Acoustics RB Pty Ltd

Report No. 19-1042.R02

Proposed Galilee Power Project

Monklands

Assessment and Control of Environmental Noise Emission

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SUMMARY

Waratah Coal Proprietary Limited (Waratah Coal) is proposing to develop a 1400 MW ultra-supercritical power station adjacent to the Mining Lease for their Galilee Coal Project. The site is located 32 kilometres north-northwest of the township of Alpha.

The Galilee Power Station will be developed as a contingent, but separate, component of the overall Galilee Coal Project. Accordingly, Waratah Coal is seeking approval for the Galilee Power Station under the Queensland Planning Act 2016 (the Planning Act).

Acoustics RB Pty Ltd has been engaged by Waratah Coal to conduct an assessment of the potential impact of noise from the proposed new power station on receptors in the vicinity of the site and to make appropriate recommendations for the control of noise from the new power station.

The acoustical assessment has been carried out with reference to (i) Environmental Protection (Noise) Policy 2019 (ie EPP-N 2019), (ii) the environmental noise assessment conducted as part of the original application for approval of the Galilee Coal Project, (iii) Draft EPML00571313 imposed on the approval of the Galilee Coal Project and (iv) other relevant considerations.

This report presents the results of the acoustical assessment together with (i) a determination of the degree of compliance achieved with the relevant noise level limits and (ii) recommendations for re-evaluation of the extent of noise emission during the detailed design phase and selection of the most appropriate location for constructing the accommodation component of the Workers' Camp.

From the results of this assessment, the following conclusions can be drawn:-

- Noise will be generated by the proposed power project (i) during the construction phase, (ii) during the commissioning phase and (iii) when operational.
- There are a number of receptor premises in the vicinity of the site of the proposed power project. Eight of these will lie within 16km of the centre of the power station. The three closest, ie Monklands, Hobartville and Kia Ora, will be acquired by either Waratah Coal (in the case of Monklands and Kia Ora) or at some alter date by Alpha Coal (in the case of Hobartville). Of the other five nearby homesteads which will remain unacquired indefinitely, the two closest will be Salt Bush Homestead (11.9km distant) and Mentmore Homestead (12.0km distant).
- The Bimblebox Nature Refuge to the SW of the power station site will extend for a distance of 6.1km to 19.1km from the centre of the new facility. The Glen Innes Homestead located within the Bimblebox Nature Refuge is situated 12.1km from the power station but it is understood that this dwelling will not operate in the normal sense of a homestead. Rather, it will provide short-term temporary accommodation at various times of the year for occupants wishing to stay within the nature refuge for periods of time of varying lengths.
- As part of the Galilee Coal Project, a new Workers' Camp is proposal to be constructed in the general vicinity of the site. As currently located, the Workers' Camp will be situated 3.2-6.0km SSE of the power station.
- It is noted that Savery & Associates Pty Ltd adopted a limit of 28dBA for acceptable levels of noise emission from the Galilee Coal Project. In that report, it was anticipated that noise from the Galilee Power Project "would have a negligible effect on the nearest residences". Consequently, the impact of noise from the operation of the power station was not included in the assessment conducted by Savery. Nor was there any headroom included in the proposed 28dBA limit to accommodate the later inclusion of the power station into the total development of the overall project.
- For a number of reasons, it is considered that the appropriate limit for acceptable levels of noise emission from the combined operation of the two facilities to the unacquired homesteads and the Hobartville Homestead should be 30dBA $L_{Aeq,adj,T}$ rather than 28dBA $L_{Aeq,adj,T}$. Having regard to the level of noise emission predicted by Savery to be generated by the operation of the Galilee Coal Project, the relevant noise level targets applying to noise emitted from the proposed power station to these identified receptor locations will vary from 26dBA to 30dBA.

- For the Workers' Camp and having regard to the nature of construction and operation of the workers' accommodation within the camp, it can be readily determined that the appropriate external noise level limit for successful operation of the Workers' Camp (ie without exceeding the external noise levels deemed appropriate by reference to EPP-N 2019 and AS/NZS 2107:2016), could be set at 50dBA $L_{Aeq,adj,T}$.
- To allow an accurate determination to be made of the extent of noise emission into the surrounding community, a SoundPLAN noise level prediction model was prepared for the power station. To ensure that the level of noise emission to the community was assessed for all relevant commonplace and likely worst-case atmospheric conditions, noise levels were predicted under five different scenarios. The level of noise emission to all nearby unacquired receptor premises was predicted to comply with the relevant noise level target applying to each particular receptor under all assessed prediction scenarios.
- Notwithstanding, during the detailed design phase of the project, ie when further more-refined details of the proposed noise generating equipment will be available, it would be prudent to re-examine the extent of noise intrusion into the community and confirm the degree of compliance that will be achieved. Should it transpire that noise reduction measures are found to be necessary/appropriate, the options for noise control should be examined so that the appropriate specifications for noise control measures can be set and the most cost-effective noise control treatments selected to the achieve the optimum outcome.
- The level of noise emission to the site of the Workers' Camp will vary by up to 16dBA from the NW corner to the SE corner of the site. To minimise the extent of noise intrusion to the residential component of the camp so that the external acoustical amenity of the accommodation can be optimised, the most favourable portion of the camp for construction of the accommodation would be the area at the SE extent. In this portion of the site, noise levels are predicted to lie in the range 30dBA to 40dBA year-round.
- From these results, it can be readily concluded that there would be no warrant to implement any specific noise control measures into the design of the power station. Notwithstanding, it would be appropriate to consider locating the accommodation within the Worker's Camp at the SE extent of the camp site to ensure that a higher level of acoustical amenity is achieved for the workers.
- The level of noise emission during the construction and commissioning phases of the power station will be at least 10dBA and 15dBA, respectively, below the level of noise emission generated by the attenuated power station when operational. In these circumstances, there will be no requirement to implement any specific noise control treatments to attenuate noise during either construction or commissioning.
- Having regard to the results of the noise level predictions throughout the Bimblebox Nature Refuge, it can be readily concluded that, under the most adverse propagation conditions, the steady-state noise generated by the operation of the proposed power station will be well below (ie more than 10dBA below) the onset of any disturbance even at the closest locations of the refuge to the power station. On this basis, there would be no warrant to implement any further noise control measures into the design of the power station.

To adequately control noise emission from the power station, it is recommended that during the detailed design phase of the project, ie when further more-refined details of the proposed noise generating equipment will be available, the extent of noise intrusion into the community should be re-examined so that the degree of compliance that will be achieved can be confirmed. In the event that noise reduction measures are found to be necessary/appropriate, the options for noise control should be examined so that the appropriate specifications for noise control measures can be set and the most cost-effective noise control treatments selected to the achieve the optimum outcome.

In addition, to ensure that the level of acoustical amenity achieved for the workers is optimised, it would be appropriate to consider locating the accommodation component of the Worker's Camp at the SE extent of the camp site.

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1.0 Introduction

Waratah Coal Proprietary Limited (Waratah Coal) is proposing to develop a 1400 MW ultra-supercritical power station adjacent to the Mining Lease for their Galilee Coal Project. The site is located 32 kilometres north-northwest of the township of Alpha.

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This report presents the results of the acoustical assessment together with (i) a determination of the degree of compliance achieved with the relevant noise level limits and (ii) recommendations for re-evaluation of the extent of noise emission during the detailed design phase and selection of the most appropriate location for constructing the accommodation component of the Workers' Camp.

2.0 Current Situation

The regional context of the proposal is presented in Figure 1.

The MCU Area boundary of the power station covers 1.310ha of land adjacent to the Galilee Coal Project Mining Lease Application area (ML70454).

The location of the MCU Area of the power station relative to both the township of Alpha and ML70454 is shown in Figures 2 and 3. The location of the power station within the MCU Area is presented in Figure 4. The concept design of the power station is presented in overview in Figure 5 and in more detail in Figure 6.

It is noted that the power station will be sited on land that has been previously cleared for the grazing of cattle.

Currently, the surrounding land use is predominately low-density grazing, but four approved but yet-to-be-constructed coal mining projects are situated to the north and south of the site. As shown in Figure 7, these are:-

- North of site: Kevin's Corner (ML70425)
- North of site: Alpha (ML70426)
- Surrounding site: Galilee (ML704543)
- South of site: South Galilee (ML 70453)

There are a number of residential premises as well as a proposed Workers' Camp associated with the Galilee Coal Project in the general vicinity of the site. In addition, the Bimblebox Nature Refuge is located 6.1-19.1km from the centre of the proposed power station.

The status of the homesteads in the general vicinity of the site is presented in Figure 8. By reference to this figure, it is evident that all of the homesteads within the lease will be acquired by Waratah Coal as part of the development of the Galilee Coal Project. In one instance, however, the property – and importantly the homestead – will be leased back to the former owner. In these circumstances, the particular homestead will continue to be a receptor.

For the purposes of clarity, a schedule has been prepared to detail the full status of each of the nearby homesteads and the Workers' Camp as well as the distance of separation of each from the centre of the proposed power station. The schedule is presented in Table 1 below.

Notes:

Eureka Homestead is 24.3km distant from the power station. At this distance, it does not warrant being considered a nearby residence. Notwithstanding, it has been included in the list because it has been used by others to set the requirement for the degree of noise control required to be applied to the Galilee Coal Project. (Refer also discussion in Section 6.0 following.)

To maintain consistency with the nomenclature used by Katestone in Report No D18047-1 *Galilee Power Project Air Quality Assessment* dated November 2019, the designations applied by Katestone have been adopted hereafter.

Katestone Design-ation	Homestead/ Premises Name	RPD	Acquisition Status	Lease/Use Status	Distance and Direction from Power Station	Receptor (Yes/No)
44	Gadwell	6BF16	Not to be acquired	NA	15.6km SE	Yes
46	Glen Innes / Bimblebox	4BF22	To be acquired by Waratah	Lease back	12.1km WSW	Yes
49	Hobartville	649SP232649	To be acquired by Alpha Coal at some future date	Use to cease at some future date	9.8km N	No
56	Kia Ora	1BF72	To be acquired by Waratah	Use to cease	11.8km W	No
61	Mentmore	4SP263963	Not to be acquired	NA	12.0km ESE	Yes
63	Monklands	2SP136836	To be acquired by Waratah	Use to cease	4.8km WSW	No
74	Salt Bush	7BF16	Not to be acquired	NA	11.9km SSE	Yes
84	Tressillian	3CP860083	Not to be acquired	NA	13.2 km ENE	Yes
WC	Workers' Camp	3BF802451	Part of Mine Development	NA	3.2-6.0km SSE	Yes
42	Eureka	3SP167133	Not to be acquired	NA	24.3 km SSW	Yes

Table 1 – Status of Homesteads and Distance from Centre of Proposed Power Station

From the information presented in Table 1, it can be seen that the closest receptor to the proposed power station will be the Workers' Camp (3.2-6.0km distant) which will be established as part of the development of the mine and the power station. Thereafter, the closest homesteads which will continue to operate as homesteads in an unfettered manner for the indefinite future will be Salt Bush Homestead (11.9km distant) and Mentmore Homestead (12.0km distant).

The Glen Innes Homestead located within the Bimblebox Nature Refuge is located at 12.1km from the power station but it is understood that this dwelling will not operate in the normal sense of a homestead. Rather, it will provide short-term temporary accommodation at various times of the year for occupants wishing to stay within the nature refuge for periods of time of varying lengths.

As noted in Table 1, the current use of the Monklands Homestead and the Kia Ora Homestead will cease once the mine and power station are developed. As also noted above, it is understood that the Hobartville Homestead will be acquired as part of the Alpha Coal operations. Notwithstanding, the commencement date for the Alpha Coal operations is not known at this point. Consequently, it is entirely possible, maybe even probable, that Hobartville will still be functioning as a residence during construction and/or operation of the power station. In these circumstances, it is appropriate to treat Hobartville is a sensitive receptor the purposes of the assessment of the impact of environmental noise emission from the operation of the power station.

3.0 Proposed New Power Station

3.1 Proposal

As noted above in Section 1.0, Waratah Coal is proposing to develop a 1400 MW ultra-supercritical power station adjacent to Mining Lease Application MLA70454.

As also noted above, the concept design of the power station is shown in Figure 3. South and West elevations of the power station are presented in Figure 9.

The Galilee Power Station will have the dual purpose of servicing the public network and providing the power needs for the Galilee Coal Project mine operations (which will undergo a slow ramp up to full capacity over 10 years), including;

- A coal slurry pipeline delivering mine processed, ready for export, coal to the RG Tanna Coal Terminal at Gladstone Port; and
- Port operational needs.

Additionally, it is envisaged that the Galilee Power Station will also service the future power needs for Waratah Coal's proposed North Galilee coal mine development.

The Galilee Power Station is being considered as a stand-alone project, and separate activities such as transmission lines, the coal slurry pipeline, port and mine are being, or have been, addressed in separate studies and approvals processes. These separate approvals involve high voltage transmission connections to the existing Powerlink system and to pumping stations on the slurry pipeline, and potentially (subject to agreement with Ergon) the reinforcement of the power supply to the towns of Alpha and Jericho. The assessment for the Galilee Power Station will consider these pieces of linear infrastructure only up to the boundary of the Power Station Site.

The power station is proposed to operate 24 hours per days, seven days per week.

The power station will be located close to the mine both (i) to allow ready coal conveyor transfer to the power station and (ii) to facilitate the transfer of conditioned ash to the ash storage facilities. The power station will either use air-cooled condenser technology to reduce water usage or a hybrid cooling technology. Relative to the air-cooled condenser technology, the hybrid cooling technology will use more of the surplus water from the dewatering process but will balance water consumption against plant efficiency and capital cost.

Construction of the power station is planned to commence in Quarter 1 2021, with a build period of three years for the first unit and with the second unit being commissioned six months later.

After commissioning, it is anticipated that the power station would be ready to provide power to the Galilee Coal Project in line with the requirements for construction and operation of that project.

3.2 Details of Major Items of Plant and Equipment

The relevant details of the major items of noise-generating plant and equipment associated with the power station are listed in Table 2 below.

The overall source sound power level[1] of each major item is included in the table.

These source sound power levels have been derived from information provided by the proponent. For the purposes of the noise modelling, anticipated octave band sound power level spectral data was derived from manufacturers' data directly, in-house data or data derived by others for comparable equipment, as appropriate/necessary.

