



**KCGM HYBRID THERMAL POWER
STATION PROJECT
YARRI ROAD, PARKESTON**

ENVIRONMENTAL ACOUSTIC ASSESSMENT

**FOR
NORTHERN STAR RESOURCES LTD
AND ZENITH ENERGY**

SEPTEMBER 2025

OUR REFERENCE: 35265-2-25195



DOCUMENT CONTROL PAGE

**ENVIRONMENTAL ACOUSTIC ASSESSMENT
KCGM HYBRID THERMAL POWER
STATION PROJECT**

Job No: 25195

Document Reference: 35265-2-25195

FOR

**NORTHERN STAR RESOURCES LTD
AND ZENITH ENERGY**

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A	POWER STATION PLANS
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EXECUTIVE SUMMARY

MBS Environmental, on behalf of Zenith Energy and Northern Star Resources Ltd commissioned Herring Storer Acoustics to carry out an acoustic study of noise emissions for a proposed Hybrid Thermal Power Station in Kalgoorlie.

Zenith and Northern Star have proposed to supplement the existing aging 110 MW natural gas thermal power station at Parkeston with a new thermal power generation facility, with a capacity of circa 120 MW.

This acoustic assessment is required for the approval process and is being undertaken prior to the final design of the plant being known. Whilst the plant design is undergoing final consideration, for the purpose of the predictive noise modelling, the current design has been used as a basis for the assessment.

The nearest noise sensitive premises (R1 Nangamia Community) is situated approximately 630m to the south of the proposed plant. The next nearest noise sensitive receivers considered are located in Williamstown (1750m) and Kalgoorlie (1950m) to the west and south west.

For this assessment, there is unique situation where there is existing Regulation 17, Ministerial exemption in place for the noise emissions associated with the KCGM Fimiston operations. This allows for higher assigned noise levels at the residential receivers being assessed in this proposal.

Based on the compliance noise levels for the nearest Regulation 17 reference location (Barton Street, Williamstown) the assigned noise level during the night period is 45 dB(A) plus a weather influencing factor. Predictive noise modelling of the difference between the Regulation 17 reference location and the noise sensitive receivers in this assessment shows a reduction of between 5 to 7 dB. Hence at a complying noise level for the Fimiston operations of 49 dB(A) at the reference location would result in noise levels at the receivers in this study of 42 to 44 dB(A).

However, noise emissions from the proposed power station are assessable under the *Environmental Protection Noise Regulations 1997*. As outlined in the criteria section, the allowable noise level at the nearest noise sensitive receivers needs to meet the assigned noise level in isolation of other noise sources. For the most stringent time period (night) the assigned noise level at R1, the most stringent receptor would be 37 dB(A). The highest predicted noise emissions for the nearest noise sensitive premise would be 36 dB(A). This includes all noise sources associated with the facility operating at 100 percent load, which is an unlikely operating condition at night.

The operating scenarios consider all noise sources from the proposed power station operating at the same time. The calculated noise levels have been assessed under the highest night-time propagation weather conditions. Given this, noise modelling would be considered conservative, as it is unlikely that all noise sources are operating at the same time under the worst-case propagation conditions.

The acoustic assessment shows that in the worst case, that noise received at the surrounding noise sensitive premises is below the assigned noise level. Thus, noise emissions from the proposed Thermal Power Station would be deemed to comply with the requirements of the Regulations.

1. INTRODUCTION

MBS Environmental, on behalf of Zenith Energy and Northern Star Resources Ltd commissioned Herring Storer Acoustics to carry out an acoustic study of noise emissions for a proposed Hybrid Thermal Power Station in Kalgoorlie.

Zenith Energy (Zenith) is working with Northern Star Resources (Northern Star) to develop additional power supply sources for the KCGM operations which are located in Kalgoorlie in Western Australia. Additional power supply is required to meet increasing power demands for the operations as a direct result of significant expansion of ore processing throughput rates at the Fimiston Gold Plant from 13.4 to about 20 Mtpa.

Zenith and Northern Star have identified supplementing the existing aging 110 MW natural gas thermal power station at Parkeston with a new thermal power generation facility with a capacity of circa 120 MW. The new power station would provide the additional power required for increased ore processing. Construction and operation of the new facility would be targeted at providing power supply for KCGM by late 2027 to match scheduled completion of the Fimiston Gold Plant expansion at KCGM. Thermal power is anticipated to provide the full KCGM power needs for a period of 12–24 months with decreasing reliance over time as other alternative energy supply options are assessed and ultimately constructed and become available.

Zenith and Northern Star are planning to construct the new 120 MW power station northwest of the existing Parkeston Power Station within pending Mining Act 1978 tenure L26/313 as shown in Figure 1.1 below.



FIGURE 1.1 – SITE LAYOUT

The nearest noise sensitive premises (R1 Nangamia Community) is situated approximately 630m to the south of the proposed plant. The next nearest noise sensitive receivers considered are located in Williamstown (1750m) and Kalgoorlie (1950m) to the west and south west.

This report assesses both the day and night-time (worst case) noise emissions under maximum propagation conditions for the power station for compliance with the requirements of the Western Australian *Environmental Protection (Noise) Regulations 1997* (WA) (*the Noise Regulations*).

2. CRITERIA

The allowable noise level at the surrounding locales is prescribed by the Environmental Protection (Noise) Regulations 1997. Regulations 7 & 8 stipulate maximum allowable external noise levels. For the neighbouring residences this is determined by the calculation of an influencing factor, which is then added to the base levels. The influencing factor is calculated for the usage of land within two circles, having radii of 100m and 450m from the premises of concern.

The base noise levels for the times of day being considered as part of this application are shown below in Table 2.1.

TABLE 2.1 – ASSIGNED OUTDOOR NOISE LEVELS

Type of premises receiving noise	Time of day	Assigned level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
Noise sensitive premises: highly sensitive area (i.e within 15m of a dwelling)	0700 to 1900 hours Monday to Saturday	45 + IF	55 + IF	65 + IF
	0900 to 1900 hours Sunday and public holidays	40 + IF	50 + IF	65 + IF
	1900 to 2200 hours all days	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	35 + IF	45 + IF	55 + IF
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises other than those in the Kwinana Industrial Area	All hours	65	80	90

Note: The L_{A10} noise level is the noise that is exceeded for 10% of the time.
 The L_{A1} noise level is the noise that is exceeded for 1% of the time.
 The L_{Amax} noise level is the maximum noise level recorded.
 IF = Influencing Factor

It is a requirement that received noise be free of annoying characteristics (tonality, modulation and impulsiveness), defined below as per Regulation 9.

