hour) criteria of 55dB(A) criteria. Similarly, an additional four residences (IDs 24, 21A.2, 43 and 87) would be located at distances of less than 92m and therefore predicted to be above the night-time peak L_{Aeq}(1hour) criteria of 50dB(A).

Whilst the predicted noise levels at some residences would exceed the total traffic noise criteria, the RNP also recognises that where the increase is less than 2dB(A) above the total traffic noise criteria, then the noise generated is considered acceptable.

The NVBA (Section 9) provided an assessment of road traffic noise along the primary access route to the Mine Area against the RNP's "principal haulage route" (i.e. sub-arterial) road criteria and concluded the following.

- The maximum relative increase in traffic flow on Jacks Road due to the amended Project occurs in Year 10 and is approximately 16% (daytime) and 90% (night-time). This increase corresponds to a negligible 0.6dB(A) (daytime) and marginal 2.8dB(A) (night-time) increase in the projected base traffic noise levels.
- The daytime relative increase in traffic noise due to the amended Project would be less than 2dB(A) and in accordance with the RNP represents a minor impact that is considered barely perceptible.
- During the night-time, the relative increase in traffic noise due to the amended Project would be 3dB(A) and noise mitigation measures would need to be considered if the total traffic noise criteria of L_{Aeq}(9hour) 55dB(A) were also

exceeded at the nearest residences adjacent to the primary access route to the Mine Area. However, all residences adjacent to the proposed primary access route to the Mine Area (i.e. Jacks Road) are located at distances 13m or greater from the road and therefore remain below the total traffic noise criteria of night-time LAeq(9hour) 55dB(A).

- The maximum relative increase in traffic flow on Waukivory Road (east of Jacks Road) due to the amended Project would occur in Year 10 and is approximately 44% (daytime) and 248% (night-time). This increase corresponds to a negligible 1.6dB(A) (daytime) and moderate 5.4dB(A) (night-time) increase in the projected base traffic noise levels. However, there are no privately-owned residences adjacent to Waukivory Road (east of Jacks Road) along the primary access route. Hence, the predicted 5.4dB(A) exceedance is not relevant.

Conclusion

Noise generated by mine-related traffic travelling to and from the Mine Area during the life of the mine before 7:00am and after 10:00pm would be acceptable in that it satisfies both criteria applicable to principal haulage route (i.e. sub-arterial road) or local road, irrespective of the classification assigned by Council.

Sleep Disturbance

The potential for sleep disturbance due to road traffic noise is discussed in the RNP – Section 5.4, where it states:

The disruption of a person's normal sleep patterns, or sleep disturbance, due to road traffic noise, has been the subject of numerous research studies conducted over the last 30 years. Despite intensive research, the triggers for and effects of sleep disturbance have not yet been conclusively determined.

...

From the research on sleep disturbance to date it can be concluded that:

- *maximum internal noise levels below 50–55dB(A) are unlikely to awaken people from sleep*
- *one or two noise events per night, with maximum internal noise levels of 65–70dB(A), are not likely to affect health and wellbeing significantly.*

Notwithstanding the uncertainty associated with the effects of road traffic noise on sleep disturbance, the maximum noise levels from the amended Project-related vehicles along the primary access route to the Mine Area are likely to generate similar maximum noise levels to vehicles currently utilising Jacks Road.

As shown in **Table 2.23.16**, in Year 1 the estimated night-time peak hour (6:00am to 7:00am) traffic flow would be approximately 62 vehicles, with 19 vehicles being amended Project related. Similarly in Year 10, the estimated night-time peak hour (6:00am to 7:00am) traffic flow would be approximately 80 vehicles, with 22 vehicles being amended Project related. As the maximum noise levels generated by both vehicles currently utilising Jacks Road and the amended Project-related vehicles along the primary access route to the Mine Area are likely to be similar, the potential for sleep disturbance is considered minimal.

2.23.11 Night-time Activities

2.23.11.1 Representative Comment(s)

Table 4 of Section 2.1 of the Noise Impact Assessment indicates that maintenance activities will be carried out Monday to Sunday, at ‘all other hours’ (10pm-8am) on the condition that the activities are not audible at privately owned residences.

The EPA acknowledges this approach as a simple way of controlling noise in the night-time period. However, audibility varies among the population and the EPA would also prefer numeric limits to remove some of the subjectivity of an “audibility” limit.

The EPA, in its suggested conditions, proposes a night time $L_{eq(15min)}$ limit of 35dBA, and sleep disturbance limit of $L_{max(15min)}$ 45dBA.

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Response

GRL is puzzled by the EPA’s proposal that the amended Project (if approved) would be licenced with a ...night time $L_{eq(15min)}$ limit of 35dBA, and sleep disturbance limit of $L_{max(15min)}$ [sic] 45dBA.

Refer to the response in Section 2.23.4.1 of this document, where the NVBA (Table 24) presents the proposed package of noise mitigation measures for the amended Project. The first (and critical) noise mitigation measure is to restrict mine operating hours to daytime and evening (i.e. no night-time mine operations). This mitigation measure is to ensure that there are absolutely no night-time noise impacts at privately-owned receivers.

The proposed maintenance activities undertaken of a night-time would involve, for example, electrical or instrumentation works, repair of conveyor belts, tyre changes, pump maintenance and limited plant and equipment mechanical servicing, with the majority of these activities undertaken within the confines of a workshop.

To ensure this fundamental amended Project objective is maintained, whilst enabling routine maintenance activities to proceed, GRL has proposed that night-time maintenance activities must be not be audible at any privately-owned residence. The amended Project has been designed to operate within the proposed hours (NVBA – Table 4) and GRL is not seeking approval for any activity that would require night-time intrusive and maximum noise limits.

Whilst it is acknowledged that audibility varies amongst the population, GRL is concerned that the EPA’s proposal to “relax” this requirement would undermine a key project commitment, that is, to safeguard the community from any night-time noise impacts from the amended Project. Based on the description of maintenance requirements (above) such activity has minimal potential to emit audible noise from the Mine Area to the nearest privately-owned receivers. Hence, irrespective of the prevailing background noise levels, GRL would ensure any night-time maintenance activities are inaudible at all privately-owned residences.

Reference is made to the suggested modified Draft Condition 25 in Section 3.2.5 whereby GRL’s position on the matter is expressed, i.e. effectively removing night-time noise limits from the table and instead adjusting the note beneath the table.

2.23.12 Predicted Exceedances

2.23.12.1 Representative Comment(s)

The assessment proposed operational noise mitigation measures, including attenuated plant and equipment, using overburden to construct noise barriers, equipment scheduling and shutdown strategies, continuous noise monitoring and predictive weather.

The assessment stated that it was not reasonable for operational noise levels from the project to be reduced further. It also stated that an operational noise management plan would be prepared and implemented to minimise operational noise impacts.

Including all identified feasible and reasonable mitigation measures, three privately owned residences are predicted to receive operational noise above the project specific noise level, by:

- *up to 5dBA at "Receiver 6 Campbell" (up to $L_{eq(15min)}$ 40dBA)*
- *up to 1dBA at "Receivers 7 Ansell and Murray" and "19A Boorer" (up to $L_{eq(15min)}$ 36dBA).*

The EPA would expect that "Receiver 6 Campbell" will receive architectural treatment rights at the minimum in any approval for the project, in line with the Voluntary Land Acquisition and Mitigation Policy. In addition, if DP&E considers consent appropriate, given the potential for under-prediction of noise levels from the mine, the EPA suggests to DP&E that any condition referring to Voluntary Land Acquisition and Mitigation Policy be non-prescriptive relating to properties and actions in the event that actual noise impacts are greater than predicted. For example, if "Receiver 6 Campbell" is subject to noise greater than 5dBA above the Project Specific Noise Levels then any condition should note that under Voluntary Land Acquisition and Mitigation Policy the resident should be able to apply for voluntary acquisition by the proponent.

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Response

GRL generally accepts the EPA's recommended approach, but notes that contemporary project approvals for mining operations already set out escalating noise criteria, such as:

- Compliance Noise Criteria;
- Mitigation Noise Criteria; and
- Acquisition Noise Criteria,

together with the associated measurement, monitoring and meteorological conditions.

The escalating noise criteria approach acts as a community safeguard in the event that (actual) mine operating noise levels are elevated by comparison with those presented in the NVBA. In other words, contemporary project approvals already address the EPA's concerns.

2.29 SURFACE WATER

2.29.4 Saline Water Treatment, Use and Salt Disposal

2.29.4.1 Representative Comment(s)

Salty minewater is proposed to be treated via a treatment plant (although not stated in the EIS it is expected by the EPA this will include a reverse osmosis treatment facility). Such a facility produces two products: a permeate with very much reduced salinity; and a concentrated (very salty) brine.

The proponent needs to be clear on the unit operations that are proposed in the water treatment plant so that the EPA can make an assessment of the potential risks involved.

The EPA has proposed two draft conditions relating to water management plans. These conditions are likely to change upon the submission of details of the water treatment plant and an adequate assessment of the range of other relevant potential pollutants from coal seams that are not listed in the proposed licence limits. In proposing these conditions the EPA highlights that if a reverse osmosis plant is proposed it is expected that most potential pollutants will be at trivial levels and those pollutants may not require licence limits for discharge. Discharge limits will mostly relate to salinity levels (not too high or too low); indicators of treatment performance/amendment levels; and any indicators that are not handled well in a reverse osmosis plant that are identified as risk factors in the commissioning monitoring.

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Response

Based on the mine water balance for the amended Project, it was determined that a water treatment plant would be required in Year 4 of mining operations and beyond. The water balance, which was derived using the predicted groundwater and surface water inflows and losses from the system, e.g. by evaporation or dust suppression use, identified that a 2.5ML capacity treatment plant would most likely be appropriate, but noted that the plant throughput required would be confirmed through monitoring of the saline water zone during the early stages of mine development. This monitoring would involve both volumes and quality and the associated validation of the modelled predictions. The outcomes of these programs, and required permeate quality would be used in the detailed design of the water treatment components.

In the absence of site specific water quality data, it is impossible to provide other than a conceptual process and componentry design, as was the case in EIS (Section 2.11.5). The treatment plant would comprise two principal components, namely a desalination plant and brine processing system, with reverse osmosis (RO) technology to be utilised as a means of treating the saline water.

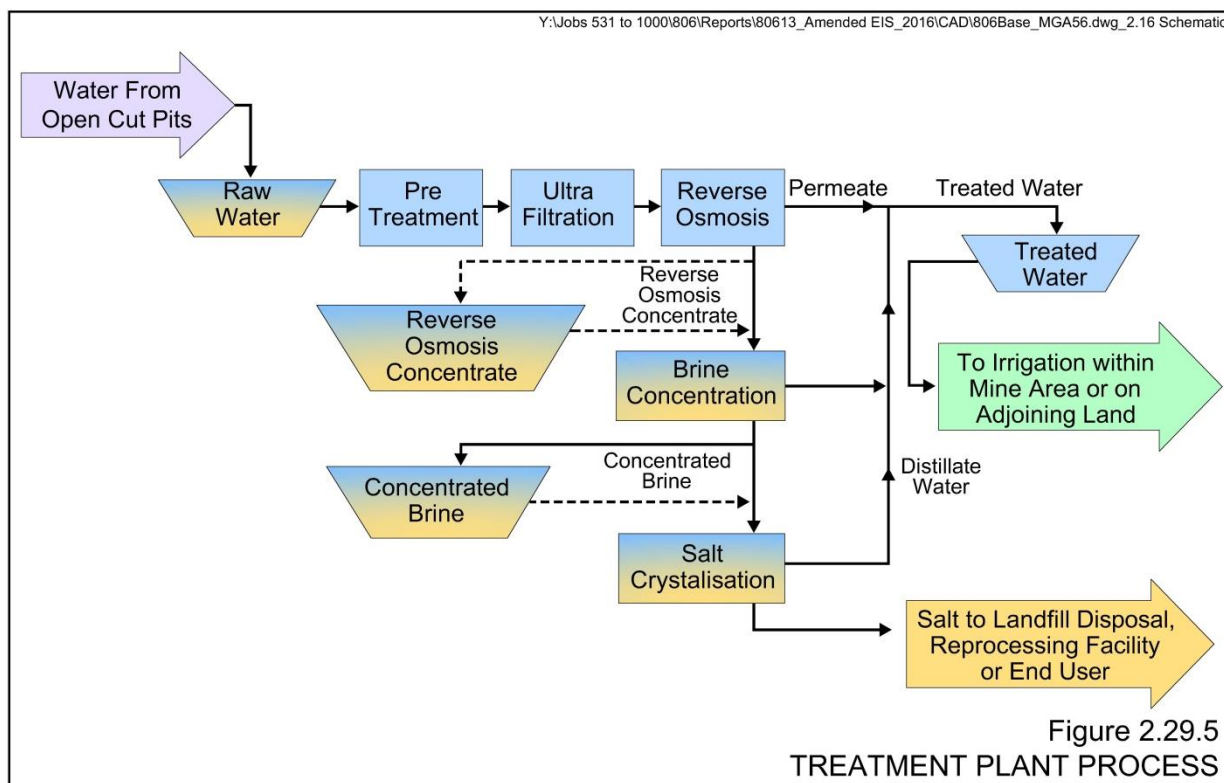
RO is a proven process for the removal of dissolved solids from brackish or saline feed water and is particularly effective as it can treat water to a variety of qualities depending on the end use. It uses pressure to “force” water through a semi-permeable membrane, leaving the ions behind a clean water stream and a concentrated brine solution, which may be further treated.