Item	Plant/Equipment	No off	Basis for Sound Power Level Determination or Likely Designation (Model/Size/Notional Capacity, ea)	Source Sound Power Level, ea (dBA re 10^{-12}W)	Source Height agl (m)
1	Primary Air Fan	2	Howden ANT-1960/1120N 700MW	Fan Inlet: 133.9	10
2	Primary Air Fan	2	Howden ANT-1960/1120N 700MW	Fan Casing: 117.8	5
3	Induced Draft Fans	2	Howden ANN-3200/1600B 700MW	Stack Discharge: 133.4	100
4	Induced Draft Fan	2	Howden ANN-3200/1600B 700MW	Fan Casing: 115.2	5
5	Forced Draft Fan	2	Howden ANN-2438/1250C 700MW	Fan Inlet: 125.6	20
6	Forced Draft Fan	2	Howden ANN-2438/1250C 700MW	Fan Casing: 111.2	5
7	Boiler House	2	Internal reverberant Level = 85dBA	Total Emitted: 123.6	Variable
8	Turbine Hall	2	Internal reverberant Level = 85dBA	Total Emitted: 111.6	Variable
9	Air-Cooled Condenser	72	As advised by Proponent, Axial fan 13m Ø @ 500rpm and Q= 664 m^3/s	88.6	30
10	Transformer	2	As advised by Proponent, 840 MVA	113.2	5

Table 2 – Details of Major Items of Noise-Generating Plant and Equipment

[1] Sound **power** level is a measure of how powerful the source is acoustically. It is measured in dBA (re 10^{-12}W, ie 1 picowatt). By contrast, the actual sound **pressure** level that would be measured at any point will depend on the sound power level and the distance between the source and the receiver. The significance of the difference between these two parameters can be illustrated by drawing the analogy to a light bulb (electric lamp). The difference between sound power level and sound pressure level can be compared to the difference between the power of a light bulb (which is fixed and is measured in Watts) and how bright it appears (which depends on its power as well as the distance from the light bulb).

4.0 Previous Environmental Noise Assessments

4.1 Galilee Coal Project

In August 2011, an environmental noise assessment was conducted by Savery & Associates Pty Ltd (Savery) as part of the supporting documentation for the application for approval of the Galilee Coal Project. (Ref. Savery Report No. SP0016-0 Revision 6, April 2011.)

During the preparation of that report, Savery conducted baseline ambient noise monitoring at 10 sites representing noise sensitive locations around the proposed mine site, rail line and coal terminal. Of these, three locations (ie N4, N6 and N7) were located in relatively close proximity to the power station as well, with another (N5) located somewhat further distant. The site and receptor designations adopted in Figure 2 of the Savery report for these four locations are listed below.

For ease of reference, the equivalent designations adopted in Table 1 above (ie the Katestone designations) are shown in blue font in brackets. Refer also Figure A below.

- Site N4 at R09 - Monklands (63)
- Site N5 at R02 - Glenlea Downs (now known as Corn Top (21)
- Site N6 at R05 - Lambton Meadows (57)
- Site N7 at R07 - Cavendish (19)

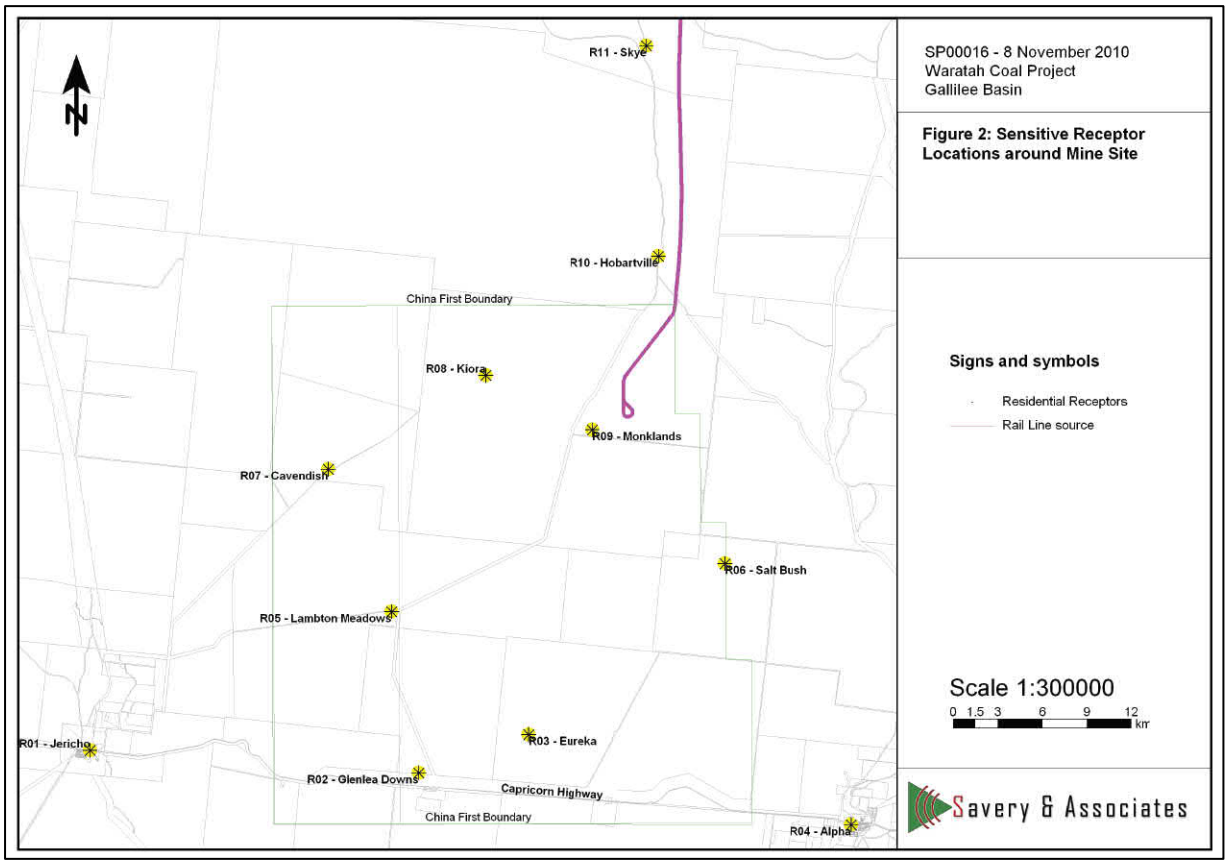

Figure A – Noise Level Monitoring Sites Adopted by Savery

From the results of the noise level monitoring, Savery established noise level limits (ie design planning levels) for the coal project.

An extract from the Savery report summarising the Rating Background Levels (RBL's) at the 10 monitoring locations is presented below in Table 3.

Table 2: Rating Background Noise Levels

Measurement Location	Rating Background Noise Level (minL_{A90} – dBA)		
	Day	Evening	Night
Site N1 – Salisbury Plains	36	35	30
Site N2 – Pepper (Railway)	33	30	20
Site N3 – Havilah	26	20	<15
Site N4 – Monklands	34	25	<15
Site N5 - Glenlea Downs	29	17	<15
Site N6 – Lambton Meadows	29	22	<15
Site N7 – Cavendish	35	34	22
Site N8 – Lenore Station	29	31	26
Site N9 – Glenalpine	31	27	20
Site N10 – Fernie	25	25	23

Table 3 – Extract from the Savery & Associates Report No. SP0016-0 Rev 6
Rating Background Levels (RBL's) at Savery Sites N1-N10

Savery noted "Baseline sampling was conducted in autumn months between 13 and 21 April 2010, and between 2 and 9 July 2010. Some insect noise was evident on dusk and as a persistent feature throughout the night-time at a number of monitoring sites. The [insect noise level] contribution was removed to ensure that it did not bias [the determination of] Rating Background Noise Levels (RBL's)".

Savery also noted "Noise data that was affected by excessive wind speed or precipitation has been excluded from the aggregate noise level statistics. … Intervals with any precipitation or average wind-speeds above 5m/s were cross-referenced to the noise monitoring data and excluded from statistical summary data and the combined noise and weather data plots in the data appendices [of the report]."

It is further noted that, notwithstanding the fact that the RBL's determined by Savery were derived from data gathered in 2010, there is be no reason to expect that there has been any material change to the RBL values in the intervening nine-year time period. Furthermore, if there were to be any changes, then in line with common experience, the changes would be expected to result in marginally higher rather than marginally lower RBL values.

Savery determined that for remote rural areas, ie the homesteads in the vicinity of the coal project, the limit for acceptable levels of noise emission from the coal project would be 28dBA $L_{Aeq\ adj,1hr}$.

The results of the predictions of the $L_{Aeq\ adj,1hr}$ levels of noise emission from the operation of the mine to the homesteads in the general vicinity of the proposed power station were presented in Table 14 of Section 7.0 of the Savery report[2]. These predictions were made under "mild temperature inversion with slight downwind" atmospheric conditions, ie the worst-case conditions assessed by Savery.

By reference to the resultant noise levels presented in Figures 12-15 of the Savery report together with the degree of attenuation required to applied to the operations of the Galilee Coal Project to achieve compliance with the 28dBA limit set by Savery Section 7.1.3[3], the predicted noise levels due to the noise generating activities of the mine at various years of operation of the mine are shown in Table 4[4].

Design-ation by Savery	Design-ation by Reference to Table 1	Homestead/ Receptor Name	Predicted Noise Level by Savery, dBA, by Year of Operation				Attenuation by Savery to Meet 28dBA Limit at All Homesteads (dBA)				Resultant Noise Level after Attenuation, dBA, by Year of Operation			
			1	5	10	20	1	5	10	20	1	5	10	20
R03	NA (42)	Eureka	30	35	35	35	4	7	7	7	26	28	28	28
R06	74	Salt Bush	27	31	31	31	4	7	7	7	23	24	24	24
R09	63	Monklands	54	54	54	54	4	7	7	7	50	47	47	47
R10	49	Hobartville	32	34	34	34	4	7	7	7	28	27	27	27
ND	44	Gadwell	24	27	27	27	4	7	7	7	20	20	20	20
ND	46	Glen Innes /Bimblebox	36	46	46	49	4	7	7	7	32	39	39	42
R08	56	Kia Ora	45	50	50	64	4	7	7	7	41	43	43	57
ND	61	Mentmore	26	28	28	28	4	7	7	7	22	21	21	21
ND	84	Tressillian	25	27	28	28	4	7	7	7	21	20	21	21
ND	WC	Workers' Camp	~40	~40	~40	~40	4	7	7	7	~36	~33	~33	~33

Table 4 – Predicted Noise Levels at Receptors due to Operations of Galilee Coal Project by Year

ND = Not Designated

[2] It is noted that Savery did not directly determine the extent of noise emission to Gadwell, Glen Innes / Bimblebox, Mentmore, Tressillian or the Workers' Camp. Notwithstanding, by reference to Figures 12-15 of the Savery report, it can be determined that the level of noise from the operation of the mine emitted to Gadwell, Glen Innes / Bimblebox, Mentmore, Tressillian and the Workers' Camp will be (i) approximately 28dBA, 49dBA, 23dBA, 22dBA and 40dBA, respectively, without attenuation and (ii) approximately 21dBA, 42dBA, 16dBA, 15dBA and 33dBA, respectively, with attenuation applied to the operations of the mine.

[3] To adequately control noise emission from the mine such that compliance with the 28dBA limit was achieved at each of the homesteads which are either (i) not proposed to be acquired, or (ii) with the exception of Glen Innes / Bimblebox, if acquired, are to be leased back (ie Eureka and Salt Bush), recommendations were made to achieve a net 4dBA and net 7dBA reduction from the operations of the mine at Years 1 and 5, respectively. It is fully expected that given the nature of the recommended noise control measures, the same 4dBA and 7dBA reductions would accrue at each of the homesteads in a generally equal manner. The reason for the omission by Savery of Glen Innes / Bimblebox from the consideration of the magnitude of attenuation to be achieved is not known. Notwithstanding, from an inspection of Figures 12-15 of the Savery report, it is evident that at the time of preparation of that report, it was intended that open cut mining would be conducted through parts of Glen Innes / Bimblebox. In these circumstances, it may have been reasonable to expect that Glen Innes Homestead would need to be relocated as a result and, hence, need not be considered as part of the overall assessment.

[4] With respect to Monklands Homestead, ie R09 by Savery, at Section 9.0 of the Savery report it was noted: "To achieve the design planning levels at Residence Location R09 will require an impractical amount of attenuation. It is recommended that Waratah Coal consult with the property owner at Location R09 to investigate possible alternative options to mitigate potential impacts." With respect to Kia Ora Homestead, ie R08 by Savery, at Section 6.3 of the Savery Report, it is noted "As Residential Location R08 (Kia Ora) will not exist when construction starts, this residence has not been considered further in this report." To further emphasise the point regarding the cessation of use of the residence at Kia Ora and notwithstanding the intent to consider Location R08 no further in the report, at Section 7.2.2. of the Savery report it was noted: "Residence R08 is within the bounds of the 20 yr open pit and is therefore not anticipated to be a viable residence well before this point." In any event, as noted above in Section 2.0 above, Monklands and Kia Ora [homesteads] are each to be acquired by Waratah and will cease being residences. In these circumstances, there is no need to give any further consideration to the impact of noise emission to Monklands or Kia Ora [homesteads] due to the operation of the mine or the power station. consequently, Savery determined the required degree of attenuation various years of operation by reference to the non-acquired homesteads.

4.2 Moray Power Project

In November 2014, an environmental noise assessment was conducted by TTM Soundmatters as part of the supporting documentation for a Material Change of Use application for approval of the proposed Moray Power Project in the North Galilee Basin.

That report presented the results of noise level monitoring at two locations in close proximity of the proposed Moray Power Project. The closest of these locations to the Galilee Power Project was situated at the Labona Homestead approximately 165km north of the Galilee Power Station. The night-time RBL determined that this location was 22dBA. At the other monitoring location, the night-time RBL was determined to be 27dBA. Based on these results, TTM Soundmatters determined that the limit for acceptable levels of noise emission from the Moray Power Project was 28dBA $L_{Aeq\ adj,1hr}$ also.

Because the Moray Power Project is located approximately 160km north of the Galilee Power Project, quite properly TTM Soundmatters did not consider the impact of noise emission from the Moray Power Project to the homesteads in the vicinity of the Galilee Power Project.

5.0 Draft Environmental Authority (EPML00571313)

The limits for acceptable levels of noise emission from the operation of the Galilee Coal Project are set at Table D1 of Condition D1 of Draft EPML00571313 imposed by Department of Environment and Heritage Protection (now Department of Environment and Science). Condition D1 is reproduced below.