“impulsiveness” means a variation in the emission of a noise where the difference between L_{Apeak} and $L_{Amax(Slow)}$ is more than 15 dB when determined for a single representative event;

“modulation” means a variation in the emission of noise that –

- (a) is more than 3 dB L_{AFast} or is more than 3 dB L_{AFast} in any one-third octave band;
- (b) is present for more at least 10% of the representative assessment period; and
- (c) is regular, cyclic and audible;

“tonality” means the presence in the noise emission of tonal characteristics where the difference between –

- (a) the A-weighted sound pressure level in any one-third octave band; and
- (b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as $L_{Aeq,T}$ levels where the time period T is greater than 10% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as L_{ASlow} levels. Where the noise emission is not music, if the above characteristics exist and cannot be practicably removed, then any measured level is adjusted according to Table 2.2 below.

TABLE 2.2 - ADJUSTMENTS TO MEASURED LEVELS

Where tonality is present	Where modulation is present	Where impulsiveness is present
+5 dB(A)	+5 dB(A)	+10 dB(A)

Note: These adjustments are cumulative to a maximum of 15 dB.

The most critical “noise sensitive premises” have been used for the assessment being identified using the City of Kalgoorlie Boulder intra maps site, as shown below in Figure 3.1.

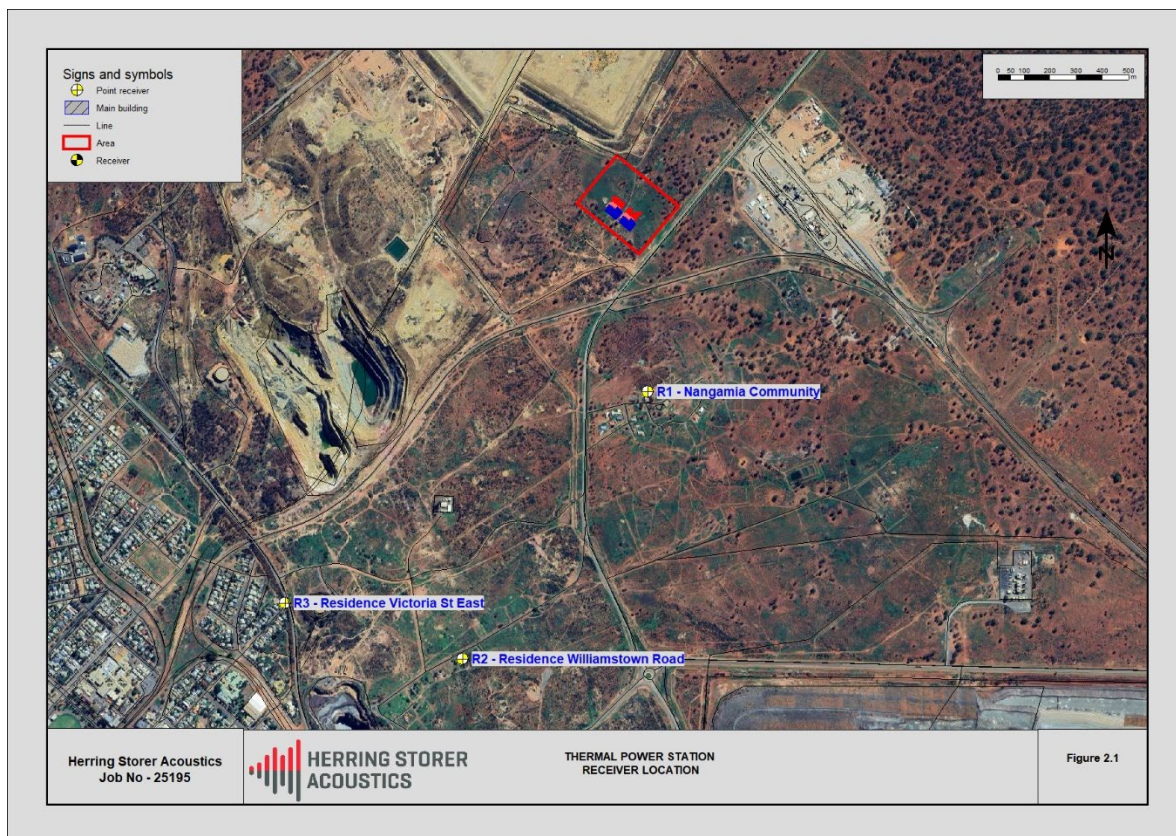


FIGURE 2.1 – RECEIVER POINTS

Review of the surrounding land use and influence of traffic is difficult for multiple receivers. However generally, combined with commercial and industrial land use there is an influence on the majority of receivers within the study area. Therefore, the influencing factor at potential noise sensitive premises has been assessed around 2 dB for the purposes of this study.

Hence, the applicable Assigned Noise Levels are listed in Table 3.1 below.

TABLE 3.1 – ASSIGNED OUTDOOR NOISE LEVEL

Type of premises receiving noise	Time of day	Assigned level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
Noise sensitive premises: highly sensitive area (i.e within 15m of a dwelling)	0700 to 1900 hours Monday to Saturday	47	57	67
	0900 to 1900 hours Sunday and public holidays	42	52	62
	1900 to 2200 hours all days	42	52	57
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays	37	47	57
Noise sensitive premises: any area other than highly sensitive area	All hours	60	75	80

Note: L_{A10} is the noise level exceeded for 10% of the time.
 L_{A1} is the noise level exceeded for 1% of the time.
 L_{Amax} is the maximum noise level.

3. PROPOSAL

In terms of acoustics, the proposed power station will consist of two fully enclosed engine halls, comprising 6 Wartsila W20V31DF Engines in each hall.

The individual engine exhaust stacks are to be 30m high. Three cooling radiator systems comprise of three fans are required for each engine.

Charge air intakes are required for each engine as well as passive ventilation intakes and outlets.

Additional to the above, insulated exhaust gas ducting will be required from the engine halls to the stacks.

It is noted that considerable noise control has been applied to each of the above components, with this detailed further in Section 4, Modelling.

The proposed plan for the layout is shown in Figure 3.1.