As noted in EIS Figure 2.16 (reproduced as **Figure 2.29.5**), the likely system proposed to treat the excess water within the saline water zone and its subsequent brine waste, would likely involve the following steps, as further described below.

1. Pre-treatment
2. Ultra filtration
3. Desalination – RO
4. Brine treatment involving brine concentration and salt crystallisation

The water treatment plant would reduce the volume of brine waste produced by maximising the amount of treated water produced from the saline feed and concentrating the brine into a concentrated salt and, as such, the brine would be an interim stage in the process, not a product.

The RO process is sensitive to the feed-water quality, with the correct pre-treatment process essential to promote the membrane lifespan and increase the process efficiency. The pre-treatment process would be designed reflecting the feed-water quality.



Pre-treatment

Pre-treatment of the saline mine water would be critical to the overall process and would be designed to remove suspended solids, biological contaminants and other constituents that may impact the subsequent membrane processes, with the overall goal of maximising system recovery to minimise waste flows.

Pre-treatment selection would be based on the detailed chemical characteristics of the mine water with the removal of suspended solids, dissolved organics and some heavy metals effectively achieved via coagulation/flocculation processes. This process would involve

coagulant dosing with sufficient mixing and contact time for removal of the target contaminants. Depending upon solids levels, settling of flocculated solids may be required or alternatively the stream can be fed directly to the subsequent ultrafiltration unit for membrane separation.

Elevated levels of hardness (calcium and magnesium) and heavy metals (including arsenic, manganese, mercury, chromium) may favour a hydroxide precipitation or lime softening process. Lime softening is a physico-chemical precipitation process widely used to reduce hardness and heavy metals using a clarifier with sludge recirculation to ensure the most efficient removal of contaminants. It is effective in removing both calcium and magnesium, along with heavy metals, and can also be used to reduce silica. Alternatively, an ion exchange process can be selected to remove hardness for the saline mine water, with the use of a chemical regenerant.

Waste solids from either a clarification/flocculation process or a precipitation process would be thickened and sent to a solids handling process to produce a sludge cake suitable for off-site disposal.

The waste stream from the clarification/flocculation process would comprise both solid and liquid fractions. This would be combined with the liquid fraction returned to the process headworks and the waste solids sludge treated for off-site disposal at an appropriately licenced disposal facility. The nature of the waste, its classification and subsequent selection of an appropriate disposal site would be determined as part of the detailed process design stage once actual feed quality is known and following analyses of the sludge. If classified as a contaminated waste, it would be trucked to the EPA licenced recycling facility near Windsor, or a similar facility.

Management of wastes from cleaning activities within the ion exchange plant, if installed, would depend on the volume to be produced which, in turn, would be determined by feed water chemistry, plant operational requirements and economics. This would potentially involve blending with the RO plant discharge water stream as a water conditioning agent and/or a combination of process charcoal recovery/release and recycling and neutralisation followed by off-site trucking to a licenced disposal facility.

Ultrafiltration

Ultrafiltration (UF) is proven and widely used and accepted membrane process technology that produces a high-quality filtrate stream suitable as a feed water to the subsequent reverse osmosis membranes, removing turbidity, pathogens and bacteria and thereby protecting the RO membranes from physical and biological fouling.

The UF System includes fine screens for mechanical protection of UF membranes along with backwashing and chemical cleaning facilities. The backwash system is designed to prevent the build-up of debris on the membranes with the waste from the backwashing process returned to the front of the pre-treatment (dependent upon final pre-treatment selection) or further concentrated for disposal.

Chemical cleaning is used to prolong production runs by minimising membrane fouling through the use of cleaning agents, typically sodium hypochlorite (NaOCl). Solid wastes from the cleaning process would potentially be introduced to the clarification/flocculation process waste stream where the liquid wastes would be treated in a similar manner to the ion exchange plant

waste stream. Neutralisation of cleaning solutions would be performed within the UF chemical cleaning facilities.

Desalination - Reverse Osmosis (RO)

The objective of the RO process is to separate the feed water into two streams: a high-quality stream (RO permeate) with low concentrations of dissolved salts, and a second, smaller stream (RO concentrate) containing most of the dissolved salts present in the feed stream. RO removes most organic compounds and up to 99% of all ions, with a range of RO membranes available to address varying water conditions and requirements.

During the operation of a membrane system, dissolved solids, organic materials, and suspended solids in the incoming water can concentrate up to a level where they begin to precipitate or accumulate on the membrane surface, causing scaling and fouling which can result in unacceptably low production, high operating pressure, or an excessive pressure drop in the system which may lead to irreversible membrane damage.

If warranted, chemical pre-treatment would be used to reduce scaling and fouling potential, and again before the scale and foulants accumulate to a level where product water quality declines, or membrane damage can occur.

Chemical pre-treatment dosing typically involves sodium bisulphite dosing to remove any free chlorine present that may oxidise the RO membranes, with antiscalant dosing used to reduce fouling and scaling potential.

For the cleaning process, a combination of both acidic and alkaline cleaners would be used with the acidic cleaner formulation designed specifically to remove metal hydroxides, calcium carbonate, and other similar scales from membranes and alkaline cleaner formulation designed to remove organics, silt, and other particulate deposits from membranes. Waste from these processes would be managed in the same manner as those for the ultra-filtration process.

Post Treatment (e.g. Re-mineralisation)

Post-treatment of the RO permeate may be required to meet discharge requirements for pH, corrosiveness and Sodium Adsorption Ratio (SAR). Typically, this is performed via chemical dosing, such as with a lime slurry to increase hardness levels and alkalinity in the final treated water stream. Post-treatment of the permeate (if required) may also be achieved, at least in part, through the re-introduction of the outflow from the ion exchange plant cleaning process and would be undertaken following desalination within the RO plant and prior to discharge to the farm dam for its use for irrigation, or discharge to the Avon River system.

Brine Treatment

The proposed waste concentrate (brine) treatment process is based on proven technology and would involve brine concentration followed by salt crystallisation, both of which are well established and understood, reliable processes.

The brine (or concentrate) from the RO system would be treated in an evaporator or brine concentrator in which the waste concentrate feed from the RO process is evaporated to produce a high dissolved solids level brine stream with a typical total dissolved solids (TDS) of 100 000 – 200 000mg/L and a distillate pure water stream.

Concentrated brine is continuously discharged from the brine concentrator and pumped to the salt crystalliser.

The concentrated brine stream produced by the brine concentrator is then converted into a salt in a forced circulation salt crystallizer which uses flash evaporation to produce a crystalline salt material of approximately 10% to 15% moisture content suitable for handling, and a very pure distillate pure water stream.

2.29.4.2 Representative Comment(s)

It is on occasions necessary to “condition” reverse osmosis permeate to make it suitable for reuse or discharge (which could be important if discharging in low flow conditions). The EIS needs to discuss any mechanisms necessary to ensure the balance of minerals in the treated effluent will not cause disruption to receiving environments or soil structural decline. If conditioning of the treated water is deemed necessary after appropriate assessment, the EIS needs to stipulate if maximum limits for parameters like pH, bicarbonate alkalinity, dissolved ions, boron, and Sodium Adsorption Ratio might be necessary, to check that overdosing during conditioning is not occurring and/or that water quality is acceptable. Discussion should also occur as to the dissolved oxygen level likely in the discharged water and whether a limit...and/or active aeration is also necessary for this parameter.

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Response

RO membranes are highly effective in rejecting hardness ions from water streams. Combined with low pH, this can produce a permeate stream that requires “re-mineralisation” so as not to be aggressive in nature – whether the permeate stream is for re-use or discharge to the environment. Several methods exist for re-mineralisation, with the selection typically based upon the effluent characteristics required in the final treated water stream. This can include bypass / blending of a small amount of raw water or ion exchange plant output with the treated water stream (where raw and treated water qualities permit); dosing using hydrated lime slurry to add calcium hardness and adjust pH, or the use of calcite filters to dissolve CaCO_3 into the treated water.

Whether for discharge or reuse as irrigation water, it is usual for the SAR to be the measure used to determine acceptable conditions of the treated water stream. Although direct measurement of SAR is not possible, sodium and calcium hardness can be measured online in the effluent water and used to calculate the SAR to allow for continuous monitoring of the treated water quality. This, along with online pH and conductivity monitoring (for dissolved solids) in the final treated water stream, would confirm the permeate satisfies the treated water quality limits.

The water treatment scheme identified in Section 2.29.4.1 of this document does not contain treatment processes that would remove dissolved oxygen (DO) from the saline water stream. However, it is recognised that some chemicals used within the process can have an impact on DO levels. For example, the sodium bisulphite employed to protect RO membranes from free chlorine can also act to remove some oxygen. Based on advice from a leading producer of water treatment plants, typically, an open, cascading discharge at the outlet of the treatment process as proposed prior to its release from the Mine Area, would ensure oxygen saturation in

the final treated water is such that it would not be expected that additional aeration would be required.

GRL would regularly test the RO permeate or treated water from the treatment plant to establish whether the parameters such as pH, dissolved oxygen, bicarbonate alkalinity, dissolved major ions, boron and SAR are within the range considered appropriate for irrigation purposes or discharge to the Avon River. The limits applicable to both the irrigation and/or discharge would be established through reference to ANZECC (2000)¹⁹ and local agronomists. In the event any parameter is established to be beyond the nominated limit(s), the RO permeate would be conditioned to achieve the acceptable concentrations or ratios of parameters.

Waste Products from Water Treatment

2.29.4.7 Representative Comment(s)

The EIS predicts there will be large volumes of brine (~7 t/d) that need to be managed or disposed at an appropriate location. Not all waste depots will be suitable for these large volumes of brine. There needs to be a commitment by the proponent to develop a brine management/disposal option that provides certainty on a final approach to ensure appropriate management and disposal of this waste stream. This requirement is consistent with the EPA position at other reverse osmosis treatment systems.

The proponent needs to investigate the availability of waste or reprocessing facilities that could or will be used for this proposal and should detail a preferred management/disposal route.

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Response

GRL commissioned an evaluation of the likely brine and hence salt composition that would be generated by the treatment plant, principally to establish its status under the EPA's Waste Classification Guideline²⁰. The evaluation was undertaken through cross-referencing to the extensive analysis undertaken by AGL for its Waukivory Pilot Project.