> **D1. Noise from mining activities not exceed the level specified in Table D1: Noise Limits Mine Noise when measured at a sensitive place or commercial place.**

Noise Level	Monday to Sunday		
	7am – 6pm	6pm – 10pm	10pm – 7am
$L_{Aeq,adj,15min}$	45	35	33
$L_{A01,adj,15min}$	55	50	40

Table D1: Noise Limits – Mine Noise

Notes:

1. $L_{Aeq\ adj,T}$ is the adjusted energy average A-weighted sound pressure level over the time period, T, using Fast response. It is the constant noise level whose energy is equivalent to that of the noise level which varies over time plus, if applicable, an adjustment for noise character, ie tonality and/or impulsiveness. The adjustment, if applicable, is usually 2dBA or 5dBA depending on the nature of the noise and the discernibility of the specific noise characteristic/s. $L_{Aeq\ adj,15min}$ is noise level measured over a 15 minute period.
2. $L_{A01\ adj,15min}$ is the A-weighted sound pressure level adjusted for noise character that is exceeded for 1% of the 15 minute monitoring time interval, using Fast response.

Clearly, while Savery recommended that the limit for acceptable levels of noise emission from operations of the mine be set at 28dBA $L_{Aeq\ adj,1hr}$ for 24-hour operation of the mine, a substantially higher limit of 33dBA $L_{Aeq\ adj,15min}$ has been set later by Department of Environment and Science[5].

[5] The 33dBA $L_{Aeq\ adj,15min}$ noise level limit applies to the night time period (ie 10pm-7am). Other less stringent limits apply during the day and evening time period. For 24 hour operation of the mine, however, the 33dBA limit becomes the default limit for assessment purposes. For all practical purposes, and having regard to all fluctuations in the level of noise emission generated by the mine from time-to-time, the noise levels generated by the activities of the mine when measured using the $L_{Aeq,adj,15min}$ would be expected to agree to those measured using the $L_{Aeq\ adj,1hr}$ noise level parameter with a tolerance of approximately 1-2dBA.

6.0 Appropriate Noise Level Limit for Proposed Galilee Power Project

6.1 Applicable Noise Level Limits and Considerations for Limit Splitting

As noted above in Section 1.0, the Galilee Power Station will be developed as a contingent, but separate, component of the overall Galilee Coal Project. Accordingly, Waratah Coal is seeking approval for the Galilee Power Station under the Planning Act.

If the same limit setting regime were to be adopted as applied by Savery, the limit for acceptable levels of noise emission from the operation of new power station would be 28dBA $L_{Aeq\ adj,1hr}$ also. Because the power station will be developed as a contingent component of the overall Galilee Coal Project, however, it is necessary to consider the level of noise generated by the mine and the power station in concert. Specifically, the more conservative approach to adopt would be to apply the 28dBA $L_{Aeq\ adj,1hr}$ target to the noise generated by the combined operation of the mine and the power station, rather than to each individually.

To set noise level targets for each of these two facilities in isolation from the other, it would be necessary firstly to split the 28dBA overall target between the two facilities. Ignoring the spatial separation of the operations of the mine from the location of the power station and adopting a simplistic approach to limit-splitting, ie an even split between each facility, the resultant noise level target for each would be 25dBA $L_{Aeq\ adj,1hr}$ (ie 28 - 3 dBA)[6].

Before accepting this approach to limit-splitting, however, there are two other matters to take into consideration.

Firstly, as noted above in Section 5.0, a substantially higher limit of 33dBA has been set by DES. Adopting the same simplistic approach, the resultant noise level limit for the mine and the power station separately would be 30dBA (ie 33 - 3 dBA).

Secondly, it is appropriate to have regard to the guidance Environmental Protection (Noise) Policy 2019 (EPP-N 2019) to establish limits for acceptable levels of noise emission for the combined operation of the mine and the power station. The relevant extracts from EPP-N 2019 follow in Section 6.2 below together with further discussion at Section 6.3.

Thereafter, the derived noise levels are presented on Section 6.4.

6.2 Environmental Protection (Noise) Policy 2019

6.2.1 Purpose, Management Strategies and Acoustic Quality Objectives

The purpose of EPP-N 2019 is stated at s.5 *Purpose* as follows:

"(1) The purpose of this policy is to achieve the object of the Act in relation to the acoustic environment.

"(2) The purpose is achieved by—

(a) identifying and declaring the environmental values of the acoustic environment; and

(b) stating acoustic quality objectives that are directed at enhancing or protecting the environmental values; and

[6] If one source generates a noise level of xx dBA, the addition of second identical noise source would result in a noise level 3dBA higher, ie (xx + 3) dBA. Correspondingly, if a noise level limit of yy dBA is applicable in circumstances where there is only one noise source to consider, a limit 3dBA lower (ie (yy - 3) dBA) would apply to each noise source if there are two noise sources to consider.

(c) providing a framework for making consistent, equitable and informed decisions that relate to the acoustic environment."

As noted in EPP-N 2019 at s.6 *Environmental values*, "The environmental values to be enhanced or protected under this policy are -

"(a) the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and

"(b) the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following -

(i) sleep;

(ii) study or learn;

(iii) be involved in recreation, including relaxation and conversation; and

"(c) the qualities of the acoustic environment that are conducive to protecting the amenity of the community."

At s.7 A*coustic quality objectives for sensitive receptors,* EPP-N 2019 states:-

"(1) This section and schedule 1 state the acoustic quality objectives to be achieved and maintained under this policy.

"(2) For a sensitive receptor stated in schedule 1, column 1, the value stated in schedule 1, column 3 is the acoustic quality objective for the time of day mentioned in schedule 1, column 2 for the sensitive receptor.

"(3) The environmental value to be enhanced or protected by the acoustic quality objective is stated in schedule 1, column 4 for the sensitive receptor.

"(4) An acoustic quality objective stated in schedule 1 is expressed as a measurement of an acoustic descriptor.

"(5) If it is reasonable in the circumstances, an acoustic quality objective may be progressively achieved and maintained as part of achieving the object of this policy over the long term."

As noted at s.8 *Management hierarchy for noise* of EPP-N 2019:-

"To the extent it is reasonable to do so, noise must be dealt with in the following order of preference—

"(a) firstly—avoid the noise;

Example for paragraph (a)—

locating an industrial activity in an area that is not near a sensitive receptor

"(b) secondly—minimise the noise, in the following order—

(i) firstly—orientate an activity to minimise the noise;

Example for subparagraph (i)—

facing a part of an activity that makes noise away from a sensitive receptor

(ii) secondly—use best available technology to minimise the noise;

"(c) thirdly—manage the noise.

Example for paragraph (c)—

using heavy machinery only during business hours"

Further, at s.9 *Management intent for noise*, it is stated:-

"(1) This section states the management intent for an activity involving noise that affects, or may affect, an environmental value to be enhanced or protected under this policy.

Note—

See Section 35 of the Environmental Protection Regulation 2019.

"(2) To the extent it is reasonable to do so, noise must be dealt with in a way that ensures—

(a) the noise does not have any adverse effect, or potential adverse effect, on an environmental value under this policy; and

(b) background creep in an area or place is prevented or minimised.

"(3) Despite subsection (2)(b), if the acoustic quality objectives for an area or place are not being achieved or maintained, the noise experienced in the area or place must, to the extent it is reasonable to do so, be dealt with in a way that progressively improves the acoustic environment of the area or place.

"(4) In this section—

background creep, for noise in an area or place, means a gradual increase in the total amount of background noise in the area or place as measured under the document called the 'Noise measurement manual' published on the department's website."

6.2.2 Derivation of Objective Criteria by Reference to EPP-N

To establish limits for acceptable levels of noise emission by reference to EPP-N 2019 and having regard to the provisions presented above, it can be concluded that (i) it is necessary achieve and maintain the acoustical quality objectives and, to the extent that it is reasonable to do so, (ii) address the management hierarchy for noise set at s.8 and (ii) satisfy the management intent for noise set at s.9.

Each is examined below.

Acoustic quality objectives

The acoustic quality objectives for residences are stated at Schedule 1 are detailed in the extract that follows below.

Column 1	**Column 2**	**Column 3**			**Column 4**
Sensitive receptor	**Time of day**	**Acoustic quality objectives (measured at the receptor, dBA)**			**Environmental value**
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$	
residence (for outdoors)	daytime and evening	50	55	65	health and wellbeing
residence (for indoors)	daytime and evening	35	40	45	health and wellbeing
	night-time	30	35	40	health and wellbeing, in relation to the ability to sleep

Extract from Schedule1 of EPP-N 2019 – Acoustic Quality Objectives for Residential Premises

s.8 *Management hierarchy for noise*

Each of the three elements of the management hierarchy are examined below.

(a) Avoid the noise:

As noted above, the closest homesteads which will continue to operate indefinitely as such will be located approximately 10-16km from the power station. These are very significant distances of separation which quite adequately fulfil the requirement to "avoid the noise".

(b) Minimise the noise, in the following order by:

(i) orientate an activity to minimise the noise, and

(ii) use of best available technology to minimise the noise

As is evident in Table 1 above, the closest of the nearby homesteads are located in a generally circular pattern in all directions from the power station. That is, somewhat fortuitously, the power station has been situated to be generally equidistant from the nearest ongoing homesteads. In doing so, there is little potential to orient the layout of the power station such that the noise in any particular direction is minimised. Rather, the level of noise emission will be minimised as a matter of course by appropriate selection of the major items of noise-generating equipment, ie notably the PA, FD and ID Fans, to maximise operating efficiency while minimising excessive levels of noise emission[7]. In addition, to the maximum extent possible, the level of noise generated by major items of power generation plant, ie boilers and turbines, will be controlled by minimising the openings in the walls of the Boiler House and Turbine Hall.

(c) Manage the noise:

Because the power station will continuously operate 24 hours per day, there is no potential to manage the noise by application of constraints on hours of operation. Rather, the focus for management of the noise will by application of the management intent of EPP-N. Refer below.

s.9 *Management intent for noise*

As noted above, to the extent it is reasonable to do so, noise must be dealt with in a way that ensures—

(a) the noise does not have any adverse effect, or potential adverse effect, on an environmental value under this policy; and

(b) background creep in an area or place is prevented or minimised.

As also noted above, the purpose of EPP-N 2019 is achieved by —

(a) identifying and declaring the environmental values of the acoustic environment; and

(b) stating acoustic quality objectives that are directed at enhancing or protecting the environmental values; and

(c) providing a framework for making consistent, equitable and informed decisions that relate to the acoustic environment.

Consequently, it can be concluded that s.9(a) can be fulfilled by achieving compliance with the relevant acoustical quality objectives.

Further, s.9(b) can be fulfilled by preventing or minimising background creep.

[7] Excessive noise is a "waste by-product" of poorly designed fans. Almost invariably, highly energy efficient fans generate lower noise levels than less efficient fans.

In contrast to the situation that prevailed under the now-repealed EPP-N 2008, the means of making a quantitative determination of prevention and minimisation of background creep that was presented in EPP-N 2008 has not been preserved in EPP-N 2019.

Rather, the concept of background creep has been relegated to a simple qualitative description in EPP-N 2019. Even in *Environmental Protection (Noise) Policy 2019 Explanatory Notes for SL 2019 No. 154* (EN No 154), very little extra information has been supplied to further elaborate upon the qualitative description of background creep, viz:

> *Background creep is defined as a gradual increase in the total amount of background noise in an area or place. The intent is to prevent or minimise background creep so that the background noise does not increase higher and higher over time to a point where it is unreasonable for the area or place. The policy refers to the measurement of background creep with reference to the "Noise measurement manual" published on the department's website.*
>
> *In some situations, it may be reasonable to allow a greater increase to the background noise in an area or place. That may be the case in an area or place with very low background noise where an activity will increase the background noise levels but only to the extent the environmental values of the area are still protected.* (Ref. EN No 154)

In these circumstances, notwithstanding the fact that EPP-N 2008 has been repealed, it is considered perfectly valid to re-adopt the quantitative assessment procedure presented at Part 4 Clause 10 *Controlling background creep* of EPP-N 2008, where the objective noise limits were set as noted below.

10 Controlling background creep

(1) This section states the management intent for an activity involving noise.

Note—

See section 51 of the *Environmental Protection Regulation 2008.*

(2) To the extent that it is reasonable to do so, noise from an activity must not be—

(a) for noise that is continuous noise measured by $L_{A90,T}$—more than nil dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$; or

(b) for noise that varies over time measured by $L_{Aeq,adj,T}$—more than 5dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$.

Taken together, it is reasonable to conclude that the three elements of the management hierarchy for noise can be fulfilled by (i) placement of the power station to maintain very substantial distances of separation from the nearby homesteads, (ii) appropriate selection and enclosure of major options of noise generating plant, (iii) ensuring that the relevant acoustic quality objectives are met and (iv) achieving compliance with the objective criteria of Part 4 Clause 10 *Controlling background creep* of EPP-N 2008.

Each of (i) and (ii) are discussed above. Further, the relevant acoustic quality objectives are presented in the extract above. It remains simply to establish the objective criteria to achieve control of background creep. It is noted that Part 4 Clause 10 *Controlling background creep* of EPP-N 2008 defined criteria for controlling background creep by reference to two methodologies. The determination of the appropriate methodology is presented in Section 6.3 following.

6.3 Controlling Background Creep Criteria

It is noted that the power station and the activities of the mine are separated several kilometres from each other. By reference to the mine layout at the 20 year horizon as shown in Figure 15 of the Savery report, it can be determined that the centre of the power station will be located approximately 7 km from the centre of the eastern pit of the mine operations, 13km from the southern extent of the east pit and 12 km from the centre of the western pit. This degree of separation produces two effects. Each is discussed below.

In the first instance, and ignoring for the moment the minor differential attenuation by topographical features, the level of noise emission to the nearby receptors under calm wind conditions will be essentially a function of the distance of separation of the receptor from each of the two noise generating facilities. Because the separation of the nearest receptors from each of the facilities (ie 10-16 km) is of the same order as the separation of the facilities from one another (ie 7-13 km), the noise level contributions to each receptor due to each of the facilities will tend to vary significantly from one receptor to the next.

In these circumstances, while it would be attractive initially to naïvely split the noise level limit evenly between two facilities, this simplistic approach would be appropriate only for those residences which are located equidistant from each of the two facilities.

In the second instance, because the level of noise emission to any particular receptor will be a function of not just the distance of separation but also wind speed and direction, the significance of the level of noise emission from one facility relative to the other will vary with the prevailing wind conditions. Only for those receptors located in a very close to the extended centreline joining the two facilities will the relative noise level contributions be largely insensitive to wind speed and direction. For this latter case, because the facilities are 7-13 km apart, the separation distances of such receptors from each facility would be approximately 7-13 km at variance to each other.

Of course, this is contrary to the requirement noted above for receptors to be equidistant from each of the two facilities.

Taken together, it can be readily determined that for the nearby receptors as a group, the level of noise emission from the combined operation of the two facilities would be judged to be time-varying in response to prevailing atmospheric conditions.