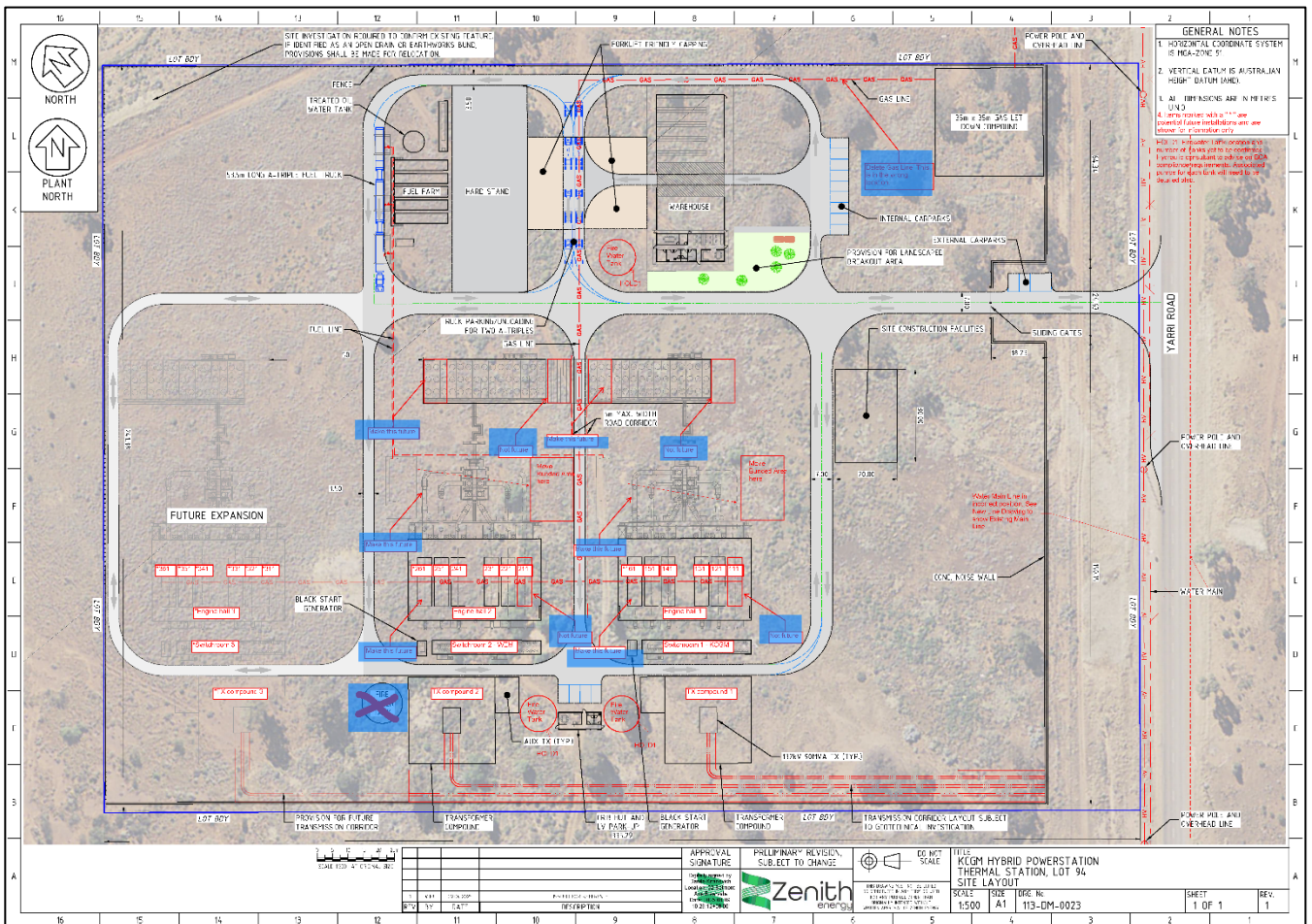


FIGURE 3.1 – POWER STATION LAYOUT

4. MODELLING

To assess the noise received at the neighbouring premises, noise modelling was undertaken using the noise modelling program SoundPlan.

Calculations were carried out using the Department of Water and Environmental Regulation's standard weather conditions for the day and night periods, which relate to worst case noise propagation, as stated in Table 4 of the Department of Environment Regulation Draft Guidance for the "Assessment of Environmental Noise Emissions". These conditions include winds blowing from sources to the receiver(s). For information, the weather conditions, (as stated in Table 4), are shown in the following Table 4.1.

TABLE 4.1 – WEATHER CONDITIONS

Condition	Night	Day
Temperature	15°C	20°C
Relative humidity	50%	50%
Pasquill Stability Class	F	E
Wind speed	3 m/s*	4 m/s*

* From sources, towards receivers.

Information, including sound power level data, has been supplied by the manufacturer, Wartsila.

Initial predictive noise modelling conducted highlighted areas within the proposal which would require further attenuation. The noise control was based around silencers and engineering controls to both the engine halls and the external noise sources, such as the stacks, ducting etc. The information regarding the acoustic data for this was also provided by Wartsila and Zenith Energy.

From data supplied by the client and the manufacturer, the sound power levels used in the noise model were as outlined in Table 5.2.

TABLE 5.2 – SOUND POWER LEVEL - NOISE SOURCES dB(A)

Noise Sources	Sound Power Level dB(A)
Engines	
Wartsila W20V31DF Engine	125
Stacks	
Wartsila W20V31DF Engine - exhaust gas stack 35 dB(A) pre-silencer TL [dB]	100
Wartsila W20V31DF Engine exhaust gas stack Both Exhaust silencer AND 35 dB pre-silencer	88
Charge Air	
Charge air intake with air silencer 35 dB(A)	98
Ducting	
Insulated exhaust gas ducting 35 dB(A) pre-silencer Lw,A [dB/m]	64
Ventilation intake	
Ventilation intake, generator side Lw,A	87
Roof Vent	
Ventilation outlet roof monitor 1200 mm baffles Lw,A [dB/m]	78
Cooling Fans	
Option 1 - Noise level 2, 3-fan cooling radiator Sound power level Lw,A [dB]	102

Based on the above, the predictive noise model was created for the proposed power station, with the noise sources located as follows in Figure 4.2 and 4.3.