The salt would be predominantly sodium chloride with smaller proportions of naturally occurring cations and anions. The analyses of water from both the Waukivory Pilot Project and the Rocky Hill Mine Area also included a range of analytes which would establish whether the salt would be classified as a general solid waste or a restricted solid waste. The results of the evaluation established that the salt generated from saline groundwater pumped from the Rocky Hill Mine Area would satisfy all criteria for the contaminants nominated in the guideline, i.e. the crystalline salt from the Rocky Hill Mine Area would be classified as a general solid waste. Hence, GRL intends to dispose the solid salt at a licenced landfill. Enquiries with the waste industry established that such landfills are available within the Hunter region, e.g. at Kurri Kurri.

¹⁹ ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, October 2000

²⁰ EPA (2014), *Waste Classification Guidelines Part 1: Classifying Waste*

GRL's Strategy for the Release, Discharge and Use of Treated Water

2.29.4.10 Representative Comment(s)

The EPA supports this approach [the discharging of treated water as a last resort during periods of high flow] however the EPA notes the project is projected to result in slightly reduced streamflows particularly in drought times and so the consent should reflect that discharges in times of drought may be beneficial in maintaining river baseflows. Given there have been no firm commitments in the EIS to reuse as much water as possible, the EPA has proposed a condition of consent requiring this objective, as well as the possibility of increasing discharges in times of drought to supplement River baseflows.

Environment Protection Authority – Page 10

Response

GRL accepts EPA's suggested condition to release treated water to the Avon River during low flow periods. GRL has committed to release at least 1ML/day of treated water when the flow rate at the Avon River gauge is less than 5ML/d. Such a practice would assist to maintain environmental flows for a number of the years the mine is operating. The request not to discharge any treated water at any time is contrary to the EPA's preference. Importantly, the quality of the treated water released would be monitored to ensure it satisfies requirements for the environment protection licence and its interaction with the river water is not detrimental.

Treated water would also be released whenever the storage capacity of the farm dams is exceeded which is most likely to occur during periods when the irrigation land is saturated and any further irrigation would result in surface water runoff from those areas being irrigated.

It is GRL's objective to use water recovered in either the sediment dams or saline water zone on site for dust suppression purposes. Treated water would not be used for dust suppression. Irrigation of vegetation to promote growth would be drawn from either sediment dams on site or from the farm dams storing the treated water from the treatment plant.

2.29.4.11 Representative Comment(s)

In times of wet weather the proponent proposes to discharge treated water to an unnamed ephemeral watercourse that discharges to the Avon River south of Jacks Road. The EIS presents no assessment as to the capacity of the unnamed ephemeral watercourse to accept the volume of water likely without adverse effects. The EPA requests an assessment be undertaken in this regard. The EPA has also proposed a condition of consent (see Attachment 2) that requires a baseline and then an annual assessment of the watercourse to ascertain any erosion issues that might need to be addressed.

Environment Protection Authority – Page 10

Response

Figures 2.29.7 and 2.29.9 respectively display the alignment and longitudinal profile of the proposed un-named ephemeral watercourse between the Mine Area and the Avon River that would convey the treated water to the Avon River either directly from the treatment plant or from the overflows from the farm dams constructed to store the treated water from the treatment plant until it is used for irrigation.

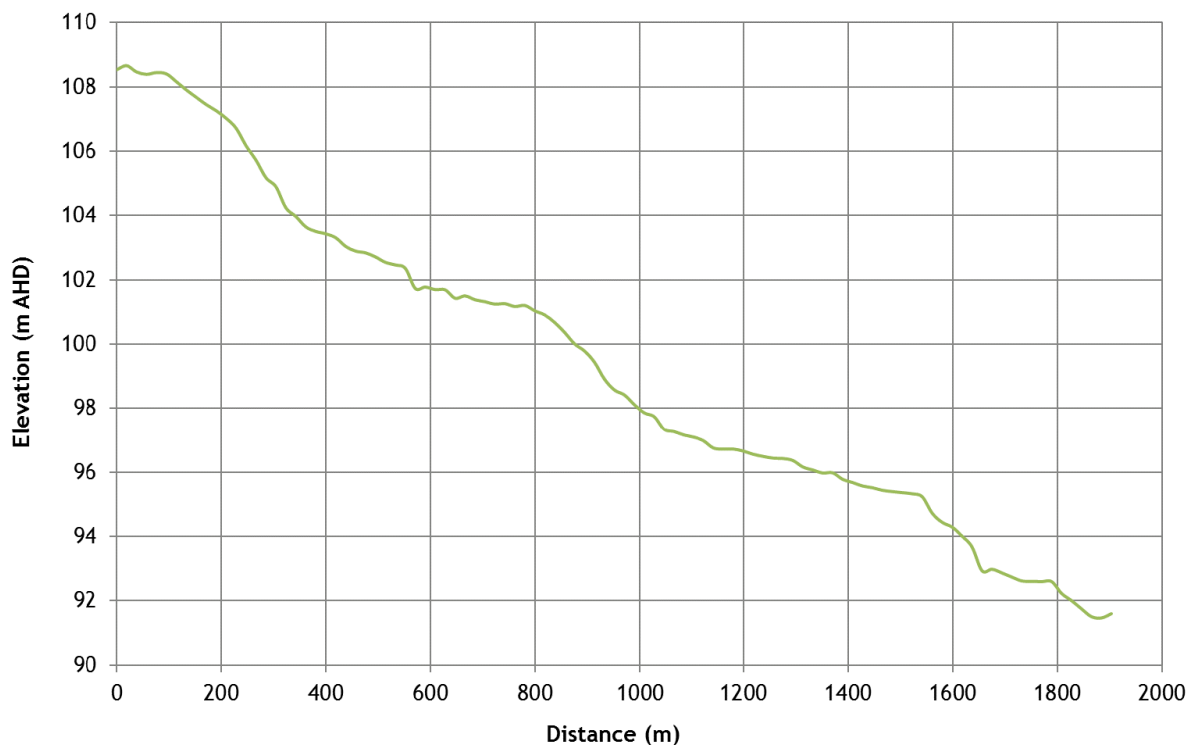


Figure 2.29.9 Watercourse Longitude Profile

In the reaches of the ephemeral watercourse immediately downstream of the Mine Area, there is no well-defined channel and the side slopes are very gradual.

The profile steepens from a bed slope of approximately 1:100 (V:H) to approximately 1:50 (V:H) at two downstream locations (commencing at about 200m and 800m downstream of the Mine Area). At these locations, the channel becomes well defined, with a base width of approximately 5m, a depth of 1m to 3m, and side slopes of approximately 1:3 (V:H). Flow velocities would be relatively high in these areas, and careful monitoring would be undertaken to manage the risk of localised erosion damage. The bed profile then flattens in the downstream reaches as the watercourse crosses the floodplain, and the channel becomes indiscernible. Photographs of lower reaches of the un-named ephemeral watercourse are shown in **Plate 2.29.1** and **Plate 2.29.2**.

It is noted that the proposed nominal treatment plant capacity of 2.5ML/day equates to a release rate of less than 30L/s. The point of discharge of treated water directly into the downstream watercourse or the overflow from the lower-most farm dam holding treated water would be designed to ensure that discharges occur at non-erosive velocities and that localised scour does not occur at the discharge or overflow point and its entry to the watercourse. Suitable rock protection works would be provided to prevent erosion and distribute the flow across the full width of the ephemeral watercourse below the discharge or overflow point.



Plate 2.29.1 Unnamed Avon River tributary watercourse looking south (upstream) from a location northeast of the landing ground



Plate 2.29.2 Indistinct unnamed Avon River tributary watercourse looking north (downstream) across the Avon River floodplain

When spread across a width of 5m, the depth of this flow would be less than 25mm, and would therefore have limited potential for causing geomorphological change in the natural watercourse compared to naturally occurring flows.

Overflows from the farm dams (other than deliberate discharges during low flow periods) would only occur when the storage capacity of the farm dams is exceeded and outflows (for irrigation) are greater than inflows from the treatment plant, i.e. during/following extended wet periods or periods when irrigation is unable to use 2.5ML/d.

Releases would be made to the non-perennial watercourse north of the Mine Area during periods of low natural flow in the Avon River, i.e. when flow levels at the Avon River stream gauge are less than 5ML/day (see Section 2.29.2.2 of this document). It is likely that a proportion of the discharged flow would seep into the alluvium, reducing surface flow and increasing soil moisture levels, which would promote vegetation growth and therefore reduce the potential for erosion further.

It is also noted that GRL also intends to irrigate areas under rehabilitation within the Mine Area when water would benefit areas being revegetated, i.e. when field moisture levels are sufficiently low.

2.29.6 Management of Saline Water

2.29.6.2 Representative Comment(s)

The proponent notes saline minewater would be managed in a closed water management system within an area referred to as the “Saline Water Zone”, an area comprising all open cut pits and three Environmental Dams. It will be necessary to prevent seepage from the Saline Water Zone storages into the surrounding aquifers or watercourses. The EIS proposes that “detailed investigations into seepage potential from the Environmental Dams will be required to identify if prevention measures such as clay lining of the embankment and storages are necessary.”

These investigations need to be provided as part of the EIS and/or a commitment provided regarding minimum permeability requirements for the Saline Water Zone storages to prevent pollution of waters.

Environment Protection Authority – Page 8

Response

Although irrigation is undertaken within contained catchments, Stratford Mine manages dirty water (or sediment-laden water) in a similar manner to that proposed for the Rocky Hill Project. Page B-54 of the Stratford Extension Project Environmental Impact Statement Appendix B Surface Water Assessment (Gilbert & Associates June 2012) states that:

“Water captured in sediment dams which receive runoff from rehabilitated or partially rehabilitated areas only (i.e. not from haul roads or active waste rock emplacements) is usually allowed to discharge from the sediment dam after gravity settling (i.e. passive management).”

The proposed Rocky Hill operation would be a “no discharge” mine in the same sense that the Stratford Mine is. However, the amended Project does not include plans to irrigate excess water from the saline water zone to catchment areas outside of the saline water zone without first treating it to a standard suitable for release to the broader environment.

The sediment dams proposed for the amended Project would be significantly larger as they are to be designed to the Blue Book (Managing Urban Stormwater: Soils and Construction Volume 2E: Mines and Quarries) requirements for Type D soils – i.e. to capture runoff from a 95th percentile 5 day rainfall event with a rainfall depth of 90.6mm (rainfall depth listed for Taree in the Blue Book Volume 1 Table 6.3a) and a runoff coefficient of 0.79 (Refer to Blue Book Volume 1 Table F2). It is also noted the use of Taree rainfall data (from Table 6.3a) introduces a degree of conservatism as annual rainfall of Taree is higher than at Gloucester.

2.29.6.4 Representative Comment(s)

... if saline waters are irrigated to, for example, a road that drains to the “dirty water” or “clean water” area, saline discharges could potentially occur (although it is recognised that given the dilution likely during rainfall events, this issue may be minimal).

The above issues need to be adequately explored in the EIS process and appropriate controls imposed as is necessary. Given that a water treatment plant is proposed anyway, it is the EPA’s preference that all reuse water be appropriately treated to remove salts and other substances that could cause biological disruption in receiving environments.

Environment Protection Authority – Page 11

Response

As noted in the SWA (Section 3.1.3), the clean water management system comprises undisturbed areas and established rehabilitation areas. Saline water (i.e. water from the saline water zone that is not processed through the water treatment plant) would be irrigated onto selected areas across the Mine Area after it is demonstrated that the salinity of any water discharging to the environment is within the range naturally occurring within the Mine Area in the absence of mining activities (i.e. 212-1370µS/cm). Water quality in the sediment dams would be monitored to ensure the captured water quality would be suitable for release. In the event that water within any sediment dam is determined to be of a quality which is not suitable for release, i.e. does not satisfy the environment protection licence discharge criteria, it would be diverted to the saline water zone for treatment (as noted in SWA Section 4.7.4) or diluted.