That is, the noise emitted to the nearby residential receptors from the combined operation of the mine and the power station would be best described as “noise that varies over time”. In these circumstances, and to the extent that it is reasonable to do so, the limit for acceptable levels of noise emission from the combined operation of these two facilities would be set in accordance with Clause 10(2)(b) of EPP-N 2008 as noted above.

When establishing the $L_{A90,T}$ value, ie the background noise level, to be adopted in these circumstances, it is necessary to have regard to (i) the question of reasonableness as well as (ii) advice provided by DES and its predecessors (ie Department of Environment and Heritage Protection and Department of Environment and Resource Management) in answer to this question.

Specifically, in situations where background noise levels (measured as the RBL) are very low, ie <25dBA, DEHP and DERM have advised that it is not necessary to adopt the measured RBL when establishing the appropriate noise level limit. Rather, in these circumstances an underpinning to the background noise level is to be applied by adopting a lower bound of 25dBA to all assessments.

Consequently, by application of the controlling background creep provisions of Clause 10, the resultant noise level limit for the combined operation of the mine and the power station would be 30dBA $L_{Aeq,adj,T}$.

Because of the time-varying nature of the level of noise emission from the combined operation of the two facilities in response to prevailing atmospheric conditions, adopting an equal limit for each (ie simply splitting evenly between the two facilities the limit set by Savery) is likely to lead to an over-constraint on the operations of each. In these circumstances, a more nuanced approach to dividing the applicable limit should be considered. This matter is discussed further in Section 6.4 following.

6.4 Derived Noise Level Limits

It is noted that the assessment conducted by Savery was completed in August 2011. At that time, and as noted by Savery, it was considered that "low cumulative noise impact may be experienced through the potential close proximity to the mine site of noise sources at the Galilee Basin Power Station (ie Galilee Power Project), Alpha Coal Mine and South Galilee Coal Project." As also noted by Savery, it was anticipated that the noise from these facilities "would have a negligible effect on the nearest residences".

In view of this, Savery gave no further consideration to the cumulative effects of the contribution of noise from the operation of the future power station. Correspondingly, when establishing the appropriate degree of attenuation needed to be achieved by noise control measures applied to the activities of the mine, no consideration was given by Savery to the need to divide the noise level limit between the activities of mine and the activities of the future power station to allow the noise level contributions from any future power station to be accommodated.

Rather, it was considered that the required acoustical performance of the noise control measures would need to be set at the point where the level of noise emitted solely from the mine activities was not greater than 28dBA.

This approach raises a potential dilemma.

Specifically, if the level of noise emission from the activities of the mine is reduced such that the 28dBA target is met exactly by the noise emitted by the mining activities, ie as recommended by Savery, there will be no headroom left to accommodate noise from the power station. That is, there will be no potential to operate the power station without the noise from the power station automatically resulting in an exceedance of the noise limit.

From an examination of the results presented in Table 4 above, it is evident that of the homesteads which were to remain unacquired, the homestead most adversely affected by noise from the mine was the Eureka Homestead. To achieve compliance with the 28dBA noise level limit set by Savery, a 7dBA attenuation target was proposed by Savery for the operation of the mine from Year 5 onwards. By application of noise control measures to the operations of the mine sufficient to attain this degree of attenuation, compliance with the 28dBA limit at the Eureka Homestead would be achieved, but importantly, without any ability to accommodate noise from the operation of the power station.

In these circumstances, there are two courses of action open to allow room for the power station to operate. These are: (i) apply a higher degree of attenuation to the operations of the mine and/or (ii) elevate the noise level limit slightly. While it is readily possible to hypothesise about additional and/or enhanced noise control measures which could be applied to the operations of the mine, without a full understanding of the modelling assumptions adopted by Savery and without access to the mine noise model itself, such measures would remain primarily matters of speculation.

Moreover, any suggestions for additional / enhanced noise control measures would not be matters which could legitimately form recommendations for noise control treatments to be applied, endorsed or conditioned as part of any approval for the power station.

In these circumstances, the second course of action warrants attention.

As noted above, the 28dBA limit adopted by Savery in 2011 was consistent with that derived by TTM Soundmatters as part of the supporting documentation for a Material Change of Use application for approval of the proposed Moray Power Project in the North Galilee Basin, but was more conservative than both (i) the 33dBA noise level set by DES in Draft EPML00571313 and (ii) the 30dBA limit that would apply under with Clause 10(2)(b) of EPP-N 2008 after application of the reasonableness test.

In view of this outcome, there is a perfectly reasonable case to be made that the appropriate target for acceptable levels of noise emission to homesteads which were to remain unacquired due to the combined operation of the two facilities should be 30dBA rather than 28dBA. This conclusion is supported by Clause 10(2)(b) of EPP-N 2008. Further, by reference to the discussion following below, the 30dBA limit is lower than, ie more stringent than, the acoustic quality objectives. Finally, a 30dBA limit would be more constraining on the level of noise generated by the activities of each of facilities than the 33dBA limit set under Draft EPML00571313.

A limit of 30dBA for the noise emitted by the mine and the power station operating in tandem has been adopted hereafter.

The appropriate mechanism for splitting the responsibility for achieving compliance with the 30dBA limit at the homesteads can then be derived by giving due regard to the relevant constraints and opportunities applying in each case. This matter and the derived noise level limits for each of the noise-sensitive receptors are discussed in more detail below.

Putting aside noise emission to Glen Innes / Bimblebox (refer also discussion at Footnote 4 in Section 4.1 above), because the level of noise emission to Eureka Homestead due to the mine operations is predicted to be 28dBA, the noise level contribution from the power station to this receptor should not exceed 26dBA if the 30dBA limit is not to be breached (ie 28dBA + 26dBA = 30dBA). It is noted that Eureka Homestead is located 24.3 km SSW of the centre of the proposed location of the power station and is 22 km south of the centre of the mine activities. In these circumstances, it is apparent that the 30dBA limit would need to be split such that the permissible level of noise emission from the further-distant mine is 28dBA, while the level of noise from the power station situated at closer proximity is not to exceed a more stringent target of 26dBA.

Glen Innes Homestead and Workers' Camp were not included in the list receptors assessed by Savery. This matter is discussed further at Footnote 4 above. Each is discussed below.

In the absence of an assessment of the impact of noise from the mine, the limit for acceptable level of noise emission to Glen Innes Homestead due to operation of the power station has been set at 27dBA[8].

[8] As discussed in Footnote 4 above, the reason for the omission of Glen Innes / Bimblebox from the consideration impact of noise emission from the mine is not known. From an inspection of Figures 12-15 of the Savery report, however, it is evident that at the time of preparation of that report, it was intended that open cut mining would be conducted through parts of Glen Innes / Bimblebox. In these circumstances, it may have been reasonable to expect that the Glen Innes Homestead would need to be relocated as a matter of course and, hence, need not to be considered as part of the acoustical assessment. In these circumstances, either (i) the Glen Innes Homestead would be relocated as a matter of course and, hence, it will not be necessary to consider the impact from either or both of the mine and power station, or (ii) if the Glen Innes Homestead were to be retained, further remedial measures beyond those envisaged by Savery will need to be implemented into the operation of the mine, notwithstanding the fact that no such remedial measures have yet been formulated. In the absence of further information, and given that the need to control of noise emission to Glen Innes Homestead affects both facilities to the same degree, the prudent means of examining the acceptability of the impact of noise from the operational power station is to assume that responsibility for control of noise emission to Glen Innes Homestead will be shared equally by the mine and the power station, resulting in a limit for acceptable levels of noise emission from each of 27dBA.

Noise intrusion into the Bimblebox Nature Refuge is discussed in further detail in Section 10.0 following.

By reference to the results presented in Table 4 above, it is evident that after the application of the 4dBA (Year 1) attenuation and 7dBA (Year 5) attenuation recommended by Savery, the level of noise emitted to the Workers' Camp by the operation of the mine is expected to be about 36dBA at Year 1 and about 33dBA at Year 5 and thereafter. These noise levels exceed by at least 5dBA the 28dBA limit which would otherwise have been expected to have been applied by Savery. Because the Workers' Camp will be designed and operated by Waratah Coal, it is fully expected that the residential component of the camp can be situated so that it is exposed to the lowest level of noise emission from the mine and the power station that is feasible having regard to other relevant siting constraints.

In addition, because the accommodation component of Workers' Camp will be designed specifically to suit the circumstances, it can be designed to incorporate any level of noise control reasonably required to be implemented. More particularly, it is also understood that in accordance with standard practice accommodation within the Workers' Camp will be air conditioned.

Furthermore, while the objective of controlling the level of noise emission from the combined operation of the mine and the power station to 30dBA is appropriate for private residences located in rural areas and owned by others, it is unnecessarily constraining on the design and operation of residential premises where the ownership and operation of the premises is by the applicant, ie Waratah Coal in this instance. Recognising this distinction in the ownership and operation, a quite adequate level of external acoustical amenity can be achieved by imposing less onerous noise level limits.

Guidance on the method to apply to achieve this outcome can be obtained from (i) Schedule 1 Acoustic Quality Objectives of EPP-N 2019 and (ii) Item 7 of Table 1 of AS/NZS 2107:2016 *Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors*.

More specifically, by application of the acoustic quality objectives of EPP-N 2019, a satisfactory level of health and well-being would be achieved if the $L_{Aeq,adj,1hr}$ noise level due to the combined operation of the mine and the power station does not exceed the following values during the night time period:-

- External to a residence: 50dBA
- Inside a residence: 30dBA

Similarly, by reference to AS/NZS 2107:2016, "the design sound level $L_{Aeq,T}$ range inside sleeping areas (night time) in houses in rural areas with negligible transportation is 25dBA to 30dBA".

Having regard to the nature of construction of workers' accommodation within the Workers' Camp and in full expectation of this accommodation being fully air conditioned, it can be readily determined that to ensure compliance with an internal noise level limit of 30dBA, the equivalent external $L_{Aeq,T}$ noise level limit would be 52dBA. In these circumstances, provided the external noise levels do not exceed the 50dBA external acoustical quality objective, compliance with the requirements of both EPP-N 2019 and AS/NZS 2107:2016 would be achieved automatically.

As noted above, the level of noise emitted to the Workers' Camp by the operation of the mine is expected to be about 33-36dBA. In the context of an external noise level limit of 50dBA, such a contribution would be negligible. Correspondingly, the 50dBA limit can be applied directly to the noise emitted by the operation of the power station. In fact, it can be readily concluded that the level of noise emission from the operation of the mine could increase to 40dBA before there would be any warrant to reduce the 50dBA limit for the operation of the power station.

If each of these considerations is examined on its merits, the resultant set of limits for acceptable levels of noise emission from the power station can be determined to be as shown in Table 5 overpage.

Design-ation by Savery	Design-ation by Reference to Table 1	Homestead/ Receptor Name	Predicted Noise Level from Mine (by Savery after Attenuation), dBA				Derived Noise Level Target, ie Permissible Limit for Noise from Power Station, dBA				Resultant Noise Level Due Combined Operations, dBA			
			1	5	10	20	1	5	10	20	1	5	10	20
R03	NA (42)	Eureka	26	28	28	28	28	26	26	26	30	30	30	30
R06	74	Salt Bush	23	24	24	24	29	29	29	29	30	30	30	30
R09	63	Monklands	50	47	47	47	NA	NA	NA	NA	NA	NA	NA	NA
R10	49	Hobartville	28	27	27	27	26	27	27	27	30	30	30	30
ND	44	Gadwell	20	20	20	20	30	30	30	30	30	30	30	30
ND	46	Glen Innes /Bimblebox	32	39	39	42	27	27	27	27	33	39	39	42
R08	56	Kia Ora	41	43	43	57	NA	NA	NA	NA	NA	NA	NA	NA
ND	61	Mentmore	22	21	21	21	29	29	29	29	30	30	30	30
ND	84	Tressillian	21	20	21	21	29	30	29	29	30	30	30	30
ND	WC	Workers' Camp	~36	~33	~33	~33	50	50	50	50	50	50	50	50

Table 5 – Resultant Noise Level Targets by Year for Acceptable Levels of Noise Emission due to Operation of the Power Station

From the results presented above in Table 5, it can be determined that, provided the level of noise emission from the operation of the power station to each receptor does not exceed the derived noise level target applicable to that particular receptor, acceptable conditions for operation of the power station will be achieved.

7.0 Noise Levels Generated by Operation of Power Station

To allow an accurate determination to be made of the extent of noise emission into the community due to operation of the proposed power station, a SoundPLAN[9] noise level prediction model was prepared. The noise levels emitted throughout the community were calculated using the CONCAWE[10] prediction algorithms as applied by SoundPLAN.

The inputs for the noise prediction model comprised:-

- Locations and dimensions of major noise sources by reference to the power station layout presented in Figures 6 and 9.
- Noise source heights by reference to information provided by the proponent and by reference to Figure 9.

[9] SoundPLAN is an integrated software package for noise and air pollution evaluation developed in Germany by Braunstein + Berndt GmbH. It has been configured to predict the extent of (i) industrial noise emission using the CONCAWE algorithms (with appropriate modifications for short-distance noise level predictions) and (ii) road traffic noise intrusion by application of the CRTN '88 algorithms. It is in use in more than 48 countries and has had widespread application throughout Australia. It is endorsed by DES and most other State environmental authorities.

[10] Conservation of Clean Air and Water in Europe. The CONCAWE methods were developed under funding from European and North American groups to quantify noise prediction procedures for emission from large industrial facilities such as oil refineries and petrochemical plants. The methods were first published in 1981 in research paper CONCAWE Report No. 4/81 entitled *The Propagation of Noise from Petroleum and Petrochemical Complexes to Neighbouring Communities*. In contrast to the methods of ISO 9613-2:1996, the CONCAWE algorithms allow prediction of noise emission under calm conditions and specified stability class conditions. The CONCAWE algorithms are endorsed by Department of Environment and Science and most State environmental authorities.

- Nearest receptors as located by reference to electronic files provided by the proponent and as shown on current aerial photographs.
- Topographical contours and cadastral information for the surrounding land as supplied by QSpatial.
- Source sound power levels noted in Table 2 and as derived by further calculation.

The noise model took account of each of the following matters:-

- Frequency-dependent energy distribution of the sound power levels of each major source
- Source locations in 3-D space
- Source directivity effects
- Effect of attenuation due to distance between sources and receivers
- Effect of attenuation due to terrain
- Effect of atmospheric and anomalous excess absorption

To ensure that the level of noise emission to the community was assessed for all relevant commonplace and likely worst-case atmospheric conditions, noise levels were predicted under five scenarios.

The schedule of the scenarios and the figures showing the resultant noise contour plots are detailed in Table 6 below.