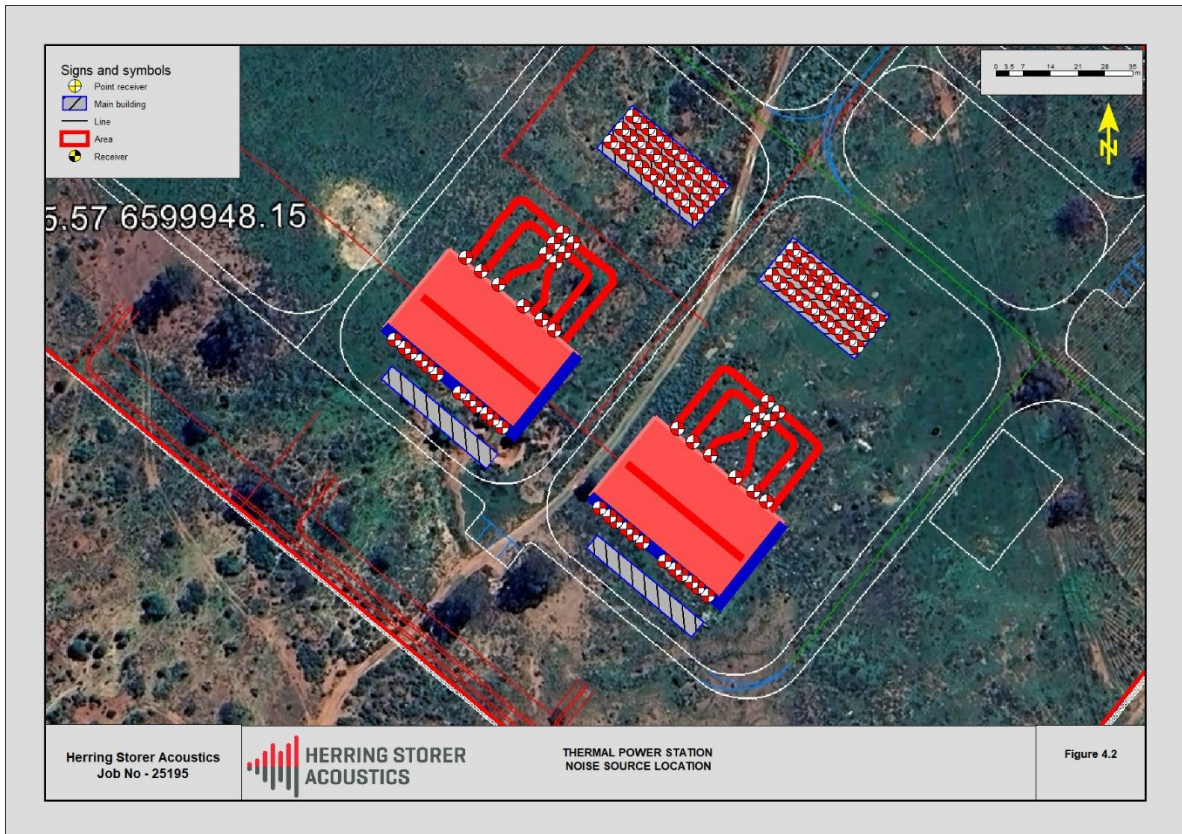


FIGURE 4.1 – POWER STATION LAYOUT

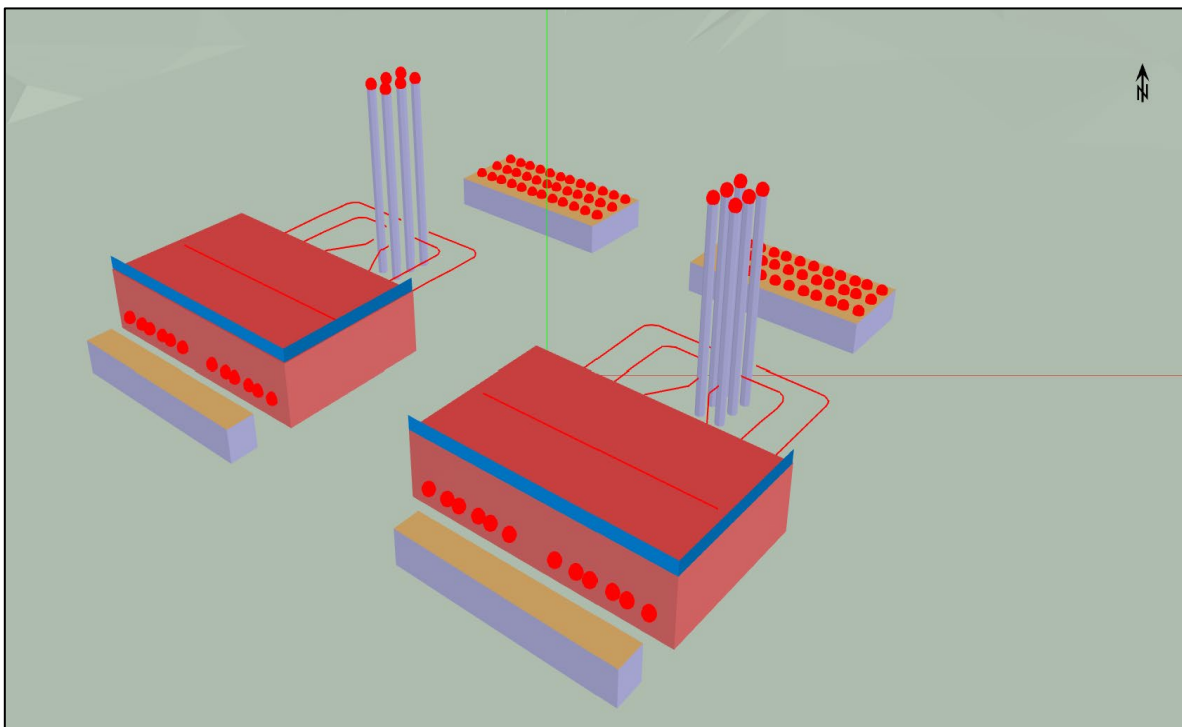


FIGURE 4.2 – POWER STATION RESPECTIVE

Following the preliminary modelling, the following inclusions have been accepted by the client and are to be incorporated in the proposed design:

Engine Halls (Both)

- Walls to Halls Concrete 150mm panel on Northwest, Southeast and Southwest sides.
- Northeast wall lightweight – RW 53 (Ceiling: + Panel 1: 1 x 0.6 mm Custom Orb (0.55mm) + Frame: Steel C-Joist (1.0-1.6mm) (254 mm x 38 mm), Stud spacing 600 mm , Cavity Width 254 mm + 90 mm Bradford Gold R1.8 Wall + Panel 2: 1 x 9 mm BGC 9m CFC Panels + Details: Panel Size 2.7 m x 4.0 m, Partition surface mass = 20.4 kg/m²).
- Roof for Halls Rw53.
- Top Hall Passive Ventilation – Required 1200mm Louvers/ baffles.
- Additional barrier (extension of walls) 2m above roofline.
- Ventilation Intake (Ground Level) – Unattenuated.

Stacks / Ducting

- Stack and pre stack silencer – 35 dB.
- Insulated Ducting Pipes.