The EPA’s preference that all re-use water should be treated to remove salt and other substances is not practical, warranted or economically feasible. The ‘best practice’ approach to water reuse is to only treat water where necessary to ensure that it is fit-for-purpose. To do otherwise unnecessarily increases the use of resources (e.g. electrical energy) and emissions in the treatment process.

The treatment and subsequent re-use of excess saline water has been adopted in response to the constrained nature of the Site and to ensure that biological disruptions in receiving environments does not occur.

2.29.6.7 Representative Comment(s)

The proponent notes that some untreated water reuse may occur throughout the premises. ... the EIS Appendix "Overburden and Reject Characterisation" by RGS Environmental states that some of the overburden materials may be sodic and be susceptible to structural stability problems related to dispersion and erosion. These issues could be exacerbated if saline waters are irrigated.

Environment Protection Authority – Page 11

Response

The O&RC Report acknowledges that some overburden may be sodic. However, further consideration of the data presented on Page 6-35 (Table 8) indicates that five of the 14 overburden samples subjected to sodicity tests represent the majority of the volume of bulk overburden materials likely to be generated at the amended Project (i.e. sandstone and siltstone). Three of the five samples have sodicity values only marginally above a value that would be considered non sodic, two samples are moderately sodic and no samples are strongly sodic. Therefore only a proportion of the overburden material would be sodic. In some Hunter Valley coal mines (e.g. Bengalla) significantly higher sodicity values are typically found for overburden materials and these are successfully managed by covering with topsoil material and being revegetated. The assertion that any saline water irrigated across overburden would exacerbate the potential sodicity issue is incorrect, as explained in the following paragraph. In light of these facts and experience of the management of potentially sodic overburden materials in the Hunter Valley, GRL intends to adopt a range of practical site rehabilitation practices firstly to identify potentially sodic overburden and thereafter manage these materials principally through to placement of non-sodic overburden above those materials within the final landform to limit the risk of dispersion and erosion of surface materials.

Sodicity in soil is the presence of a high proportion of sodium ions relative to other cations. Salinity is often confused with sodicity because both are associated with sodium, a naturally occurring element in NSW soils. Saline soils can often be sodic, but these soils would not show indicators of sodicity. The salts in the soil actually prevent dispersion of soil particles. If the salinity level in a soil falls below the requirement for soil stability even a small amount of sodium can produce adverse effects. A combination of high sodium levels and low salt would produce poor physical conditions in soils^{21,22}. Hence, the EPA's preference that "all reuse water be appropriately treated to remove salts" could be counterproductive with respect to soil sodicity and the potential for erosion and dispersion.

From an irrigation perspective, GRL would develop an understanding of the minerals balance in permeate in the context of a program of rehabilitation field trials rather than prematurely stipulating maximum values for pH, bicarbonate alkalinity, dissolved major ions, boron and Sodium Adsorption Ratio. GRL would progressively obtain a detailed operational knowledge of the quality of any treated water quality and/or its effect on overburden material sodicity values on site.

²¹ <http://www.dpi.nsw.gov.au/content/agriculture/resources/soils/sodic>

²² Northcote, K.H. and Skene, J.K.M. (1972), *Australian Soils with Saline and Sodic properties*, CSIRO Australia, Soil Publication No. 27, Canberra

2.29.8 Discharge Criteria

2.29.8.1 Representative Comment(s)

The EIS states that Environment Protection Licence limits (Table 4.55 in the EIS “Potential water quality discharge limits”) have been proposed based on the 80th percentile of the receiving water quality monitoring data when the guideline value exceeds the 80th percentile value (see also Table 4.15 in the specialist consultant report). The 80th percentile value of receiving waters can only be used when the data is from an agreed reference site that meets the definition of a reference site for the purposes of developing site specific trigger values as set out in the ANZECC (2000) guidelines. ANZECC (2000) states that: “the reference condition should represent a substantial achievement in environmental protection that is agreeable to the majority of stakeholders” and “It is not acceptable to allow poor environmental performance or water pollution, simply because a waterway is degraded”. In accordance with the ANZECC (2000) guidelines, the level of protection that should apply in this case is for a “slightly to moderately disturbed system”. In the absence of appropriate reference conditions the ANZECC (2000) default trigger values should be used as a basis for developing discharge criteria.

There is a range of other relevant potential pollutants from coal seams that are not listed in the proposed licence limits shown in Table 4.55 that should be taken into account in the environmental assessment for the proposed discharges of treated minewater. For toxicants such as metals, the trigger values can be adjusted using the decision tree for toxicants in the ANZECC (2000) guidelines. The EIS should also consider and discuss whether BTEX chemicals need to be included as limits, and if so, propose appropriate limits. Similarly discussion should occur for dissolved oxygen. Where ANZECC (2000) Volume 1 does not provide an aquatic ecosystem trigger value for a particular analyte reference should be made to Volume 2 to determine if an interim trigger value is available as a basis for decision making, or international literature can be reviewed. The use of 99% species protection levels applies as a default value for some analytes for “slightly to moderately disturbed ecosystems” to account for potential bioaccumulation effects or other issues, e.g. the selenium trigger value proposed by the consultants in Table 4.55 is incorrect and should be 5µg/L. The licence limits can be adjusted to take into account available initial dilution if discharges occur during times of adequate flows and available dilution can be demonstrated.

The proponent needs to propose Environment Protection Licence limits using approaches consistent with the ANZECC (2000) guidelines.

Environment Protection Authority – Page 10-11

Response

No data was available for reference sites which are not impacted by the existing land use in the catchment. Nonetheless, concentrations of toxicants in the Avon River, Oaky Creek and Waukivory Creek are generally below the default 95th %ile ecosystem protection trigger values. However, in samples collected from watercourses crossing the Site, some concentrations are elevated above these triggers. The higher trigger values adopted for electrical conductivity, chromium, copper, lead and zinc reflect these locally elevated water quality observations.

In the catchments from where these samples were obtained, the upper reaches are largely undisturbed, there are generally no point sources of pollution, and local land use practices appear to be consistent with currently accepted practice in the Gloucester Valley. The slightly elevated concentrations of some toxicants above trigger levels is likely due to the local soil

geochemistry rather than due to past environmental performance. It needs to be recognised that the groundwater within the alluvium has substantial natural variations in water quality, i.e. with electrical conductivity levels from 330µS/cm to 6 450µS/cm.

EIS Table 4.55 (reproduced and amended as **Table 4.30.10**) displays the range of analytes that would be considered in the monitoring program for surface water potentially released from the Site. WRM suggested the range of analytes displayed in **Table 4.30.10**, based on experience with similar projects and which may be expected to be encountered in sufficient quantity in the mine water management system to be of concern in the receiving environment. Discussions with the EPA have clarified that it is the EPA's intention to impose water quality limits on an environment protection licence for pH, electrical conductivity, total suspended solids and oil and grease, i.e. in a similar manner to environment protection licence 11745 for the Stratford Mining Complex. With respect to the remaining analytes listed in **Table 4.30.10**, the EPA, in its recommended conditions (*Condition 65* – see Section 3.2.1 of this document) nominate a suite of analytes as part of the water treatment plant commission stage monitoring plan.

WRM considers it is very unlikely that any other potential contaminant would be elevated above trigger levels if the targeted electrical conductivity, pH and turbidity are achieved.

Controlled releases of treated water into the watercourse north of the Mine Area would be made either directly from the water treatment plant or farm dams north of the Mine Area. GRL would ensure the proposed cascading of treated water, as part of the final stage of treatment, achieves the required dissolved oxygen concentrations prior to its release. The water directed to the farm dams north of the Mine Area would be further oxygenated within the relatively shallow farm dams before it is used for irrigation or, if necessary, is released to the adjoining watercourse to flow to the Avon River. The flow of water in the watercourse, whether directly from the water treatment plant or from the farm dams, would be further oxygenated through flowing overland for almost 1km before reaching the Avon River. It is therefore very unlikely that the proposed releases would reduce dissolved oxygen levels in the receiving waters.

2.29.10 Management of Sediment-laden Water

2.29.10.1 Representative Comment(s)

Dirty (sediment laden) water needs to be better characterised and adequate monitoring Proposed

The water balance modelling, sizing of basins, overburden geochemical characterisation investigations and proposed mitigation methods appear adequate for the dirty water zone.

Monitoring of sediment basins for a full range of potential pollutants should be conducted periodically to confirm the predictions in the EIS, e.g. selenium, aluminium and arsenic. This would be in addition to expected licence limits for pH, electrical conductivity (EC) and total suspended solids (TSS).

Reference to the "Blue Book" in the EIS might imply Volume 1 of Managing urban storm water: soils and construction, which is not the appropriate reference. Based on the year of publication cited in the EIS, the EPA expects that the consultant is referring to Managing urban stormwater: soils and construction Volume 2E: Mines and quarries which contains management methods for sediment laden water on mine sites. This should be confirmed.

The proponent needs to better characterise the “dirty water”, propose monitoring of sediment basins for a full range of potential pollutants to confirm the predictions in the EIS and confirm pollution controls will be based on the relevant guideline.

Environment Protection Authority – Page 9

Response

As part of the EIS, RGS completed water extract tests and kinetic leach column tests on representative samples of overburden materials that would be generated within the Mine Area. The results were reported in the O&RC report and compared with applied Australian Water Quality Guidelines²³.

The O&RC report highlighted that direct comparison of geochemical data with water quality guideline values can be misleading. For the purpose of the RGS study, applied guideline values were only provided for broad context and were not intended to be interpreted as arbitrary ‘maximum permissible values’ or ‘trigger’ values for site water storage or discharge. While arbitrary comparisons against guideline concentrations can be useful in some situations and help to provide relevant context, such comparisons cannot be directly extrapolated to the field situation within the Mine Area. For example, water extracts, using sample pulps (ground to passing 75µm) provides a very high surface area to solution ratio, which encourages mineral reaction and dissolution of the solid phase. As such, the results of screening tests on water extract solutions are assumed to represent an assumed ‘worst case’ scenario for initial surface runoff and seepage from overburden materials.

Similarly kinetic leach column (KLC) tests were performed on crushed drill core material (<10mm) representing overburden and the sample preparation method used in this test can produce a ‘first flush’ concentrating event, which would not occur to the same extent in the field. The concentration of sample to water in the KLC tests was generally 2.5:1 (w/v) (i.e. concentrated), whereas the ratio of sample to water generally used in tests where results can (arbitrarily) be compared against guideline concentrations to provide relevant context is over an order of magnitude more dilute at 1:5 (w/v).

The water extract and KLC results on the overburden samples contained in the O&RC report present very much a “worst case” scenario and demonstrate that the concentration of trace metals/metalloids in surface water and seepage at the RHCP is likely to be very low and within the applied livestock drinking water quality guideline criteria, where these exist. Comparison against ‘trigger’ values for freshwater aquatic ecosystems (95% species protection level) (ANZECC & ARMICANZ, 2000) indicates that the only dissolved element that may have some potential to be present in surface water and seepage from some overburden materials at slightly elevated concentrations at the RHCP is aluminium. Based on the available water quality data arsenic and selenium are not expected to be present at elevated concentrations in surface water and seepage from bulk overburden materials at emplacement areas.

The O&RC report recommends surface water and seepage from overburden collecting within sediment dams be monitored to ensure that key water quality parameters remain within appropriate limits. The recommendation describes pH, electrical conductivity (EC) and total suspended solids (TSS) being monitored on a regular basis together with the full suite of water

²³ ANZECC & ARMICANZ (2000), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Environment Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra, ACT (2000)

quality analytes described in the O&RC report (Table 11) be monitored on an annual basis. This approach is consistent with that proposed by the EPA in its recommended *Condition 65* in Section 3.2.7 of this document. This method reflects the fact that most metals/metalloids in overburden are sparingly soluble under expected site conditions and would adequately address and monitor the relatively small risk of any dissolved metals being present at elevated concentrations in sediment dams. Site specific ‘maximum permissible values’ or ‘trigger’ values for discharges from sediment dams would be developed based on existing knowledge, expected values and background/receiving water quality concentrations.