Notes:

All noise levels presented in Figures 10-14 are the predicted component $L_{Aeq\ adj,15\ min}$ noise levels and are designated by the generic $L_{Aeq,T}$ noise level parameter. In the context of (i) the nature and spectral distribution of the noise emission from the power station and (ii) the nature and level of ambient noise at the receptor locations, the adjustment (ie $_{adj}$) penalty has been assessed to be zero in all instances. That is, the resultant $L_{Aeq,T}$ noise levels are equivalent to the $L_{Aeq,adj\ T}$ noise levels.

Scenario	Time	Wind	Temperature Inversion	Pasquill Stability Class	Figure
1	Day	Calm	No	A	7
2	Day	2.5m/s downwind	No	B	8
3	Night	Calm	No	D	9
4	Night	2.5m/s downwind	No	F	10
5	Night	Calm	Yes	G	11

Table 6 – Assessment Scenarios and Corresponding Figures – No Noise Control Applied

The predicted noise levels at each of the identified receptor locations are presented in Table 7.

Receptor		Predicted Noise Levels (dBA) for Each Prediction Scenario with No Noise Control (Figure Reference)				
No	Description	1 (Fig 7)	2 (Fig 8)	3 (Fig 9)	4 (Fig 10)	5 (Fig 11)
42	Eureka	<5	<10	<10	<15	<20
74	Salt Bush	9	19	17	20	22
49	Hobartville	13	22	20	23	25
44	Gadwell	3	13	11	14	17
46	Glen Innes	9	19	16	20	22
61	Mentmore	9	19	16	20	22
84	Tressillian	8	17	15	18	21
WC	Workers' Camp	29-45	36-49	33-47	37-50	36-48

Table 7 – Predicted Noise Levels at Each Identified Receptor Location – No Noise Control Applied

Notes:

In accordance with standard techniques and recognising the accuracy of prediction of emitted noise levels, all predicted noise levels presented in Table 7 have been rounded to the nearest whole decibel. As also noted above re the results presented in Figures 10-14, all results presented in Table 7 are the predicted component $L_{Aeq\ adj,15\ min}$ noise levels and are designated by the generic $L_{Aeq,T}$ noise level parameter. At all receptor locations, the adjustment (ie $_{adj}$) penalty has been assessed to be zero.

The noise levels presented in Figures 10-14 and Table 7 are based on the power station operating under 100% load with both 700 MW units operating, but without any noise control applied. This is the likely worst-case operating scenario. Noise levels will be approximately 3dBA lower with only one unit operating, ie the normal operating condition.

An analysis of the degree of compliance achieved by the noise emitted from the power station against the noise level target applying to each of the receptor locations is presented in Table 8 following.

Receptor		Predicted Maximum Noise Level, dBA	Noise Level Target, dBA	Meets Target (Yes/No)	Attenuation Required, dBA
No	Description				
42	Eureka	<20	26	Yes	0
74	Salt Bush	22	29	Yes	0
49	Hobartville	25	26	Yes	0
44	Gadwell	17	30	Yes	0
46	Glen Innes	22	27	Yes	0
61	Mentmore	22	29	Yes	0
84	Tressillian	21	29	Yes	0
WC	Workers' Camp	50	50	Yes	0

Table 8 – Degree of Compliance Achieved and Attenuation Required – No Noise Control Applied

From the results presented above in Tables 7 and 8, it can be seen that under all prediction scenarios, the level of noise emission to the nearest unacquired homesteads, ie Salt Bush (74), Gadwell (44), Glen Innes (46), Mentmore (61) and Tressillian (84) as well as (i) the nearby temporarily unacquired Hobartville Homestead (49) and (ii) the further-distant Eureka Homestead (42) is predicted to comply with the relevant noise level target applying these receptors.

In addition, the 50dBA limit deemed appropriate for the Workers' Camp (ref. Section 6.2 above) will also be met across the entirety of the camp area. By reference to noise contours plots presented in Figures 10-14, it is evident that the noise levels across the camp site will vary by up to 16dBA from the NW corner to the SE corner. Clearly, if it were desired to achieve lower ambient noise levels due to the operation of the power station, the most favourable portion of the camp would be the area at the SE extent. In this area, noise levels are predicted to be in the range 30dBA to 40dBA year-round.

Having regard to these results, it can be readily concluded that there would be no warrant to implement any specific noise control measures into the design of the power station. Notwithstanding, it would be appropriate to consider locating the accommodation within the Worker's Camp at the SE extent of the camp site to ensure that a higher level of acoustical amenity is achieved for the workers.

8.0 Noise During Construction

Having regard to the nature of type and number of noise sources expected to be in use during the construction of the power project, it can be determined that the total sound power level of all construction noise sources acting in unison, ie simultaneously, would be 124-127dBA re 10^{-12}W $L_{Aeq,T}$. In practice, of course, it is very unlikely that all of the items of construction plant and equipment will be operated simultaneously at any time during the construction phase.

By contrast, the total sound power level of the operating power station will be 140dBA re 10^{-12}W $L_{Aeq,T}$.

Furthermore, it should be noted that all of the major construction noise sources will operate at, or close to, ground level. This is in contrast to the noise sources of the operating power station which will be located at elevations of 5m to 100m above ground level and, hence, will be afforded much lower rates of attenuation over the ground than will be case for the construction noise sources.

Taken together, it can be readily determined that the level of noise emission during construction will be at least 10dBA below the level of noise emission generated by the power station when operational. In these circumstances, there will be no requirement to implement any specific noise control treatments to attenuate noise during the construction phase.

9.0 Noise During Commissioning

The dominant noise sources during commissioning phase will result from steam releases during short-term purging activities and safety valve checking. Based on noise level measurements conducted at other similar facilities, the source sound power levels of these commissioning activities are typically in the range 115-122dBA re 10^{-12}W $L_{Aeq,T}$. In addition, the energy generated by these activities is centred in the 1000Hz and 2000Hz octave bands. In these octave bands, the level of noise emission is more rapidly attenuated by atmospheric absorption than is the case for general operational and construction noise.

Taken together, it can be readily concluded that the level of noise emitted to the receptors during commissioning phase will be at least 15dBA below the level of noise generated during the operational phase. In these circumstances, there will be no requirement to implement any specific noise control treatments to attenuate noise during the commissioning phase.

10.0 Noise Emission into Bimblebox Nature Refuge

Bimblebox Nature Refuge is situated 6.1km from the centre of the power station at its closest point, but more than 19km distant at its furthest point. The level of noise intrusion into the refuge will depend upon the separation distance from the power station and the atmospheric conditions prevailing at the time.

Given the large variation in separation distances coupled with the significant variability in emitted noise levels due to changes in atmospheric conditions, these effects will result is a large variation in the level of noise emission to points throughout the refuge.

By reference to the noise contour plots presented in Figures 10-14, the variation of noise levels throughout the refuge due to distance and atmospheric conditions can be determined to be as detailed below in Table 9 below.

Scenario	Figure	Time	Wind	Temperature Inversion	Predicted Noise Levels in Bimblebox Nature Refuge, dBA	
					SW Corner	NE Corner
1	7	Day	Calm	No	0	27
2	8	Day	2.5m/s downwind	No	9	35
3	9	Night	Calm	No	7	32
4	10	Night	2.5m/s downwind	No	11	36
5	11	Night	Calm	Yes	15	35

Table 9 – Predicted Range of Noise Levels in Bimblebox Nature Refuge for Each Assessment Scenario

The noise levels presented in Table 9 are based on the power station operating under 100% load with both 700 MW units operating and with noise control applied. Noise levels will be approximately 3dBA lower with only one unit operating, ie the normal operating condition. Furthermore, during the construction and commissioning phases noise levels will be substantially lower than the noise levels generated during the operational phase of the power station.

To put the predicted noise levels in to context, it is appropriate to have regard to the otherwise prevailing ambient noise levels. From a review of the available noise studies conducted in the general area, there are no reports of direct monitoring of current ambient noise levels having been undertaken within the refuge. Rather, the closest noise level monitoring locations were at the three homesteads located nearby, ie Monklands (site), Cavendish (W) and Lambton Meadows (SW).

Aggregating the results at these three homesteads, the day time and night time average ambient noise levels measured as $L_{Aeq,T}$ (ie the same noise level parameter as adopted for assessment of the noise from the power station) were recorded to be as follows:-

- Day time: 39-52dBA (mean = 47dBA)
- Night time: 24-45dBA (mean = 38dBA)

In the absence of noise level data obtained at any locations within the refuge, it would be quite reasonable to assume that the same ambient noise levels would apply to the refuge. In fact, given the greater abundance of trees throughout the reserve relative to the extent of vegetation at the monitoring locations, it would be reasonable to expect that at times when wind speed is other than calm, the average $L_{Aeq,T}$ noise levels in the refuge will be higher than these recorded at the homesteads due to the noise generated by the combined effect of the rustling of leaves and the noise generated by the wildlife itself.

On this basis, while the operation of the power station may result in a minor elevation of the otherwise prevailing ambient noise levels in the north eastern extent of the refuge, the effect is anticipated to be confined to the night time period only. Furthermore, the area of the refuge that is likely to be affected in this way will be quite small.

During the day time period, and by reference to the results presented in Table 9, it is expected that the level of noise generated by the power station will be below the otherwise prevailing ambient noise levels in the refuge.

In November 2019, Austecology prepared a report to present the results of an investigation into the potential impacts associated with noise and air emissions of the proposed power project upon *MNES fauna, ie MNES Fauna - Emissions and Noise Assessments Galilee Power Station, Central Queensland*. By reference to that report, it was determined that "Collectively, research findings reviewed for this assessment indicate that the onset of noise disturbance occurs at about 60dBA for fluctuating noise sources and 50dBA for steady-state noise sources."

Clearly, from the results presented above, it can be readily concluded that, under the most adverse propagation conditions, the steady-state noise generated by the operation of the proposed power station will be well below (ie more than 10dBA below) the onset of any disturbance even at those locations in the refuge closest to the power station.

On this basis, there would be no warrant to implement any specific noise control measures into the design of the power station.

11.0 Conclusions

From the results of the assessment presented above, the following conclusions can be drawn:-

- Noise will be generated by the proposed power project (i) during the construction phase, (ii) during the commissioning phase and (iii) when operational.
- There are a number of receptor premises in the vicinity of the site of the proposed power project. Eight of these will lie within 16km of the centre of the power station. The three closest, ie Monklands, Hobartville and Kia Ora, will be acquired by either Waratah Coal (in the case of Monklands and Kia Ora) or at some alter date by Alpha Coal (in the case of Hobartville). Of the other five nearby homesteads which will remain unacquired indefinitely, the two closest will be Salt Bush Homestead (11.9km distant) and Mentmore Homestead (12.0km distant).
- The Bimblebox Nature Refuge to the SW of the power station site will extend for a distance of 6.1km to 19.1km from the centre of the new facility. The Glen Innes Homestead located within the Bimblebox Nature Refuge is situated 12.1km from the power station but it is understood that this dwelling will not operate in the normal sense of a homestead. Rather, it will provide short-term temporary accommodation at various times of the year for occupants wishing to stay within the nature refuge for periods of time of varying lengths.

- As part of the Galilee Coal Project, a new Workers' Camp is proposal to be constructed in the general vicinity of the site. As currently located, the Workers' Camp will be situated 3.2-6.0km SSE of the power station.
- It is noted that Savery & Associates Pty Ltd adopted a limit of 28dBA for acceptable levels of noise emission from the Galilee Coal Project. (Ref. Savery Report No. SP0016-0 Revision 6, April 2011.) In that report, it was anticipated that noise from the Galilee Power Project "would have a negligible effect on the nearest residences". Consequently, the impact of noise from the operation of the power station was not included in the assessment conducted by Savery. Nor was there any headroom included in the proposed 28dBA limit to accommodate the later inclusion of the power station into the total development of the overall project.
- For a number of reasons, it is considered that the appropriate limit for acceptable levels of noise emission from the combined operation of the two facilities to the unacquired homesteads and the Hobartville Homestead should be 30dBA $L_{Aeq,adj,T}$ rather than 28dBA $L_{Aeq,adj,T}$. Having regard to the level of noise emission predicted by Savery to be generated by the operation of the Galilee Coal Project, the relevant noise level targets applying to noise emitted from the proposed power station to these identified receptor locations will vary from 26dBA to 30dBA.
- For the Workers' Camp and having regard to the nature of construction and operation of the workers' accommodation within the camp, it can be readily determined that the appropriate external noise level limit for successful operation of the Workers' Camp (ie without exceeding the external noise levels deemed appropriate by reference to EPP-N 2019 and AS/NZS 2107:2016), could be set at 50dBA $L_{Aeq,adj,T}$.
- To allow an accurate determination to be made of the extent of noise emission into the surrounding community, a SoundPLAN noise level prediction model was prepared for the power station. To ensure that the level of noise emission to the community was assessed for all relevant commonplace and likely worst-case atmospheric conditions, noise levels were predicted under five different scenarios. The level of noise emission to all nearby unacquired receptor premises was predicted to comply with the relevant noise level target applying to each particular receptor under all assessed prediction scenarios.
- Notwithstanding, during the detailed design phase of the project, ie when further more-refined details of the proposed noise generating equipment will be available, it would be prudent to re-examine the extent of noise intrusion into the community and confirm the degree of compliance that will be achieved. Should it transpire that noise reduction measures are found to be necessary/appropriate, the options for noise control should be examined so that the appropriate specifications for noise control measures can be set and the most cost-effective noise control treatments selected to the achieve the optimum outcome.
- The level of noise emission to the site of the Workers' Camp will vary by up to 16dBA from the NW corner to the SE corner of the site. To minimise the extent of noise intrusion to the residential component of the camp so that the external acoustical amenity of the accommodation can be optimised, the most favourable portion of the camp for construction of the accommodation would be the area at the SE extent. In this portion of the site, noise levels are predicted to lie in the range 30dBA to 40dBA year-round.
- From these results, it can be readily concluded that there would be no warrant to implement any specific noise control measures into the design of the power station. Notwithstanding, it would be appropriate to consider locating the accommodation within the Worker's Camp at the SE extent of the camp site to ensure that a higher level of acoustical amenity is achieved for the workers.

- The level of noise emission during the construction and commissioning phases of the power station will be at least 10dBA and 15dBA, respectively, below the level of noise emission generated by the attenuated power station when operational. In these circumstances, there will be no requirement to implement any specific noise control treatments to attenuate noise during either construction or commissioning.
- Having regard to the results of the noise level predictions throughout the Bimblebox Nature Refuge, it can be readily concluded that, under the most adverse propagation conditions, the steady-state noise generated by the operation of the proposed power station will be well below (ie more than 10dBA below) the onset of any disturbance even at the closest locations of the refuge to the power station. On this basis, there would be no warrant to implement any further noise control measures into the design of the power station.