Cooling Radiators

- Day Operations - Option 1 - Noise level 2, 3-fan cooling radiator (Three per Engine) SWL 102 dB(A).
- Night Operations - Option 1 - Noise level 2, 3-fan cooling radiator (Three per Engine) SWL 99dB(A) – (allowance for cooler operations and diversity during the night period).

5. RESULTS

A summary of the calculated noise levels for scenarios are shown in Table 6.1.

TABLE 6.1 – CALCULATED NOISE LEVELS, LA10 dB(A)

Receiver Name	Calculated Noise Level (dB(A))	
	Day Operations	Night Operations
R1	38	36
R2	31	29
R3	26	25

6. ASSESSMENT

For this assessment, there is unique situation where there is existing Regulation 17, Ministerial exemption in place for the noise emissions associated with the KCGM Fimiston operations. This allows for higher assigned noise levels at the residential receivers being assessed in this proposal.

Based on the compliance noise levels for the nearest Regulation 17 reference location (Barton Street Williamstown) the assigned noise level during the night period is 45 dB(A) plus a weather influencing factor. Predictive noise modelling of the difference between the Regulation 17 reference location and the noise sensitive receivers in this assessment shows a reduction of between 5 to 7 dB. Hence at a complying noise level for the Fimiston operations of 49 dB(A) at the reference location would results in noise levels at the receivers in this study of 42 to 44 dB(A).

Assessment of the proposed power station noise emissions are assessable under the *Environmental Protection Noise Regulations 1997*. As outlined in the criteria section, the allowable noise level at the nearest noise sensitive receivers needs to meet the assigned noise level in isolation of other noise sources.

Based on this, the ambient noise levels at the receiver location would be expected to mask any annoying characteristic associated with the proposed power station noise emissions.

As the noise received from the power station would occur more than 10% of the time, noise received at noise sensitive premises would need to comply with the assigned L_{A10} noise level.

Based on the assessable noise levels above, comparison against the relevant assigned noise level is contained in Table 6.1.

TABLE 6.1 – ASSESSMENT OF NOISE LEVELS

Receiver	Assessable Noise Level, dB(A)	Applicable Times of Day	L_{A10} Compliance Noise Level (dB)	Exceedance to Assigned Noise Level L_{A10} (dB)
R1	38	0700 - 1900 hours Monday to Saturday	47	Complies
		0900 - 1900 hours Sunday and Public Holidays	42	Complies
		1900 - 2200 hours all days	42	Complies
	36	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	37	Complies
R2	31	0700 - 1900 hours Monday to Saturday	47	Complies
		0900 - 1900 hours Sunday and Public Holidays	42	Complies
		1900 - 2200 hours all days	42	Complies
	29	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	37	Complies
R3	26	0700 - 1900 hours Monday to Saturday	47	Complies
		0900 - 1900 hours Sunday and Public Holidays	42	Complies
		1900 - 2200 hours all days	42	Complies
	25	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and Public Holidays	37	Complies

7. CONCLUSION

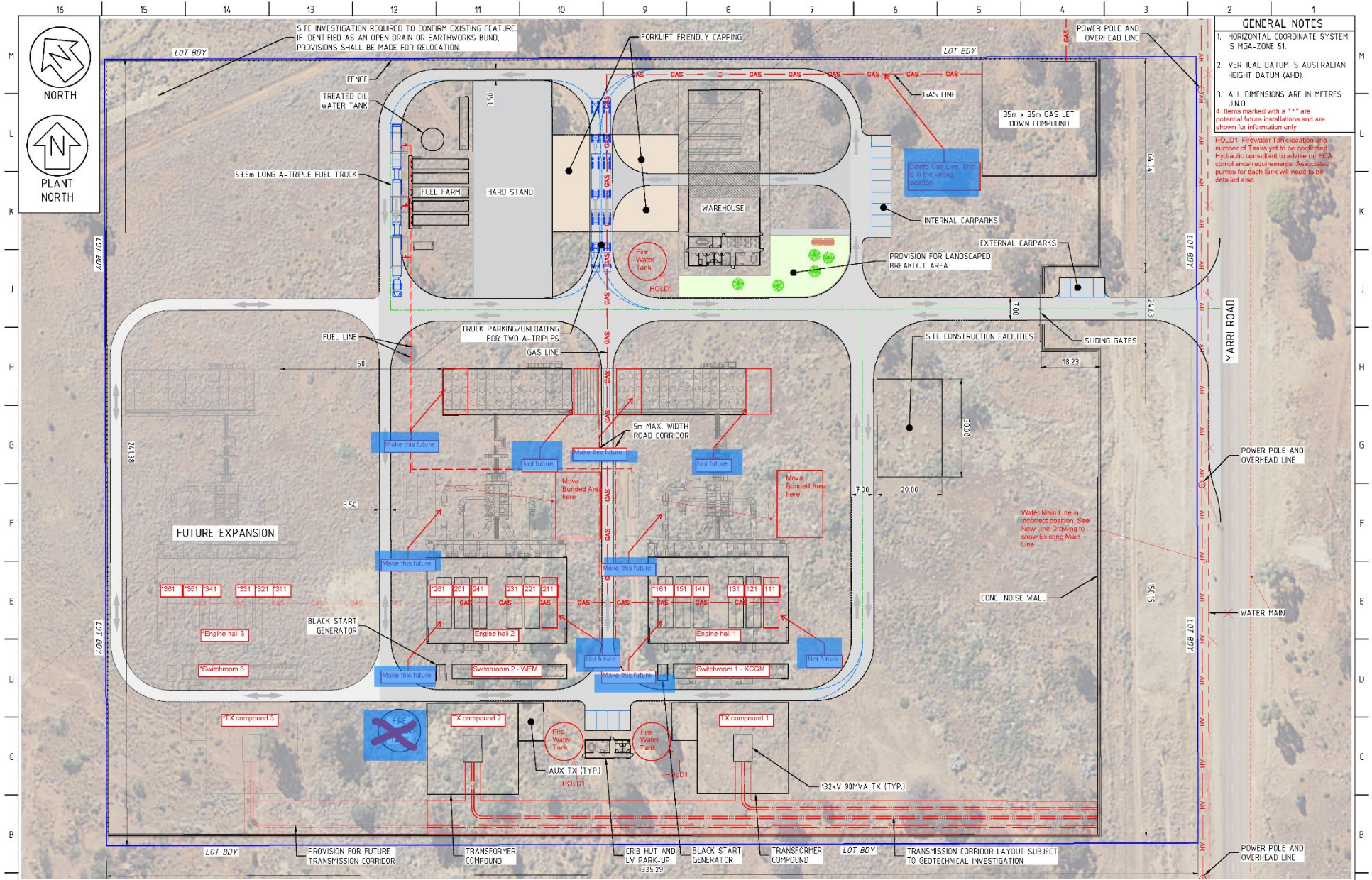
A noise assessment has been undertaken with regards noise received at the residential premises from the proposed Theraml Power Station located in Parkeston, Kalgoorlie.