Finally, GRL confirms that the document *Managing urban stormwater: soils and construction Volume 2E: Mines and quarries* was used as the basis for erosion and sediment controls in the SWA.

3. RESPONSE TO PROPOSED CONDITIONS OF CONSENT

3.2 ENVIRONMENT PROTECTION AUTHORITY

It is noted that reference to “the site” and “the premises” are used interchangeably throughout the recommended conditions. In any event, it is assumed that “the site” or “the premises” coincides with the Site boundary displayed in the EIS for the amended Project.

3.2.1 Administrative Conditions

Works to be undertaken in accordance with information supplied

1. *Except as provided by these recommended conditions of approval, the works and activities shall be undertaken in accordance with the proposal contained in:*
 - (a) *The document “Amended Rocky Hill Coal Project Environmental Impact Statement Development Application No SSD-5156 (August 2016),” prepared by RW Corkery and Co Pty Ltd and dated August 2016*

unless otherwise specified in these conditions of approval.

Response

This proposed condition is not consistent with the standard conditions used in development consents for mining projects. GRL would accept the inclusion of the standard condition 2 of Schedule 2 commonly included in development consents for mining projects as follows:

2. The Applicant must carry out the development:
 - a) generally in accordance with the EIS and the Development Layout Plans; and
 - b) in accordance with the conditions of this consent.

We note that the EIS would be defined to also include the Response to Submissions and any other additional documents submitted by GRL to DPE during the assessment process.

3.2.2 Operating Conditions

2. *Activities at the premises must only occur during the times detailed in the table below:*

Activity	Days *	Permitted Hours of Operation
Construction and site establishment	Monday to Saturday	In accordance with condition 22 and 23 of this consent
Mining (Year 1 to 3)	Monday to Saturday	7:00 am - 6:00 pm
Mining (year 4 to end of mine life)	Monday to Saturday	7:00 am - 10:00 pm
Breaker station operations	Monday to Saturday	7:00 am - 6:00 pm
Coal haulage via private haul road	Monday to Saturday	7:00 am - 6:00 pm
Maintenance	Monday to Saturday	7:00 am - 10:00 pm

	Sunday	8:00 am - 10:00 pm
	Monday to Sunday	All other hours - in accordance with condition 25 ?? of this consent

Response

GRL would accept this recommended condition with the correction of the typographical error (as shown above) and the modification to the cross reference to the condition relating to maintenance (see Consent upon Condition 25).

3. *Activities must be carried out in a competent manner. This includes:*

- a) *The processing, handling, movement and storage of materials and substances used to carry out the activity; and*
- b) *The treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.*

Response

This recommended condition is usually included in an EPL rather than a development consent. GRL would accept this recommended condition being included in its EPL.

4. *Maintenance of plant and equipment*

All plant and equipment installed at the premises or used in connection with the activity:

- a) *Must be maintained in a proper and efficient condition; and*
- b) *Must be operated in a proper and efficient manner.*

Response

This recommended condition is usually included in an EPL rather than a development consent. GRL would accept this recommended condition being included in its EPL.

5. *All above ground tanks containing material that is likely to cause environmental harm must be bunded or have an alternative spill containment system in place.*

Response

GRL would accept this recommended condition.

6. *Bunds must:*

- a) *have walls and floors constructed of impervious materials;*
- b) *be of sufficient capacity to contain 110% of the volume of the tank (or 110% volume of the largest tank where a group of tanks are installed);*
- c) *have floors graded to a collection sump; and*
- d) *not have a drain valve incorporated in the bund structure,*

or be constructed and operated in a manner that achieves the same environmental outcome.

Response

This recommended condition is usually included in an EPL rather than a development consent. GRL would accept this recommended condition being included in its EPL.

3.2.3 Air

3.2.3.1 Air Quality Management Plan

7. *For all emission sources at the site the proponent must prepare an air quality management plan that includes, but is not limited to:*

- *Key performance indicator(s);*
- *Monitoring method(s);*
- *Location, frequency and duration of monitoring;*
- *Record keeping;*
- *Response mechanisms; and*
- *Compliance reporting.*

Response

GRL would accept this recommended condition being incorporated into a condition of development consent relating to the requirement to prepare an Air Quality Management Plan in consultation with the EPA.

8. *The air quality management plan must also include:*

- *Details of the predictive meteorological system;*
- *Details of the real-time dust monitoring system; and*
- *Specific actions that will be taken in response to meteorological or particulate matter triggers being reached, these actions must include ~~stopping~~ curtailing certain activities in identified weather conditions or when certain trigger levels are reached.*

Response

GRL would accept this recommended condition being incorporated into a condition of development consent relating to the requirement to prepare an Air Quality Management Plan in consultation with the EPA.

It will be appropriate for GRL to “appropriately manage” their equipment fleet as outlined in *Condition 17* which invariably involve “curtailing” rather than “stopping” certain activities.

-
9. *The air quality management plan must be implemented prior to the commencement of any dust generating activities associated with the project.*

Response

GRL would accept this recommended condition being incorporated into a condition of development consent relating to the requirement to prepare an Air Quality Management Plan in consultation with the EPA.

3.2.3.2 General Dust Conditions

10. *All areas in or on the premises must be maintained in a condition that prevents or minimises the emission of dust to the air.*

Response

GRL would accept this recommended condition being included in its EPL.

-
11. *Any activity carried out in or on the premises must be carried out by such practical means as to prevent dust or minimise the emission of dust to the air.*

Response

GRL would accept this recommended condition being included in its EPL.

-
12. *Any plant operated in or on the premises must be operated by such practical means to prevent or minimise dust or other air pollutants.*

Response

GRL would accept this recommended condition being included in its EPL.

-
13. *All trafficable areas, coal storage areas and vehicle manoeuvring areas in or on the premises must be maintained, at all times, in a condition that will minimise the emission of dust to the air, or emission from the premises of wind-blown or traffic generated dust.*

Response

GRL would accept this recommended condition being included in its EPL.

3.2.3.3 Air Quality Monitoring and Management

14. *Real Time Dust Monitors*

- a) *The proponent must, prior to the commencement of dust generating ~~activities~~ activities at the site, install continuous real time air quality monitoring for PM₁₀ and PM_{2.5} at two locations representative of residences within the Forbesdale Estate and the Avon River Estate*

Response

GRL would accept this recommended condition being included in its EPL.

15. Requirement to monitor ambient particulate matter

- a) The licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1. The licensee must use the sampling method, units of measure, averaging period and sample at the frequency, specified opposite in the other columns.

Point 1 to Point x

Parameter	Units of measure	Frequency	Averaging Period	Method
PM ₁₀	Micrograms per cubic metre	Continuous	1-hour	AS 3580.9.8 - 2008

Note: The ~~number and~~ location of **the two** PM₁₀ monitors must be approved by the EPA prior to the installation of the monitoring equipment.

Note: The method must be approved by the EPA prior to the installation of the monitoring equipment.

Note: The calibration, quality assurance, quality control and audit program must be approved by the EPA prior to the installation of the monitoring equipment.

- b) Monitoring of all parameters listed in Condition 15(a) Column 1 must commence prior to earth moving activities being undertaken at the site.

Response

GRL would accept this recommended condition as a condition of its EPL subject to the requested modification which achieves consistency with the text in Condition 14(a).

16. Contingency monitoring

- a) Prior to the commencement of dust generating ~~activities~~ **activities** at the site, the licensee must submit a report to Manager EPA Hunter Region that details:
- (i) contingency actions, including monitoring, that will be implemented when the weather station is not operating in a proper manner; and
 - (ii) contingency actions, including monitoring, that will be implemented when any of Points 1 - x (continuous PM₁₀ monitoring) are not operating in a proper manner.

Note: For the purpose of the above condition 'proper manner' means:

- (i) operation in accordance with manufacturers specifications and recommendations;
- (ii) operation in accordance with relevant Australian Standards:
 - i. AS 3580.14-2011 for Condition 1(a);
 - ii. AS 3580.9.8 -2008 for Condition 2(a); and
- (iii) operation in a manner that provides data required to satisfy condition(s) of the environment protection licence.

- b) Prior to the commencement of dust generating ~~activities~~ activities at the site, EPA must approve the proposed contingency methodology presented in the report required under condition 16(a).
- c) To remove any doubt, the licensee must not undertake dust generating activities at the site at any time when there is no way assess to real time site specific or representative ambient PM₁₀ and meteorological monitoring data which satisfies the requirements of Conditions 15 or 69.

Response

GRL would accept this recommended condition being included in its EPL.

17. Predictive Meteorological System

Prior to the commencement of dust or noise generating ~~activities~~ activities at the site, the licensee must install and operate a predictive meteorological system that will predict adverse weather conditions so that operations on the premises can be appropriately managed ~~shut down or altered~~ to adequately control air quality and noise impacts.

Response

GRL would accept this recommended condition, subject to the above changes.

18. Dynamic dust management

- a) Prior to the commencement of dust generating ~~activities~~ activities at the site, the licensee must submit a report to Manager EPA Hunter Region that details:
 - (i) Action trigger levels based on measured real time PM₁₀ concentrations at representative receptor locations and other inputs such as predicted and prevailing meteorology;
 - (ii) Specify actions to be taken in response to the identified trigger levels which may include, but not be limited to, stopping certain activities, additional control measures or limitations on particular site activities during adverse meteorological conditions
- b) A minimum of 1 review of the effectiveness of the ~~dust~~ air quality management plan must be conducted each twelve months.
- c) The plan and the management of all relevant activities on the site must be updated in accordance with the findings of any review of the plan.
- d) The plan must be posted on the proponent's website and be made available to the EPA upon request.

Response

GRL would accept this recommended condition being included in its EPL subject to the adjustment of the name of the air quality management plan, i.e. consistent with Condition 8.

19. Coal Mine Particulate Matter Best Practice Implementation

Wheel generated dust

- a) *The Licensee must achieve and maintain a dust control efficiency of 84% or more on all haul roads*

Control efficiency is calculated as:

$$CE = \frac{E \text{ (uncontrolled)} - E \text{ (controlled)}}{E \text{ (uncontrolled)}} \times 100$$

Where E = the emission rate of the activity

- b) *The Proponent must prepare a Monitoring Program to assess its compliance with Condition 19(a) under varying meteorological conditions. The Monitoring Program must detail the following:*
- the parameters to be monitored;*
 - the methods to be used to monitor each parameter;*
 - the locations where each parameter will be monitored;*
 - the frequency at which each parameter will be monitored;*
 - the Key Performance Indicators that will be used to determine compliance with Condition 5(a); and*
 - a detailed justification for each Key Performance Indicator selected.*

As a guide, the EPA anticipates that the following parameters will be monitored:

- moisture and silt contents of haul roads;*
- frequency, duration, rate and quantity of water applied to haul roads;*
- frequency, duration, rate and quantity of suppressant applied to haul roads in comparison to manufacturer's specifications;*
- vehicle kilometres travelled;*
- haul truck weight;*
- haul truck speed; and*
- dust levels on haul roads.*

The Monitoring Program must be submitted by the Licensee to the Environment Protection Authority Regional Manager Hunter, at PO Box 488G, NEWCASTLE prior to any dust generating activity occurring on the site.

Note: The EPA intends to require the licensee to implement the Monitoring Program once it is approved by the EPA.

- c) *The proponent must submit a written report to the EPA providing the results of the Monitoring Program. The report must include an assessment of the dust control effectiveness, dust levels and the proponent's compliance with Condition 19(a). The report must be submitted by the Licensee to the Environment Protection Authority Regional Manager Hunter, at PO Box 488G, NEWCASTLE.*

Response

GRL would implement dust control measures generally in accordance with the EIS and the air quality management plan.

3.2.4 Odours

20. Potentially Offensive Odour

The proponent must not cause or permit the emission of offensive odour beyond the boundary of the premises.

Response

GRL would accept this recommended condition being included in its EPL.