12.0 Recommendations

To adequately control noise emission from the power station, it is recommended that during the detailed design phase of the project, ie when further more-refined details of the proposed noise generating equipment will be available, the extent of noise intrusion into the community should be re-examined so that the degree of compliance that will be achieved can be confirmed. In the event that noise reduction measures are found to be necessary/appropriate, the options for noise control should be examined so that the appropriate specifications for noise control measures can be set and the most cost-effective noise control treatments selected to the achieve the optimum outcome.

In addition, to ensure that the level of acoustical amenity achieved for the workers is optimised, it would be appropriate to consider locating the accommodation component of the Worker's Camp at the SE extent of the camp site.

Report prepared by
Acoustics RB Pty Ltd

Russell Brown
RPEQ 2799

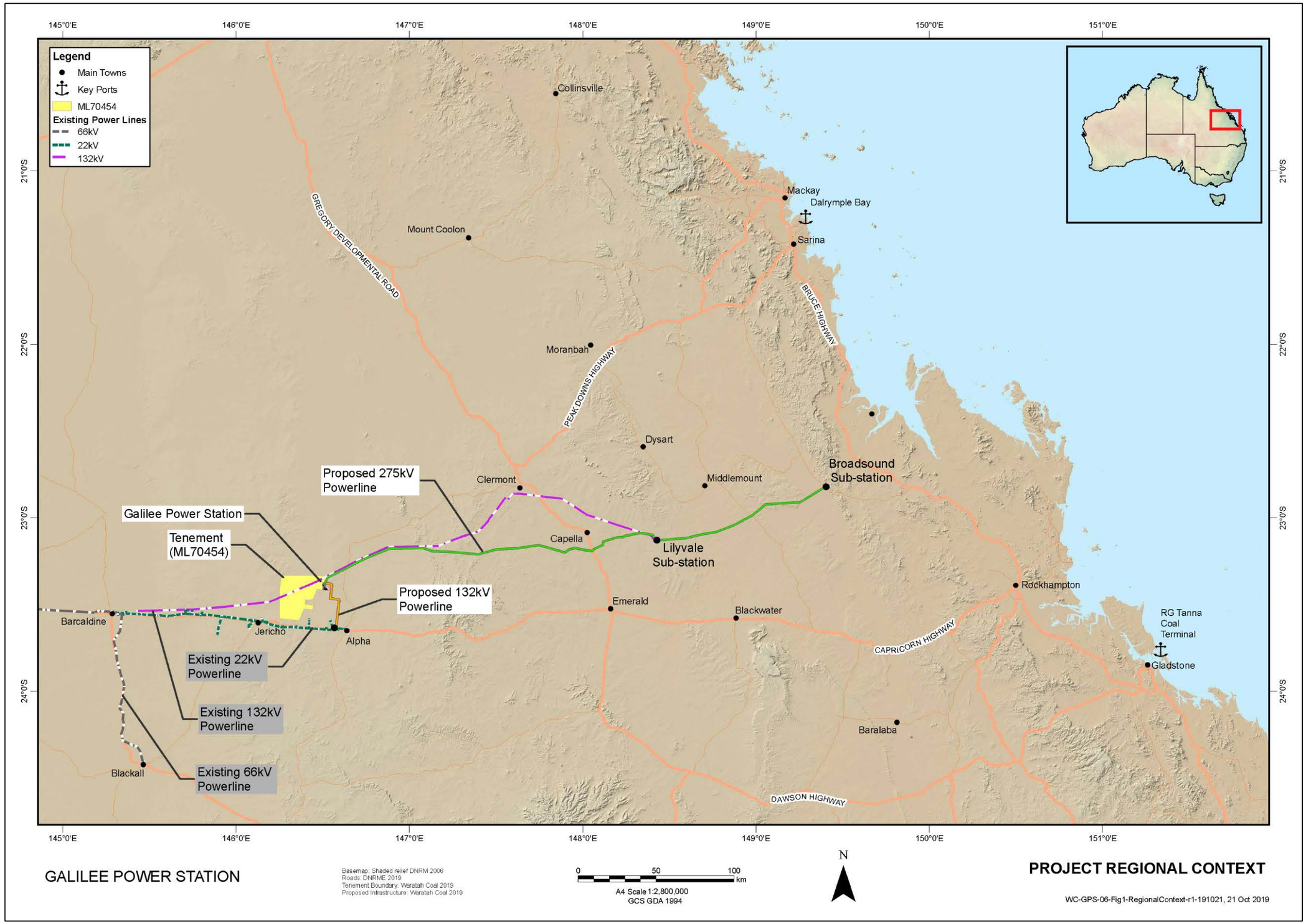

Figure 1 – Regional Context of Proposal and Location of ML70454

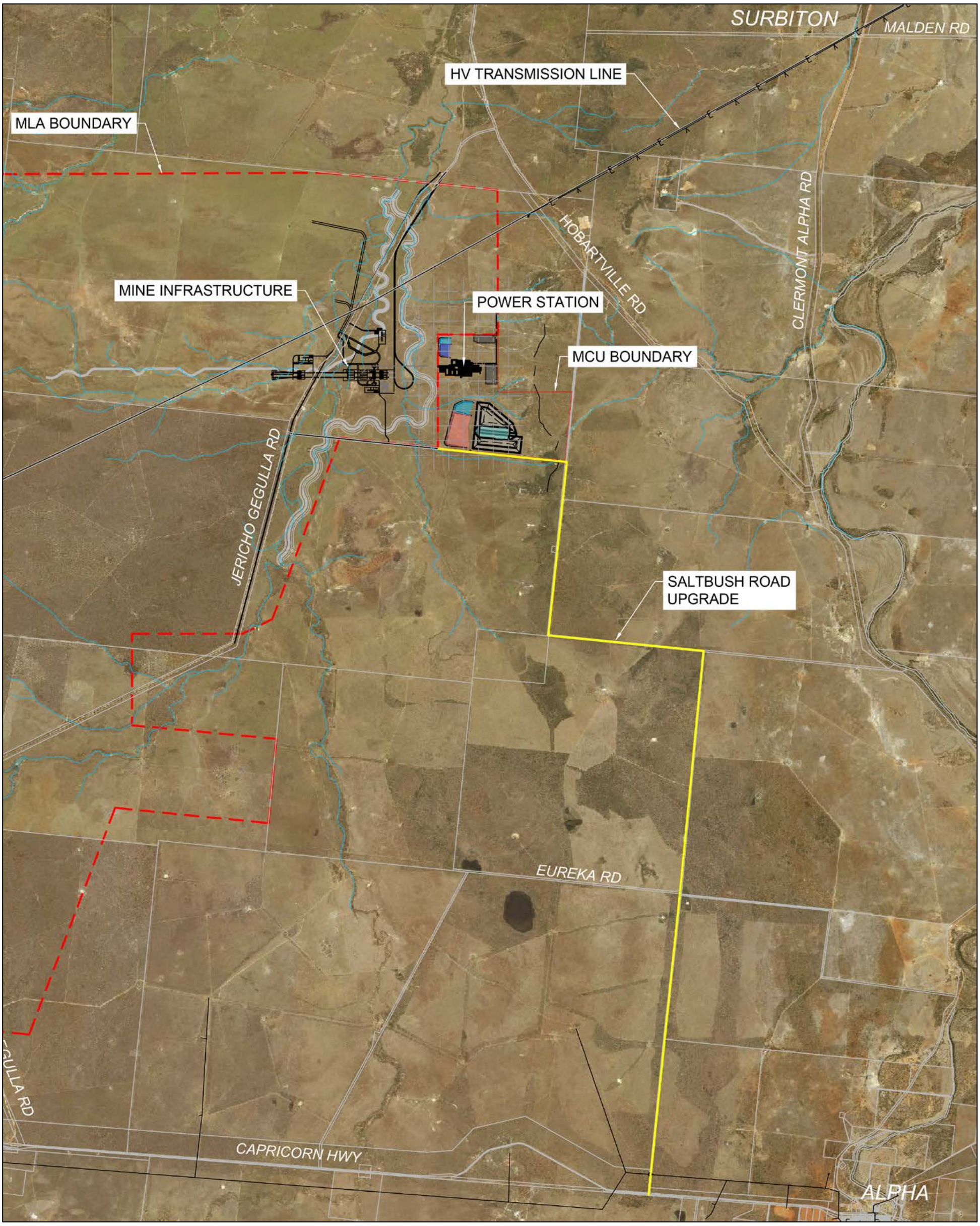

Figure 2 – Location of Power Station

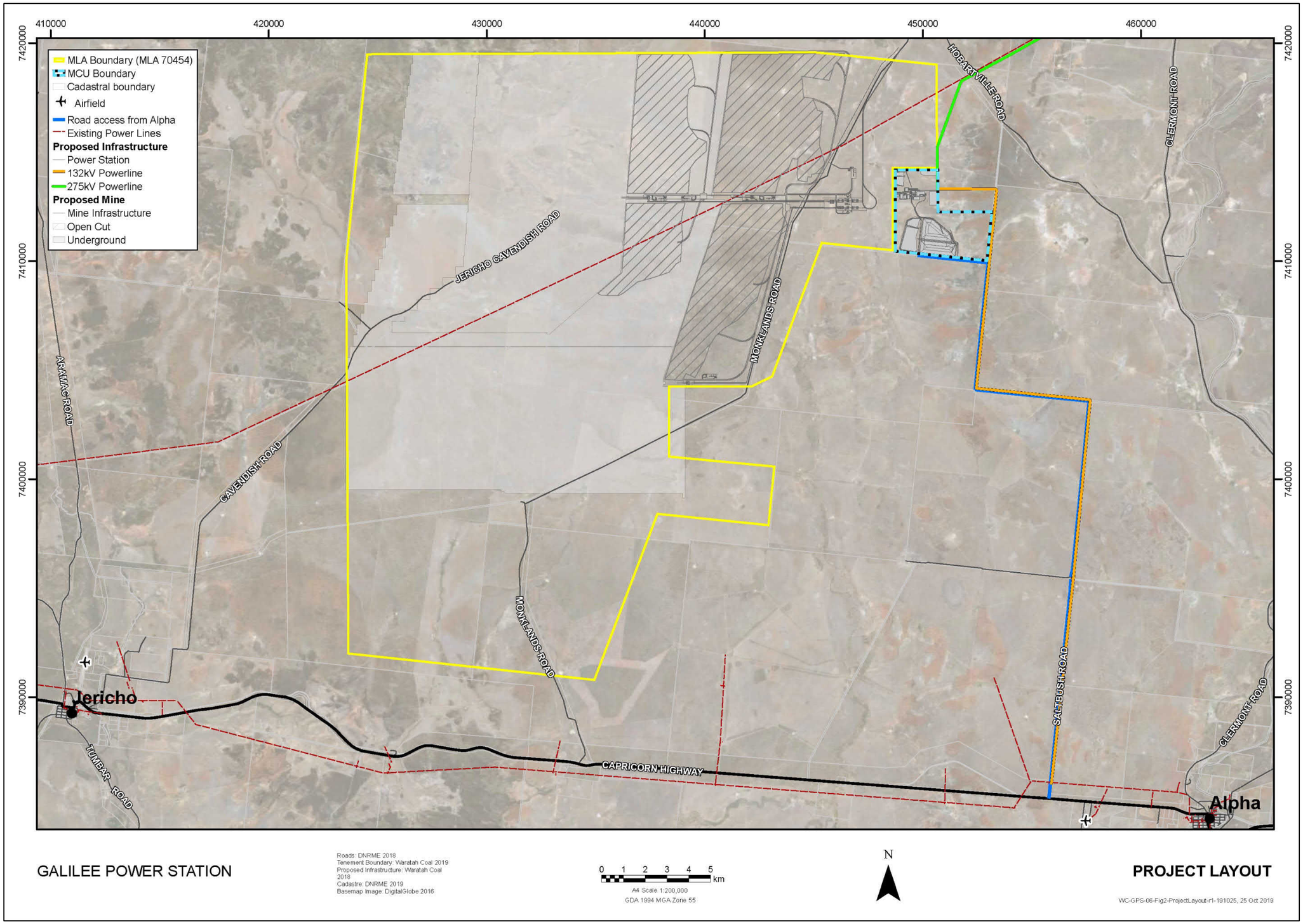

Figure 3 – Project Layout Showing Mine and Proposed Power Station

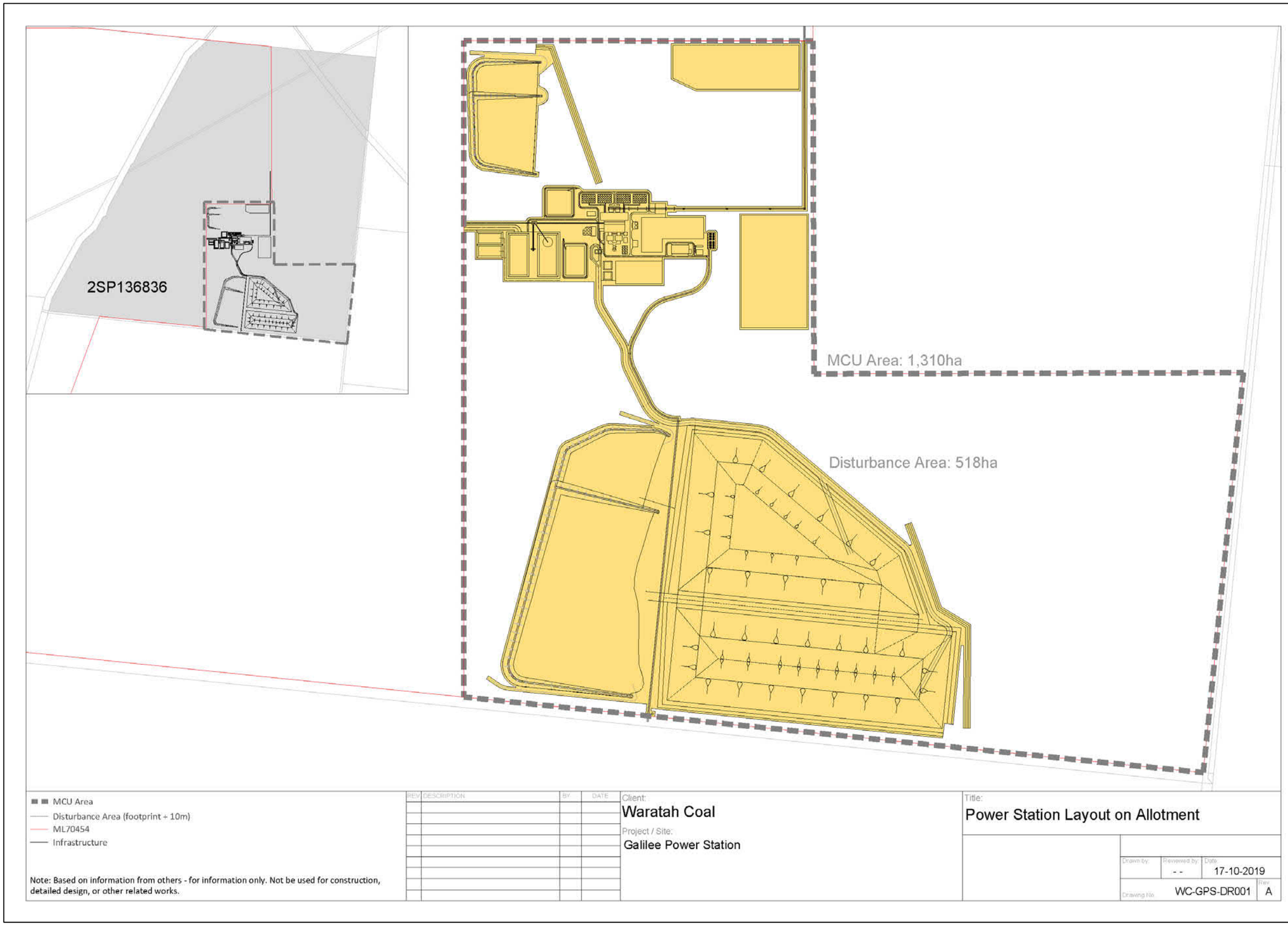

Figure 4 – Layout of Proposed Power Station on Allotment

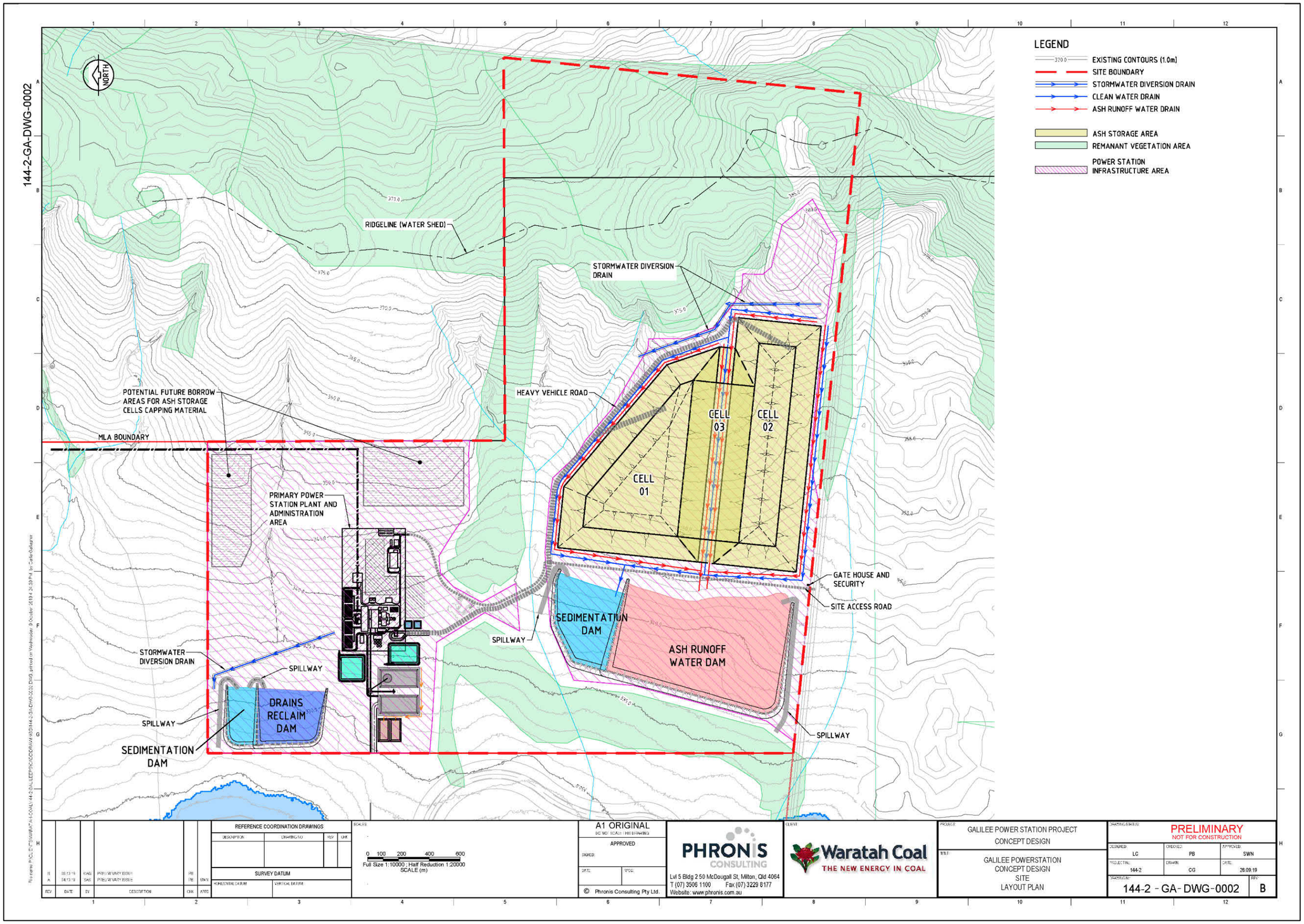

Figure 5 – Concept Design of Proposed Power Station within MCU Area (Note: North to Left)