We note that the assessment has been based on the power station operating at full capacity. Under this scenario, noise received at the residences would comply with the Regulatory requirements during the day, evening and night periods. It is noted that during the night period, there would be a reduction in noise emissions, not only due to demand, but the lower ambient temperature resulting in less air required for cooling.

As part of the design process, noise mitigation options will be incorporated as required to ensure compliance with the Regulatory requirements are achieved.

APPENDIX A

POWER STATION PLANS



- GENERAL NOTES**
- HORIZONTAL COORDINATE SYSTEM IS MGA-ZONE 51
 - VERTICAL DATUM IS AUSTRALIAN HEIGHT DATUM (AHD)
 - ALL DIMENSIONS ARE IN METRES UNO.
 - Items marked with a "HOLD1" are potential future installations and are shown for information only
- HOLD1 Firewater Tank location and number of Tanks yet to be confirmed. Hydraulic consultant to advise on PCA compliance requirements. Associated pumps for each tank will need to be detailed also.

SITE INVESTIGATION REQUIRED TO CONFIRM EXISTING FEATURE. IF IDENTIFIED AS AN OPEN DRAIN OR EARTHWORKS BUND, PROVISIONS SHALL BE MADE FOR RELOCATION.

FENCE

53.5m LONG A-TRIPLE FUEL TRUCK

TREATED OIL WATER TANK

FUEL FARM

HARD STAND

FORKLIFT FRIENDLY CAPPING

GAS

GAS

GAS

GAS

GAS

GAS

GAS

GAS

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GAS

35m x 35m GAS LET DOWN COMPOUND

Create Gas Line. This is in the wrong location

INTERNAL CARPARKS

EXTERNAL CARPARKS

PROVISION FOR LANDSCAPED BREAKOUT AREA

SLIDING GATES

POWER POLE AND OVERHEAD LINE

POWER POLE AND OVERHEAD LINE

POWER POLE AND OVERHEAD LINE

POWER POLE AND OVERHEAD LINE

POWER POLE AND OVERHEAD LINE

POWER POLE AND OVERHEAD LINE

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POWER POLE AND OVERHEAD LINE

POWER POLE AND OVERHEAD LINE

POWER POLE AND OVERHEAD LINE

Water Main Line in incorrect position. See New Line Drawing to show Existing Main Line

CONC. NOISE WALL

WATER MAIN

CONC. NOISE WALL

WATER MAIN

CONC. NOISE WALL

WATER MAIN

CONC. NOISE WALL

WATER MAIN

CONC. NOISE WALL

WATER MAIN

CONC. NOISE WALL

WATER MAIN

CONC. NOISE WALL

WATER MAIN



REV	BY	DATE	DESCRIPTION
1	YJD	20/01/2023	ISSUED FOR PERMIT

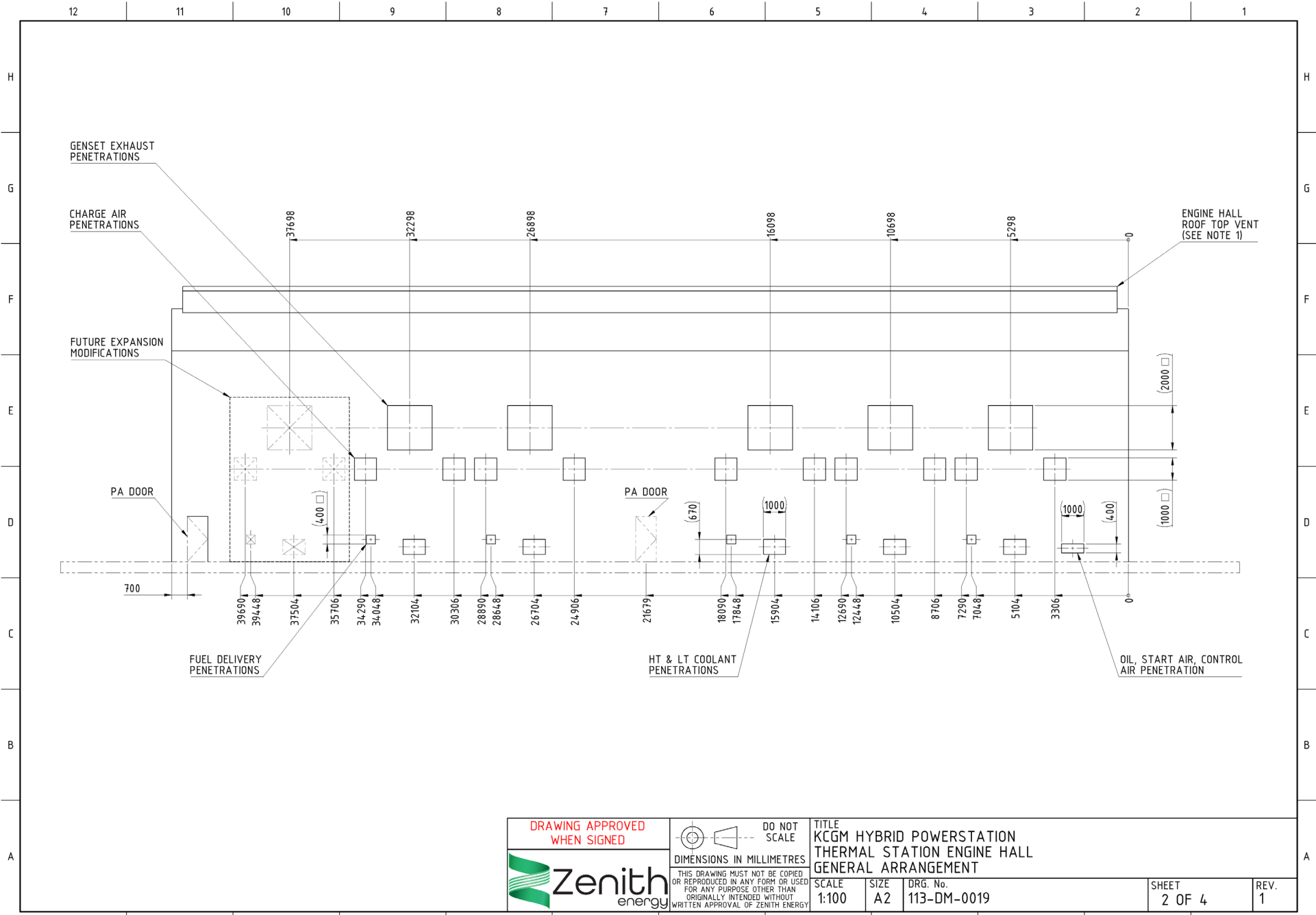
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 Drawn, signed by
 Date: 20/01/2023
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 Date: 20/01/2023
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 THERMAL STATION, LOT 94
 SITE LAYOUT**
 SCALE: 1:500 SIZE: A1 DRG. No: 113-DM-0023