3.2.5 Noise

21. The proponent must prepare and implement a detailed Construction Noise Management Plan (CNMP), prior to commencement of construction activities, that includes but is not necessarily limited to:

- f) identification of each work area, site compound and access route (both private and public)*
- g) identification of the specific activities that will be carried out and associated noise sources at each site and access route*
- h) identification of all potentially affected sensitive receivers*
- i) the construction noise objectives identified in accordance with the Interim Construction Noise Guideline (ICNG, DECC 2009)*
- j) assessment of potential noise and vibration from the proposed construction methods, including noise from construction traffic, against the objectives identified in (d)*
- k) detailed description of the feasible and reasonable noise mitigation measures that will be implemented to reduce noise from the project in an effort to meet the objectives identified in (d), including at least all feasible and reasonable measures from section 6 of the ICNG*
- l) procedures for notifying residents of construction activities that are likely to affect their noise and vibration amenity*
- m) measures to monitor noise performance and respond to complaints.*

Response

GRL would accept this recommended condition being incorporated into a condition of development consent relating to the requirement to prepare a Construction Noise Management Plan in consultation with the EPA. A requirement to prepare a Construction Noise Management Plan would be expected within the development consent.

22. Construction work associated with the project must be undertaken:

- a) between 7:00 am and 6:00 pm, Mondays to Fridays;
- b) between 8:00 am and 1:00 pm on Saturdays; and
- c) at no time on Sundays or public holidays.

Note 1: for the purpose of this approval, “construction work” includes only: ~~upgrading works for Jacks Road and Waukivory Road, construction of the mine access road and private haul road; construction of offices and amenities; construction of light vehicle carparks; construction of water management structures required prior to the commencement of construction; construction of workshop (including fuel bay, wash-down, store); construction of the ROM pad and breaker station earthworks; and installation of power generation equipment, reticulated power and communications infrastructure~~ that identified within the EIS and its ancillary activities undertaken during the site establishment and construction stage. All other activities are deemed operational noise.

Note 2: The EIS for the Project predicted a 10 month site establishment and construction phase.

Response

GRL would accept this recommended condition subject to the removal of the nominated works. The inclusion of the nominated works will not necessarily cover all construction activities. Hence, it is preferable to refer to “construction work identified within the EIS and its ancillary activities undertaken during the site establishment and construction stage”.

23. Construction work associated with the project may be undertaken outside the hours specified in the standard hours if it is:

- a) construction that causes $L_{Aeq(15min)}$ noise levels that are:
 - i. no more than 5dB above Rating Background Level at any privately-owned residence in accordance with the Interim Construction Noise Guideline (DECC, 2009); and
 - ii. no more than the Noise Management Levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other noise sensitive land uses; and has been approved in writing by the Secretary, or
- b) for the delivery of materials required by the police or other authorities for safety reasons; or
- c) required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm; or
- d) approved through the process outlined below.

Response

It is requested that part (a) is amended to incorporate the additional tracked text.

24. The hours of construction specified may be varied with the prior written approval of the Secretary. Any request to alter the hours of construction shall:
- be considered on a case-by-case or activity-specific basis;
 - be accompanied by details of the nature and justification for activities to be conducted during the varied construction hours;
 - be accompanied by written evidence to the Secretary that appropriate consultation with potentially affected noise sensitive receivers and notification of relevant Council(s) and other relevant agencies has been and will be undertaken;
 - demonstrate that all reasonable and feasible noise mitigation measures have been put in place; and,
 - be accompanied by a noise impact assessment consistent with the requirements of the Interim Construction Noise Guideline (DECCW, 2009).

Response

GRL would accept this recommended condition.

25. Noise generated at the premises must not exceed the noise limits in the table below. The locations referred to in the table below are indicated by Appendix C1 – Land ownership Plan of the Noise, Vibration and Blasting Assessment (SLR Consulting Australia Pty Ltd 2016).

Receiver	Location: MGA94 Zone 56 Easting and Northing	Noise Limits dB(A)			
		Day	Evening	Night	
		L _{Aeq} (15 minute)	L _{Aeq} (15 minute)	L _{Aeq} (15 minute)	L _{Amax} (15 minute)
6 Campbell	405555,6453564	40	40	35	45
7 Ansell & Murray	403954,6455192	36	36	35	45
19A Boorer	402107,6452036	36	35	35	45
Any other residence	Any residence not identified above, and not subject to a negotiated agreement	35	35	35	45

~~Note: In the EIS for the Project the proponent committed that any maintenance activities carried out during ‘all other hours’ (10pm-8am) will only occur on the condition that the activities are not audible at privately owned residences.~~

Response

GRL would prefer that this condition removes the reference to “night” noise levels as its inclusion could suggest to the community that GRL is permitted to undertake night-time mining activities. The Noise, Vibration and Blasting Assessment (Section 3.2.3 (and Table 16) and then Table 19) for the amended Project established that the default background noise level of 35dB(A) was not recorded at a number of residences adjacent to The Bucketts Way or within the Gloucester urban area (with their higher daytime PSNLs of 40dBA and 37dBA respectively). It is requested that these additional localities are specifically identified on this table. The preferred table would be presented as follows.

Receiver	Location: MGA94 Zone 56 Easting and Northing	Noise Limits dB(A)	
		Day L _{Aeq} (15 minute)	Evening L _{Aeq} (15 minute)
6 Campbell	405555,6453564	40	40
7 Ansell & Murray	403954,6455192	36	36
19A Boorer	402107,6452036	36	35
<u>Privately-owned residences adjacent The Bucketts Way and not subject to a negotiated agreement</u>		40	35
<u>Gloucester urban privately-owned residences (excluding residences located adjacent The Bucketts Way) and not subject to a negotiated agreement</u>		37	35
Any other <u>privately-owned</u> residence	Any residence not identified above <u>owned by the licensee or another resource company, or subject to a negotiated agreement</u>	35	35

It would be GRL's preference that a further condition is added to the effect that:

“Any maintenance undertaken beyond the hours specified in *Condition 2* not exceed L_{Aeq} (15 minute) of 35dB(A) and L_{Amax} (15 minute) 45dB(A)”.

Further discussion regarding this matter is provided in Section 2.23.11.1.

26. For the purpose of condition 25:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and Public Holidays.
- Evening is defined as the period 6pm to 10pm.
- Night is defined as the period from 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and Public Holidays.

Response

GRL would accept this recommended condition.

27. The noise limits set out in condition 25 apply under all meteorological conditions except for the following:

- Wind speeds greater than 3 metres/second at 10 metres above ground level; or
- Temperature inversion conditions greater than $8^{\circ}\text{--}1.5^{\circ}/100\text{ m}$ (i.e. stability class E).

Response

For general consistency with the INP Section 9, which states “the consent or licence condition applies under typical meteorological conditions relevant to the site”. A temperature inversion of $8^{\circ}/100\text{m}$ could apply to a 24hour mining operation located in an arid area (i.e. annual rainfall less than 500mm). However, the amended Project which is located in a non-arid area with mining operations restricted to 7:00am to 10:00pm. So generally consistent with INP Sections 9 and 5.2, the temperature inversion is firstly reduced to $3^{\circ}/100\text{m}$ for a non-arid area, and then

further reduced to 1.5°/100m as mining operations are restricted to 7:00am to 10:00pm. The proposed temperature inversion of 1.5°/100m is also consistent with DING Section 5.2 (Fact Sheet D, Table D1) which defines noise-enhancing meteorological conditions as Daytime/evening: stability categories A–E with light winds (0.5–3 m/s).

28. For the purposes of condition 27:

- a) Data recorded by the meteorological station identified as EPA Identification Point <?> **TBA** must be used to determine meteorological conditions; and
- b) Temperature inversion conditions (vertical temperature gradient in degrees C) are to be determined by direct measurement over a minimum 50m height interval as referred to in Part E2 of Appendix E to the NSW Industrial Noise Policy or through the use of an alternate method approved by the EPA.

Response

GRL would accept this recommended condition with the additional suggested text.

A good understanding of temperature inversions in the vicinity of the Rocky Hill Mine Area is already available through data collected within the Stratford Mining Complex and within the Rocky Hill Mine Area. Temperature sensors placed at various elevations within the Rocky Hill Mine Area provide a suite of relevant data that could be used to record the temperature gradient. Details of GRL's approach to this matter would be included in an application for an EPL.

29. To determine compliance:

- a) with the $L_{Aeq(15 \text{ minute})}$ noise limits ~~specified above~~ in Condition 25, the noise measurement equipment must be located:
 - approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
 - within 30 metres of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
 - ~~within approximately 50 metres of the boundary of a National Park or a Nature Reserve.~~
- b) ~~with the L_{Amax} noise limits in condition 25, the noise measurement equipment must be located within 1 metre of a dwelling façade.~~
- c) with the noise limits in condition 25, the noise measurement equipment must be located:
 - at the most affected point at a location where there is no dwelling at the location; or
 - at the most affected point within an area at a location prescribed by conditions (a) or (b).

Response

GRL would locate noise monitoring equipment in accordance with the NSW Industrial Noise Policy reference to a National Park or Nature Reserve is not relevant to the amended Project. Furthermore, there are no L_{Amax} noise limits included in *Condition 25*.

30. A non-compliance of this Noise Limits condition will still occur where noise generated from the premises in excess of the appropriate limit is measured:

- at a location other than an area prescribed by [Condition 25](#); and/or
- at a point other than the most affected point at a location.

Response

GRL would accept this recommended condition. An adjustment (tracked) is suggested for clarity.

31. For the purpose of determining the noise generated at the premises: the modifying factors, except for low-frequency noise, in Section 4 of the NSW Industrial Noise Policy must be applied, where appropriate, to the noise levels measured by the noise monitoring equipment.

Response

GRL would accept this recommended condition.

32. For the purpose of determining the noise generated at the premises, a correction must be applied to any measured noise level, before comparison to limits, where the $L_{Ceq} - L_{Aeq}$ exceeds 15dB and:

- where any of the 1/3 octave noise levels in the table below are exceeded by up to 5dB, a 2dBA positive adjustment to measured A weighted levels applies in the evening ~~and night~~ periods.
- where any of the 1/3 octave noise levels in Table A are exceeded by more than 5dB, a 5dBA positive adjustment to measured A weighted levels applies for the evening and night periods, and a 2dBA positive adjustment applies for the daytime period.

Centre frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
One-third octave $L_{Zeq(15min)}$ threshold level (dB)	92	89	86	77	69	61	54	50	50	48	48	46	44

Response

GRL would accept this recommended condition being included in its EPL.

-
33. To assess compliance with Condition 25, attended noise monitoring must be undertaken in accordance with Condition 29 and:
- at each one of residential receivers 6, 7, 19A and at a location representative of residences in the Avon River Estate;
 - occur Quarterly, in a reporting period;
 - occur during each day, evening and night period as defined in the NSW Industrial Noise Policy for a minimum of:
 - 1.5 hours during the day;
 - 30 minutes during the evening; and
 - 1 hour during the night.
 - occur for three consecutive operating days.

The extent of monitoring required will be reviewed by the EPA, upon request, after the first two years of data.

Response

GRL would accept this recommended condition.

-
34. A noise compliance assessment report must be submitted to the EPA within 30 days of the ~~completion of the quarterly monitoring~~ end of each quarter. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:
- an assessment of compliance with noise limits presented in Condition 25; and
 - an outline of any management actions taken within the monitoring period to address any exceedances of the limits contained in Condition 25.

Response

GRL would accept this recommended condition being included in the EPL.

-
35. Annually the noise compliance assessment report must also include an assessment of compliance with the plant and equipment sound power levels identified in Table 4.9 of the EIS. The compliance report must clearly identify the methodology used to determine the sound power levels of the plant and equipment. If plant or equipment individually exceeds the originally predicted sound power level, ~~or~~ and if the overall mobile and fixed plant sound power level exceeds the originally predicted sound power level identified in tables 4.9 or 4.10, the proponent must stipulate actions that will be taken to ensure overall sound power levels do not exceed originally predicted levels.