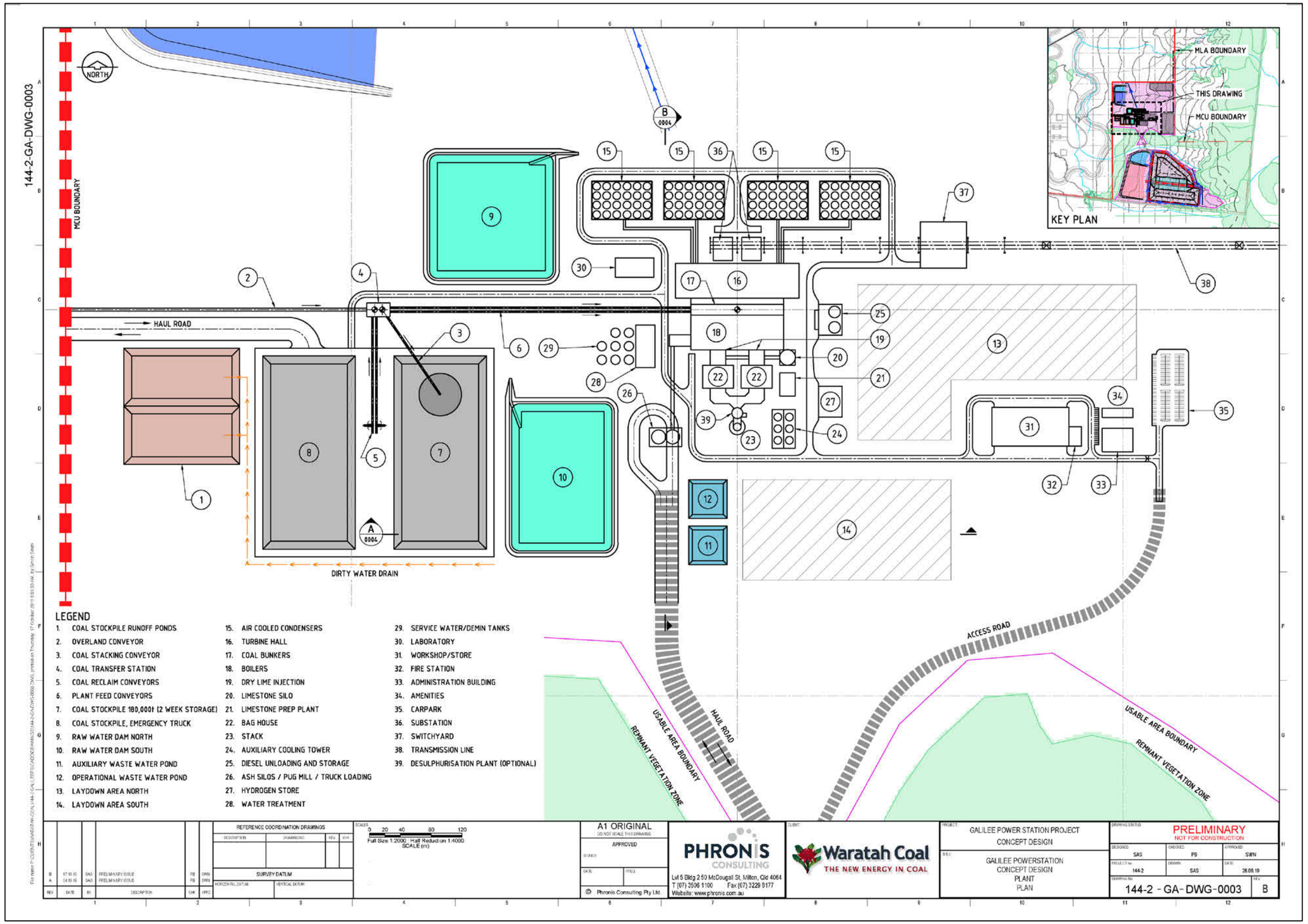

Figure 6 – Concept Design Plant Plan

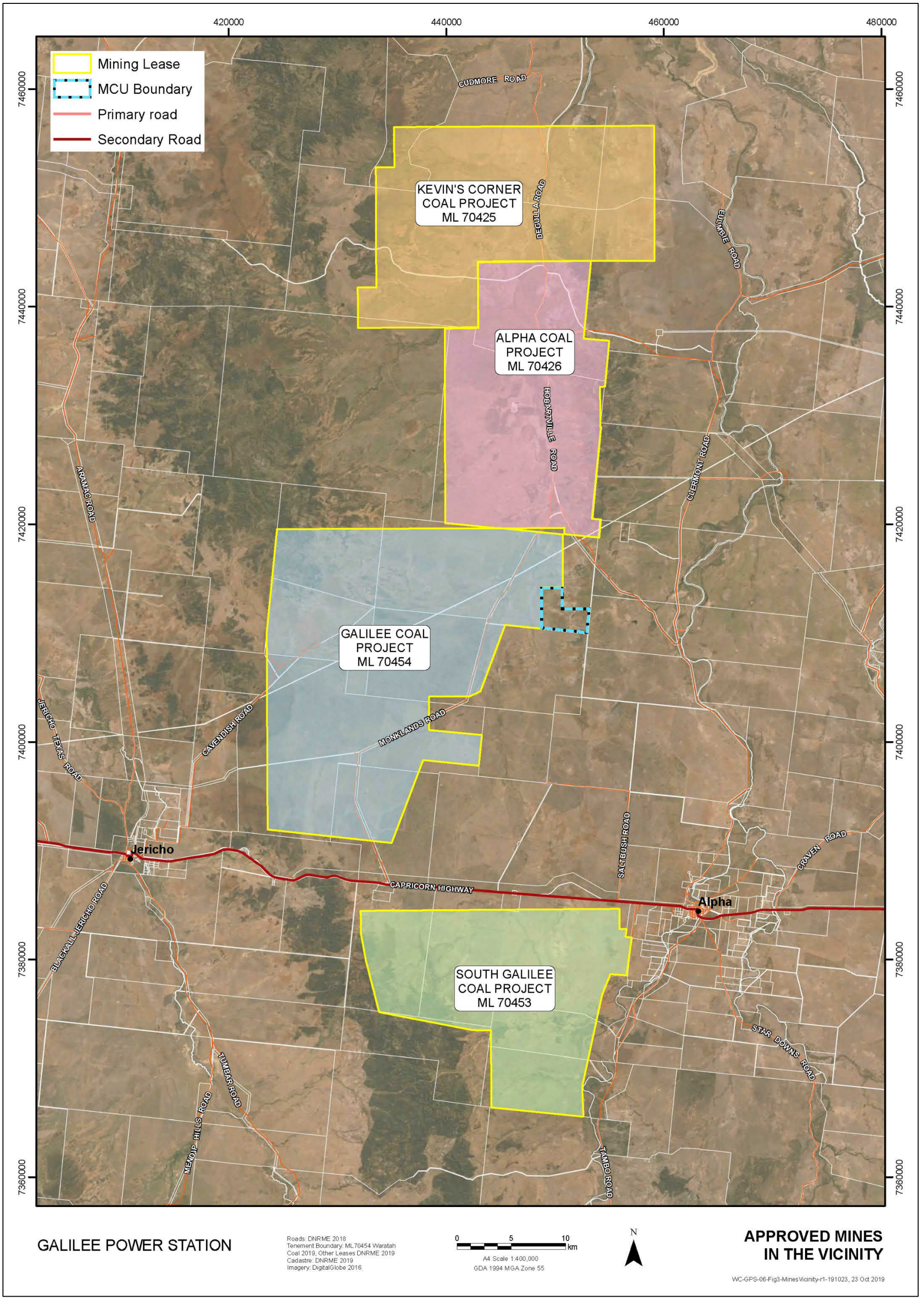

Figure 7 – Mining Leases Granted for Approved Coal Mines Nearby

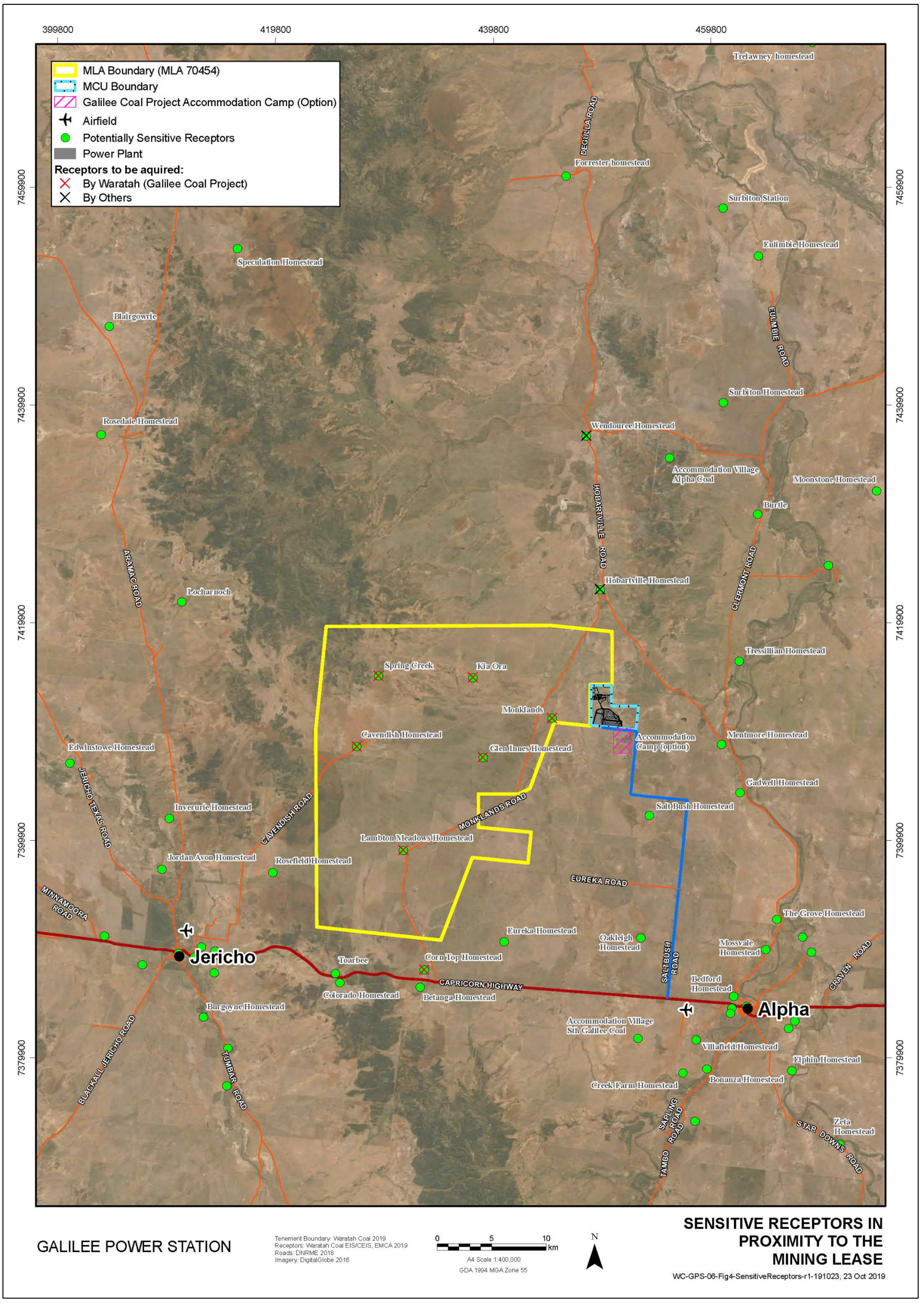

Figure 8 – Location of Sensitive Receptors in General Vicinity

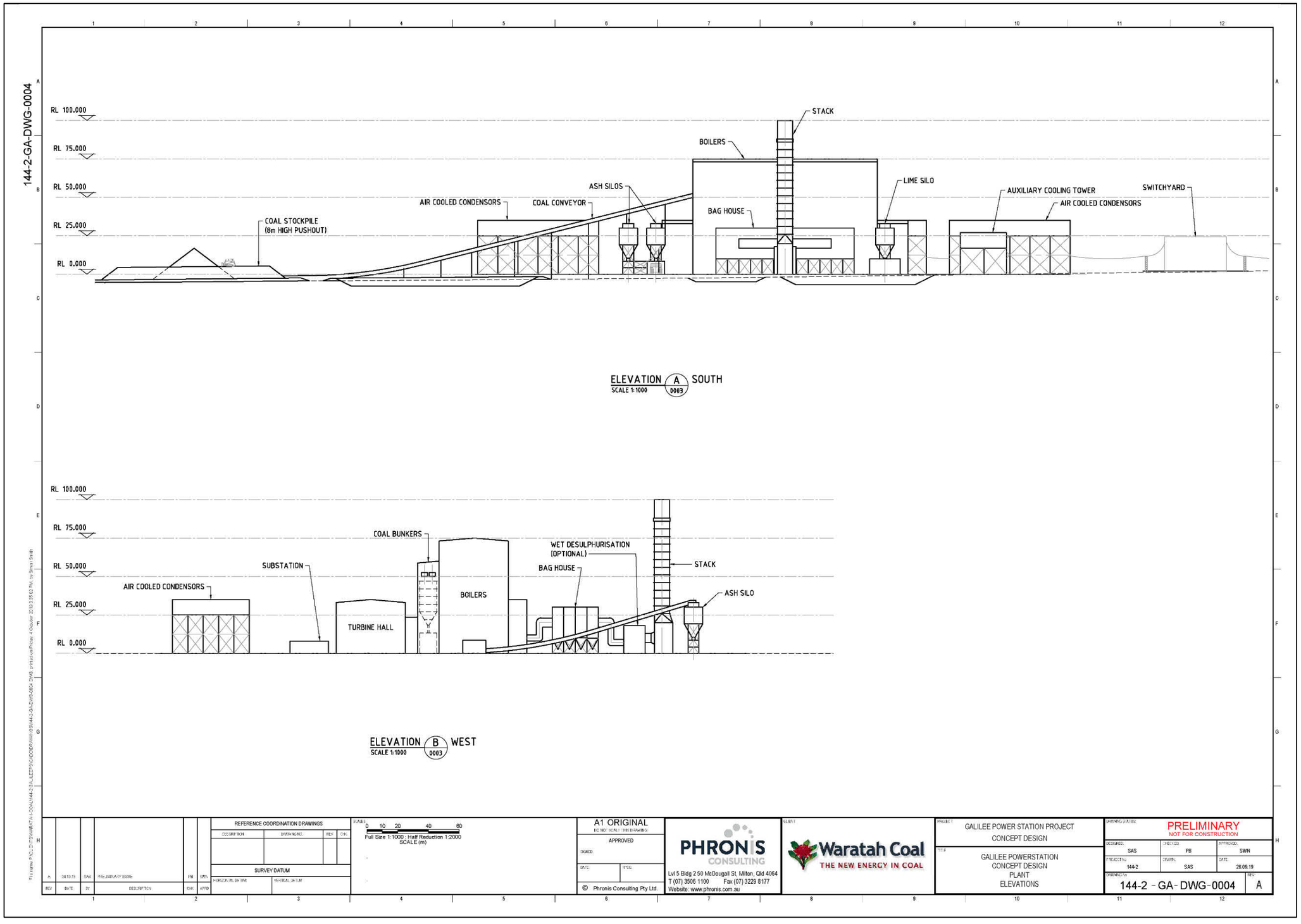

Figure 9 – South and West Elevations of Proposed Power Station

Figures 10 – 14

Acoustics RB Pty Ltd

Report No. 18-1042.R02 Figure 10

$L_{Aeq,T}$ Noise Levels

Proposed Galilee Power Project
2x700MW All Noise Sources
Day Time Calm Wind (Class A)
No Attenuation

N

Hobartville Homestead
Acquired by Alpha Coal
49

Tressillian Homestead
84

Kia Ora Homestead
Acquired by Waratah
56

Monklands
Acquired by Waratah
63

Workers Camp

Bimblebox Nature Refuge

Glen Innes Homestead
Acquired by Waratah
46

Mentmore Homestead
61

Gadwell Homestead
44

Salt Bush Homestead
74

$L_{Aeq,T}$ Noise Level (dBA)

= 0
= 5
= 10
= 15
= 20
= 25
= 30
= 35
= 40
= 45
= 50
= 55
= 60
= 65
= 70

A3 Scale 1:100000

0 500 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 m

Acoustics RB Pty Ltd

Report No. 18-1042.R02 Figure 11

$L_{Aeq,T}$ Noise Levels

Proposed Galilee Power Project
2x700MW All Noise Sources
Day Time 2.5m/s Downwind (Class B)
No Attenuation

N

Hobartville Homestead
Acquired by Alpha Coal
49

Kia Ora Homestead
Acquired by Waratah
56

Tressillian Homestead
84

Monklands
Acquired by Waratah
63

Bimblebox Nature Refuge

Glen Innes Homestead
Acquired by Waratah
46

Workers Camp

Mentmore Homestead
61

Gadwell Homestead
44

Salt Bush Homestead
74

$L_{Aeq,T}$ Noise Level (dBA)

= 0
= 5
= 10
= 15
= 20
= 25
= 30
= 35
= 40
= 45
= 50
= 55
= 60
= 65
= 70

A3 Scale 1:100000

0 500 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 m

Acoustics RB Pty Ltd

Report No. 18-1042.R02 Figure 12

$L_{Aeq,T}$ Noise Levels

Proposed Galilee Power Project
2x700MW All Noise Sources
Night Time Calm Wind (Class D)
No Attenuation

N

Hobartville Homestead
Acquired by Alpha Coal
49

Tressillian Homestead
94

Kia Ora Homestead
Acquired by Waratah
56

Monklands
Acquired by Waratah
63

Workers Camp

Bimblebox Nature Refuge

Glen Innes Homestead
Acquired by Waratah
46

Mentmore Homestead
61

Gadwell Homestead
44

Salt Bush Homestead
74

$L_{Aeq,T}$ Noise Level (dBA)

= 0
= 5
= 10
= 15
= 20
= 25
= 30
= 35
= 40
= 45
= 50
= 55
= 60
= 65
= 70

A3 Scale 1:100000

0 500 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 m

Acoustics RB Pty Ltd

Report No. 18-1042.R02 Figure 13

$L_{Aeq,T}$ Noise Levels

Proposed Galilee Power Project
2x700MW All Noise Sources
Night Time 2.5m/s Downwind (Class F)
No Attenuation

N

Hobartville Homestead
Acquired by Alpha Coal
49

Kia Ora Homestead
Acquired by Waratah
56

Tressillian Homestead
84

Monklands
Acquired by Waratah
63

Workers Camp

Bimblebox Nature Refuge

Glen Innes Homestead
Acquired by Waratah
46

Mentmore Homestead
61

Gadwell Homestead
44

Salt Bush Homestead
74

A3 Scale 1:100000

0 500 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 m

$L_{Aeq,T}$ Noise Level (dBA)

= 0
= 5
= 10
= 15
= 20
= 25
= 30
= 35
= 40
= 45
= 50
= 55
= 60
= 65
= 70

Acoustics RB Pty Ltd

Report No. 18-1042.R02 Figure 14

$L_{Aeq,T}$ Noise Levels

Proposed Galilee Power Project
2x700MW All Noise Sources
Night Time Temperature Inversion (Class G)
No Attenuation

N

Hobartville Homestead
Acquired by Alpha Coal
49

Kia Ora Homestead
Acquired by Waratah
56

Monklands
Acquired by Waratah
63

Bimblebox Nature Refuge

Glen Innes Homestead
Acquired by Waratah
46

Workers Camp

Tressillian Homestead
84

Mentmore Homestead
61

Gadwell Homestead
44

Salt Bush Homestead
74

A3 Scale 1:100000

0 500 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 m

$L_{Aeq,T}$ Noise Level (dBA)

= 0
= 5
= 10
= 15
= 20
= 25
= 30
= 35
= 40
= 45
= 50
= 55
= 60
= 65
= 70

Attachment A – Glossary

CONCAWE	Conservation of Clean Air and Water in Europe. The CONCAWE methods were developed under funding from European and North American groups to quantify noise prediction procedures for emission from large industrial facilities such as oil refineries and petrochemical plants. The methods were first published in 1981 in research paper CONCAWE Report No. 4/81 entitled *The Propagation of Noise from Petroleum and Petrochemical Complexes to Neighbouring Communities*. In contrast to the methods of ISO 9613-2:1996, the CONCAWE algorithms allow prediction of noise emission under calm conditions and specified stability class conditions. The CONCAWE algorithms are endorsed by Department of Environment and Science and most State environmental authorities.