SHEET 1 OF 1 REV. 1



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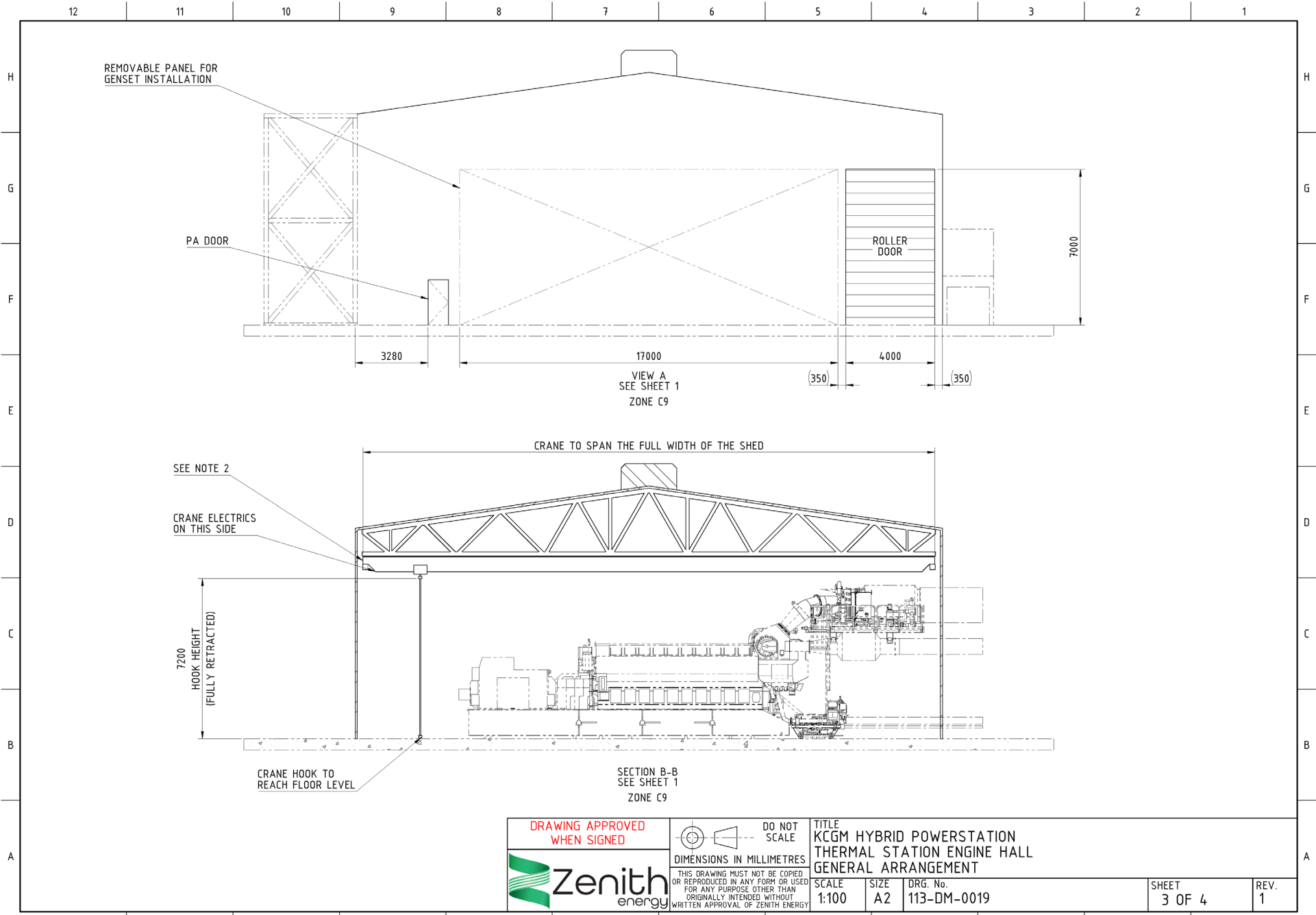


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TITLE
**KCGM HYBRID POWERSTATION
THERMAL STATION ENGINE HALL
GENERAL ARRANGEMENT**