Response

It is GRL's position with respect to this condition that it is unnecessary given the over-riding requirement is to satisfy the noise limits contained in the development consent as identified in suggested Condition 25 and the fact that GRL will need to manage noise levels through the use

of two real-time noise monitors (see suggested Condition 36). GRL would need to satisfy these conditions irrespective of the sound power levels on each of the items of equipment. In any event, GRL's acceptance and implementation of Condition 4 would result in negligible changes to the sound power levels of the equipment.

36. *Real Time Noise Monitor*

*The proponent must, prior to the commencement of noise generating ~~activities~~ **activities** at the site, install a continuous real time noise level monitor at a location representative of residences within **the Forbesdale Estate** and Avon River Estate.*

Response

GRL would accept this recommended condition. However, it is suggested that "Forbesdale Estate" is added to this condition – consistent with GRL's commitment in the EIS (Section 4.2.8).

37. *Dynamic noise management*

- a) *Prior to the commencement of noise generating ~~activities~~ **activities** at the site, the licensee must submit a report to Manager EPA Hunter Region that details:*
 - i. *Action trigger levels based on measured real time noise levels at a representative receptor location and other inputs such as predicted and prevailing meteorology;*
 - ii. *Specify actions to be taken in response to the identified trigger levels which may include, but not be limited to, stopping certain activities, additional control measures or limitations on particular site activities during adverse meteorological conditions.*
- b) *A minimum of 1 review of the effectiveness of the ~~dust~~ **noise** management plan must be conducted each twelve months.*
- c) *The plan and the management of all relevant activities on the site must be updated in accordance with the findings of any review of the plan.*
- d) *The plan must be posted on the proponent's website and be made available to the EPA upon request.*

Response

GRL would accept this recommended approach however suggest that details regarding noise management be included within a noise management plan to be submitted in accordance with the timing specific in the development consent and in consultation with the EPA prior to the commencement of development.

3.2.6 Blasting

38. *Blasting at the premises may only take place between 10:00am-4:00pm Monday to Saturday. Blasting is not permitted on public holidays.*

Note: these time restrictions have been applied as modelling has shown there is a risk of nitrogen dioxide from blast fume exceeding relevant ground level criteria in stable meteorological conditions outside the above time period.

Response

GRL would accept this recommended condition.

39. *Blasting outside of the hours specified in the condition above can only take place with the ~~written~~ approval of the EPA Secretary.*

Response

GRL would accept this recommended condition, subject to the above changes – given the EPA is not responsible for matters relating to safety and blasting.

40. *Offensive blast fume must not be emitted from the premises.*

Definition:

Offensive blast fume means post-blast gases from the detonation of explosives at the premises that by reason of their nature, duration, character or quality, or the time at which they are emitted, or any other circumstances:

- i. are harmful to (or is likely to be harmful to) a person that is outside the premises from which it is emitted, or*
- ii. interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premise from which it is emitted.*

Response

GRL would accept this recommended condition being included in its EPL.

41. *Blasts must be delayed during weather conditions that would transfer excessive dust and/or fume towards Forbesdale, Thunderbolt or Avon River estates.*

Response

GRL would accept this recommended condition.

42. *All blasts conducted on the premises must be videoed in such a manner that the scale, direction and extent of any fume and dust produced by the blast is readily apparent. Such video must be provided to the EPA immediately upon request.*

Response

GRL would accept this recommended condition being included in its EPL.

43. *The airblast overpressure level from blasting operations at the premises must not exceed 120dB (Lin Peak) at any time at any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.*

Response

GRL would accept this recommended condition being included in its EPL.

44. *The airblast overpressure level from blasting operations at the premises must not exceed 115dB (Lin Peak) at any noise sensitive locations for more than five per cent of the total number of blasts over each annual reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.*

Response

GRL would accept this recommended condition being included in its EPL with the addition of “annual” as shown above.

45. *Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 10mm/sec at any time at any noise sensitive locations. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.*

Response

GRL would accept this recommended condition being included in its EPL.

46. *Ground vibration peak particle velocity from the blasting operations at the premises must not exceed 5mm/sec at any noise sensitive locations for more than five per cent of the total number of blasts over each annual reporting period. Error margins associated with any monitoring equipment used to measure this are not to be taken into account in determining whether or not the limit has been exceeded.*

Response

GRL would accept this recommended condition being included in its EPL.

47. *A breach of the above mentioned limits will still occur where airblast overpressure or ground vibration levels from the blasting operations at the premises exceeds the limit specified at any “noise sensitive locations” other than any specific locations identified above.*

Response

This condition seems unnecessary given the above two proposed conditions apply generally to noise sensitive locations. Uncertainty exists regarding ‘specific locations’ identified above.

48. *The airblast overpressure and ground vibration levels in conditions 43 to 47 do not apply at noise sensitive locations that are owned by the licensee or another resource company or subject to a private agreement, relating to airblast overpressure and ground vibration levels, between the licensee and landowner.*

Response

GRL would accept this recommended condition with the addition of “or another resource company” being included in its EPL.

3.2.6.1 Blast Monitoring

49. *To determine compliance with condition(s) 43-47:*

- a) *Airblast overpressure and ground vibration levels must be measured and electronically recorded at the ~~nearest~~ privately-owned residences nominated in the Blast Management Plan or noise sensitive locations for all the parameters in the first column of the table below.*
- b) *The licensee must use the units of measure, sampling method, and sampling frequency specified in the other columns.*

Parameter	Units of Measure	Frequency	Sampling Method
Airblast overpressure	Decibels (linear peak)	Continuous during all blasts	Australian Standard AS2187.2-2006
Ground vibration peak particle velocity	Millimetres/second	Continuous during all blasts	Australian Standard AS2187.2-2006

Response

GRL would accept this recommended condition with the addition of “privately-owned” residences “to the blast” in Part (a) as a condition of its EPL.

50. *The proponent must monitor all blasts carried out in or on the premises at or near the nearest privately-owned residences or noise sensitive locations (such as a school or hospital) that is likely to be most affected by the blast and that is not owned by the licensee or subject of a private agreement between the owner of the residence or noise sensitive location and the licensee relating to alternative blasting limits. ~~At the minimum, monitoring must be conducted at residences generally north and west of the premises.~~*

Response

GRL consider it more appropriate to reference the blast monitoring program be included in a blast management plan and prepared in consultation with the EPA prior to the commencement of blasting. Should this condition be retained, it is requested the final sentence is removed as it is ambiguous and does not provide accurate guidance on monitoring locations.

51. *The proponent must report any exceedance of the blasting limits to the regional office of the EPA as soon as practicable after the exceedance becomes known to the proponent or to one of the proponent's employees or agents.*

Response

GRL would accept this recommended condition being included in its EPL.

52. *The proponent must report any impact on a person from offensive blast fume (as defined in the condition 40 above) to the regional office of the EPA as soon as practicable after the impact becomes known to the proponent or to one of the proponent's employees or agents.*

Response

GRL would accept this recommended condition.

3.2.7 Water and Groundwater

53. *Except as may be expressly provided by a licence issued under the Protection of the Environment Operations Act 1997 in relation of the development, section 120 of the Protection of the Environment Operations Act 1997 must be complied with in connection with the carrying out of the development.*

Response

GRL would accept this recommended condition being included in its EPL.

54. *There must be no discharge from the premises of waters contained within open cut pits, unless such waters have first been treated in the water treatment plant.*

Response

GRL would accept this recommended condition being included in its EPL.

55. *(EPA note: the EPA is likely to suggest condition restricting or prohibiting saline water reuse on the premises, following an adequate and thorough assessment during this EIS process as to whether saline water reuse is appropriate).*

Response

GRL would not support a condition framed in the manner suggested. The use of water accumulating in the saline water zone for dust suppression would be an appropriate use, particularly given runoff from the road network during the first 6 years of operations reports to the saline water zone. GRL intends to undertake sufficient monitoring during the first 6 years of operations to establish the need for an alternate approach to dust suppression during the construction of the interim overburden emplacement (where runoff does not report to the saline water zone). Use of saline water for dust suppression after the construction of the interim

overburden emplacement would be appropriate as all runoff from the internal road network would report to the saline water zone. This practice is a standard operating procedure in most coal mines.

56. *The proponent must sustainably reuse as much of the treated mine water as possible, with discharges of treated water to the ephemeral creek to the north of the premises considered a last resort option, unless in times of drought (and with EPA approval) discharges are needed to supplement Avon River baseflows.*

Note 1: The EIS for the Project notes the proponent intends to reuse as much of the treated water as possible and the annual volume of water produced by the water treatment plant would be sufficient to irrigate about 200ha of land, which represents about 15% of the land owned by the proponent in or adjacent to the mine area.

Note 2: The EPA must be provided with evidence from an appropriate authority that drought discharges are needed to supplement Avon River baseflows prior to any discharge in low riverflow conditions.

Response

GRL would accept this approach however suggest that the relevant measures regarding the management of treated mine water be included in the surface water management plan to be prepared in consultation with DPI Water and the EPA prior to the commencement of development.

57. *The proponent must supply a report to the EPA, yearly with the Environment Protection Licence Annual Return documentation, that provides details of:*

- a) The volume of mine water treated annually in the water treatment plant;*
- b) The volume of treated mine water sustainably reused on and off the premises throughout the annual return reporting period, including a breakdown on the locations where the treated mine water was reused;*
- c) The volume of treated mine water discharged off site throughout the annual return reporting period;*
- d) Rainfall recorded over the annual return period, including a comparison to historic 10 percentile, median and 90 percentile rainfall for the area; and*
- e) Where sustainable reuse of treated mine water represents less than ninety percent of the total mine water treated in the annual return period, commentary as to the reason for this level of reuse and actions proposed to be taken to sustainably reuse as much of the treated mine water as possible.*

Response

GRL would accept this recommended condition being included in its EPL with the addition of the inserted (tracked) modified text. It is GRL's preference that sustainable use of the treated water is considered both on site and off site i.e. for irrigation or supplementary flows in the Avon River, i.e. when recorded flows at the Avon River gauge are <5ML/day. The discharge of treated water to the Avon River during periods when irrigation is impractical or the farm dams are at capacity would similarly be considered a sustainable use.

58. *Following the cessation of mining and rehabilitation activities there must be no discharge of mine water from the premises.*

Response

GRL would accept this recommended condition.

59. *Overburden must be assessed to determine if it is Potential Acid Forming (PAF). All breaker rejects, non-economic coal seams and PAF overburden must be managed so as to mitigate against acid formation and pollution of waters.*

Response

GRL would accept this recommended condition with the suggested text amendments and the use of similar terminology to the EIS to avoid future confusion (i.e. “waste rock” should be consistently termed “overburden” as is normally the case in open cut coal mines).

Based upon the characterisation of the overburden within the Mine Area (O&RC Report), the occurrence of PAF overburden, if present, would be confined largely to materials immediately above and below the various coal seams. Overall, there would only be small quantities of PAF overburden. It is GRL’s preference that the PAF overburden, breaker rejects and non-economic coal seams are managed as discussed in the EIS (Sections 2.7.2.4 and 2.8.4) and discussed in Section 2.20 of this document.

60. *PAF material must not be disposed above groundwater level without EPA specifically approving in writing the location and design of the out-of-pit PAF waste cells.*

Response

GRL considers that this condition is unnecessary. GRL’s proposed management of PAF overburden, uneconomic coal seams and breaker reject, as discussed in Section 2.20 of this document would be appropriate to prevent any adverse impacts from these materials. Waste cells would not be used.

61. *Stormwater management measures must be prepared and implemented to mitigate the impacts of stormwater run-off from and within the premises in a manner that is consistent with the guidance contained in to Managing Urban Stormwater: Soils and Construction Volume 1 and Managing Urban Stormwater: Soils and Construction: Volume 2C Unsealed Roads and Volume 2E Mines and Quarries (DECCW 2008).*

Response

GRL would accept this recommended condition.