dBA	A-weighted decibels. The decibel value adjusted by application of the A-weighting filtering network. The filtering values for the weighting network have been determined at each one third octave band over the frequency range 10Hz-20kHz and have been designed to approximate the loudness level sensitivity of the human ear when listening to pure tones. The A-weighting filtering network emphasises levels in the human speech range (1kHz - kHz) to which the human ear is most sensitive, and attenuates levels in the lower frequency range, ie those to which the human ear is less well attuned.
Decibel, dB	A measure of the *level* of one quantity relative to a reference quantity. When applied to sound, the decibel is most commonly a unit of sound pressure (squared) level or a unit of sound power level.
EPP-N 2008	*Environmental Protection (Noise) Policy 2008*
Frequency	The objective measure of pitch measured in cycles per second, Hertz (Hz).
$L_{A90,T}$	The A-weighted sound pressure level exceeded for 90% of the minute monitoring time interval, T. $L_{A90,T}$ is also termed the background noise level.
$L_{A90,15min}$	The A-weighted sound pressure level exceeded for 90% of a 15 minute monitoring time interval.
$L_{Aeq\ adj,T}$	The adjusted energy average A-weighted sound pressure level over the time period, T, using Fast response. It is the constant noise level whose energy is equivalent to that of the noise level which varies over time plus, if applicable, an adjustment for noise character, ie tonality and/or impulsiveness. The adjustment, if applicable, is usually 2dBA or 5dBA depending on the nature of the noise and the discernibility of the specific noise characteristic/s..
$L_{Aeq,15min}$	The energy average A-weighted sound pressure level over a 15 minute monitoring time interval.
$L_{A01\ adj,15min}$	The A-weighted sound pressure level adjusted for noise character that is exceeded for 1% of the 15 minute monitoring time interval, using Fast response.
RBL	Rating Background Level. For the purposes of determining the limits for acceptable levels of noise emission from facilities not yet established, the background noise level is determined as the long-term background noise level ($\min L_{A90}$) also termed the Rating Background Level, RBL. This value is determined using the methods described in Appendix B of DEHP (now DES*) Planning for Noise Control*.
Sound power level, L_w	Sound power level is a measure of how powerful a source is acoustically. It is measured in decibels (dB or dBA) and given by the equation, $L_w = 10 \log(w/w_0)$, where w is the sound power of the source measured in Watts and w_0 is set equal to 10^{-12}W (ie 1 picowatt). By contrast, the actual sound pressure level that would be measured at any point will depend on the sound power level, the distance between the source and the receiver and the nature of the space in which the determination of sound pressure level is made. The significance of the difference between these two parameters can be illustrated by drawing the analogy to a light bulb (electric lamp) in a room. The difference between sound power level and sound pressure level can be compared to the difference between the power of a light bulb (which is fixed and is measured in Watts), how bright it appears (which depends on its power as well as the distance from the light bulb) and the amount of reflection in the room (ie the nature of the space).
Sound pressure level, L_p	A level value measured in decibels (dB or dBA) and given by the equation, $L_p = 10*\log(p^2/p^2_0)$, where p_0 equals $2x10^{-5}$ Pa (ie 20 micropascals).
SoundPLAN	SoundPLAN is an integrated software package for noise and air pollution evaluation developed in Germany by Braunstein + Berndt GmbH. It has been configured to predict the extent of (i) industrial noise emission using the CONCAWE algorithms (with appropriate modifications for short-distance noise level predictions) and (ii) road traffic noise intrusion by application of the CRTN '88 algorithms. It is in use in more than 48 countries and has had widespread application throughout Australia. It is endorsed by DES and most other State environmental authorities.