62. The drainage from all areas at the premises which will liberate suspended solids when stormwater runs over these areas must be diverted into adequately sized sedimentation basins.

Response

GRL would accept this recommended approach however suggest that details regarding water management are included in the surface water management plan to be prepared in consultation with the EPA and DPI Water prior to the commencement of development.

63. The sedimentation basins must be maintained (to remove both accumulated sediments ~~and treated water~~) to ensure that their design capacity is available for the storage of runoff from ~~cleared~~ disturbed areas.

Note: The EIS for the proposal has noted that sediment control basins will be operated such that the water that accumulates after rainfall will be treated as is necessary to achieve the necessary discharge limits and then discharged within five days of the rainfall event.

Response

GRL would accept this recommended approach with the minor change above as treated water would not be stored within sediment basins. Details regarding sedimentation basins will be included in the surface water management plan to be prepared in consultation with the EPA and DPI Water prior to the commencement of development.

64. Water and irrigation management plan

(EPA note: it is the intention of the EPA to add a condition similar to that shown below. This draft condition might be varied upon submission of all relevant information as requested in this letter)

Prior to commencement of the operation the proponent must develop and implement a management plan (or series of plans) that cover the surface water (including the water treatment plant), irrigation and groundwater issues. The plan(s) must include:

- *erosion and sediment control measures and bunding;*
- *maintenance and monitoring of the treatment plant, including reverse osmosis membrane performance, ~~and distribution system for irrigation water and brine,~~ including operational triggers to ensure that the treatment process is functioning in a proper and efficient manner for the entire operational period;*
- *further development of a detailed water balance that incorporates an annual review to update the balance based on actual rainfall and effluent irrigation data;*
- *~~specifications for the unamended and amended quality of irrigation water and the circumstances under which the amendment might be varied, linked to soil monitoring;~~*

- a soil and water monitoring program for irrigation water, soils, groundwaters and crops based on risk factors that aim to detect when specific water quality, soil or crop sustainability trigger values are nearing, or have exceeded, trigger levels;
- clearly defined management actions that are implemented when approaching or exceeding sustainability trigger values. An example of trigger values used for soil sustainability management can be found in: McGahan, Eugene and Robyn Tucker (Principle Authors), 2003, *Resource Manual of Development of Indicators of Sustainability for Effluent Reuse in the Intensive Livestock Industries: Piggeries and Cattle Feedlots*. Project No. 1816. Australian Pork Limited, Canberra, Australia, May, 2003;
- use of 'control' or 'reference' sites which are unlikely to be impacted by irrigation water to allow comparison between impacted and non-impacted sites;
- contingency plans for incidents and emergencies including for water treatment, tank or bunding failure, chemicals spills and poor crop performance, ~~and breakage of brine pipelines~~;
- a program for reporting on the treatment processes and irrigation operations.

Response

GRL would accept a condition similar to the above within its EPL with the removal of the identified text.

- The distribution for irrigation water would not be located within the Mine Area and should not be the subject of the EPL.
- The text removed refers to "brine" which will not be generated on site. GRL intends that the salt recovered from the water treatment plant is produced as a solid material.
- The reference to "unamended and amended water quality" is not relevant to the water treatment plant GRL intends to install and operate.

65. Water Treatment Plant Commissioning Stage Monitoring Plan

(EPA note: it is the intention of the EPA to add a condition similar to that shown below. This draft condition might be varied upon submission of all relevant information as requested in this letter)

The proponent must ensure that data is collected and collated as part of the water treatment plant commissioning stage monitoring program for amended and unamended effluent. The data must be submitted to the EPA for consideration. The data must include, at a minimum:

- organics (total recoverable hydrocarbons, including BTEX);
- radionuclides, including: combined radium-226/-228, gross alpha and gross beta;
- a full suite of metals;

- *non-metallic inorganics: ammonia, nitrate, nitrite;*
- *salinity, major ions, alkalinity and hardness: total dissolved solids, sodium, chloride, potassium, magnesium, fluoride, sulfate, calcium, bromide, bicarbonate, carbonate, hydroxide, hardness;*
- *dissolved oxygen, electrical conductivity, pH, redox potential, turbidity, total suspended solids.*

Response

GRL would accept a condition similar to the above within its EPL recognising that it will need to be modified to reflect the specific water treatment process to be adopted for the amended Project. GRL would provide all relevant information to assist the EPA when forming this condition as part of the documentation submitted with its application for an environment protection licence.

66. Concentration limits (consent condition)

The proponent must not discharge waters from the site, except in accordance with the conditions of any environment protection licence.

Response

GRL would accept this recommended condition.

67. Concentration limits (Environment Protection Licence condition)

- For each monitoring/discharge point or utilisation area specified in the table\ below (by a point number), the concentration of a pollutant must not exceed the concentration limits specified for that pollutant in the table.*

POINT 1-x (each point where sediment laden water is discharged from the premises)

Pollutant	Units of measure	100 percentile limit
Total Suspended Solids	M mg/L	50
pH	pH units	6.5-8.5
Oil and Grease	M mg/L	5 mg/L and/or None visible

POINT Y (the discharge from the water treatment plant)

Pollutant	Units of measure	100 percentile limit
Total Suspended Solids	M mg/L	50
pH	pH units	6.5-8.5
Oil and Grease	M mg/L	5 mg/L and/or None visible
<i>Other parameters and limits are yet to be determined and will be stipulated by the EPA after the submission of an appropriate EIS assessment, and prior to determination of the development application</i>		

Note: the EPA will consider a turbidity limit in addition to (or as an alternative to) Total Suspended Solids (TSS) where it can be demonstrated there is a clear correlation between TSS and turbidity for the discharge(s) in question.

Response

GRL would accept this recommended condition in its EPL. Note that title case for units has been adjusted.

68. Water Monitoring (Environment Protection Licence condition)

For each monitoring/discharge point or utilisation area specified below (by a point number) the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns

POINT 1-x (each point where sediment laden water is discharged from the premises)

Pollutant	Units of measure	Frequency	Sampling Method
Total Suspended Solids	mg/L	Daily during any discharge	Grab Sample
Turbidity	ntu	Daily during any discharge	Probe
pH	pH units	Daily during any discharge	Probe
Oil and grease	visual	Daily during any discharge	Visual observation
Conductivity	µS/cm	Daily during any discharge	Grab Sample
Aluminium and other parameters – TBD after a more thorough assessment by the proponent			

POINT Y (the discharge from the water treatment plant)

Pollutant	Units of measure	Frequency	Sampling Method
Total Suspended Solids	mg/L	Daily during any discharge	Grab Sample
Turbidity	ntu	Daily during any discharge	Probe
pH	pH units	Daily during any discharge	Probe
Oil and grease	visual	Daily during any discharge	Visual observation
Conductivity	µS/cm	Daily during any discharge	Grab Sample
<i>Other parameters and monitoring requirements/frequency are yet to be determined and will be stipulated by the EPA after the submission of an appropriate EIS assessment, and prior to determination of the development application</i>			

POINT A (Waukivory Creek U/S 2), POINT B (Waukivory Creek D/S), POINT C (Avon River U/S) and POINT D (Avon River D/S) (sampling locations shown on Figure 4.50 of the EIS for the Amended Rocky Hill Coal Project dated 2016)

Pollutant	Units of measure	Frequency	Sampling Method
Total Suspended Solids	mg/L	Monthly	Grab Sample
Turbidity	ntu	Monthly	Probe
pH	pH units	Monthly	Probe
Oil and grease	visual	Monthly	Visual observation
Electrical Conductivity	µS/cm	Monthly	Grab Sample

Response

GRL would accept this recommended condition in its EPL. A note is required beneath each table to the effect that 'Upon the establishment of a relationship between total suspended solids and turbidity, analyses for total suspended solids can be discontinued'.

69. Weather Monitoring

A meteorological weather station must be installed and maintained so as to be capable of continuously monitoring the parameters specified in the table below.

For each monitoring point specified in the table below the proponent must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1. The proponent must use the sampling method, units of measure, averaging period and sample at the frequency, specified opposite in the other columns.

Point <z>

Parameter	Units of Measure	Frequency	Averaging Period	Sampling Method
Siting				AM-1
Air temperature at 2 metres	°C	Continuous	1 hour	AM-4
Air temperature at 10 metres	°C	Continuous	1 hour	AM-4
Wind direction at 10 metres	°	Continuous	15 minute	AM-2 & AM-4
Wind speed at 10 metres	m/s	Continuous	15 minute	AM-2 & AM-4
Temperature lapse rate	°C	Continuous	15 minute	Direct measurement over a minimum 50m height interval as referred to in Part E2 of Appendix E to the NSW Industrial Noise Policy <u>or through the use of an alternate method approved by the EPA.</u>
Rainfall	mm	Continuous	15 minute	AM-4
Relative humidity	%	Continuous	1 hour	AM-4

Monitoring for all parameters listed in Column 1 must commence prior to earth moving activities being undertaken on the premises.

Note: The location of the weather station must be approved in writing by the EPA prior to the installation of the monitoring equipment.

Response

GRL would accept this recommended condition in its EPL with the addition to the sampling method for temperature lapse rate (i.e. consistent with Condition 28).

70. Receiving Environment Investigations

- (a) *Prior to the commencement of construction the proponent must engage a suitably qualified person to conduct a baseline survey along the entire length of the ephemeral watercourse that is proposed to receive discharges from the water treatment plant to assess for impacts of erosion. The results of the survey must be compiled into a report*

and include photographs of any erosion issues and recommendations for actions that will be taken (including timelines) to address any erosion (or potential erosion) issues identified. The report must be provided to the EPA within two months of the person conducting the survey.

- (b) *Annually the proponent must engage a suitably qualified person to conduct a survey along the entire length of the ephemeral watercourse that receives discharges from the water treatment plant to assess for impacts of erosion. The results of the survey must be compiled into a report which compares the results to the baseline survey and the previous survey. The report should include photographs, taken in approximately the same location each year, which compares any erosion issues from year to year. The report must include recommendations for actions that will be taken (including timelines) to address any erosion issues identified. The report must be provided to the EPA annually with the Environment Protection Licence Annual Return.*

Note: the EPA will review the frequency of this requirement for the watercourse survey, upon request, after the first two years of surveys have been completed (noting that discharges from the water treatment plant are not predicted to occur until about Year 4).

Response

In light of the information provided in Section 2.29.4.11 of this document, the requirements in the above condition are unnecessary.

71. Annual Report on Ambient Environmental Monitoring

Annually the proponent must engage a suitably qualified person review the results of ambient water quality monitoring conducted in the vicinity of the premises. The results of the review must be compiled into a report including graphs for key parameters at each site, showing results since monitoring began. The report must include expert commentary that discusses any trends observed, postulates the reasons for the trends and makes recommendations for any actions necessary to address any adverse trends or results (including timelines). The report must be provided to the EPA annually with the Environment Protection Licence Annual Return.

Response

In light of the information provided in Section 2.29.4.11 of this document, the requirements in the above condition are unnecessary.

3.2.8 Waste

72. *The proponent must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by an environment protection licence.*

Response

GRL would accept this recommended condition in its EPL.

73. *This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if those activities require an environment protection licence.*

Response

GRL would accept this recommended condition in its EPL.

3.2.9 Emergency Response

74. *The proponent must maintain, and implement as necessary, a current Pollution Incident Response Management Plan (PIRMP) for the premises in accordance with the requirements in Part 5.7A of the Protection of the Environment Operations (POEO) Act 1997 and PO EO regulations. The proponent must keep the incident response plan on the premises at all times. The incident response plan must document systems and procedures to deal with all types of incidents (e.g. spills, explosions or fire) that may occur at the premises or that may be associated with activities that occur at the premises and which are likely to cause harm to the environment.*

Response

GRL note that this proposed condition reflects legislative requirements contained in the *Protection of the Environment Operations Act 1997* and applicable to all licence holders and so is unnecessary to include as a condition of the EPL.