SCALE 1:100	SIZE A2	DRG. No. 113-DM-0019
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SHEET 2 OF 4	REV. 1
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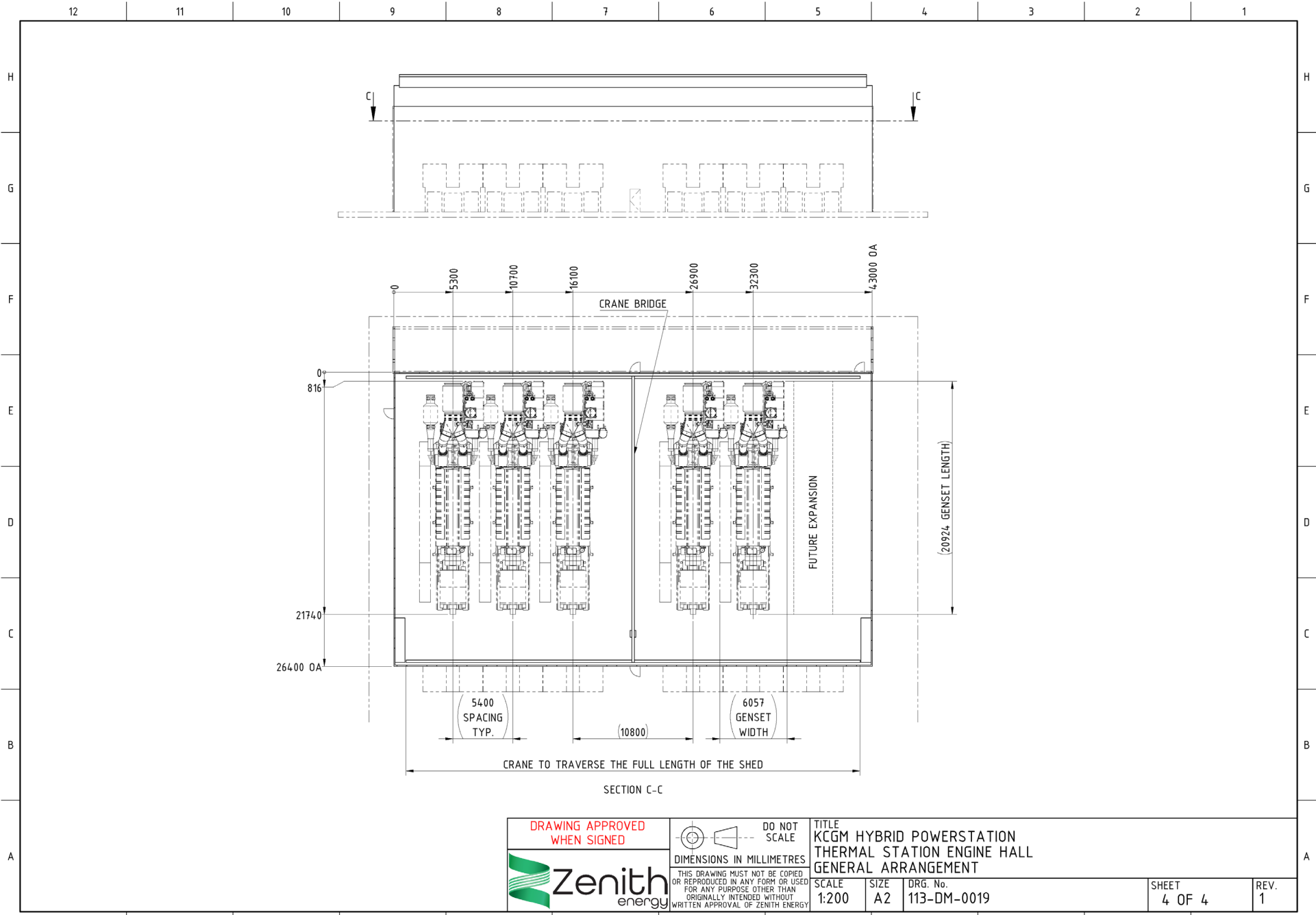
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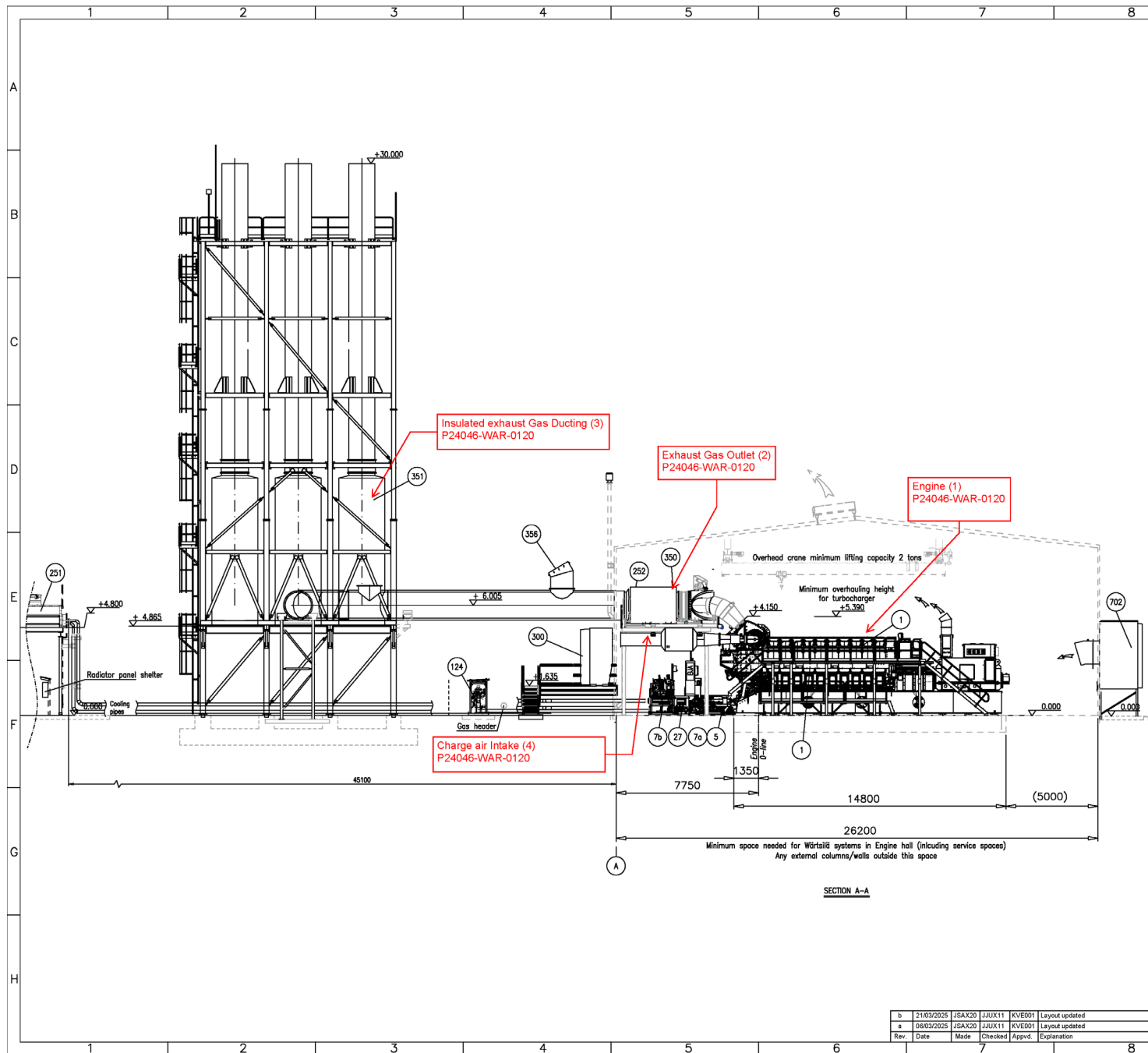
TITLE
KCGM HYBRID POWERSTATION
THERMAL STATION ENGINE HALL
GENERAL ARRANGEMENT

SCALE 1:100	SIZE A2	DRG. No. 113-DM-0019	
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SHEET 3 OF 4	REV. 1
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		<p>SCALE 1:200</p>	<p>SIZE A2</p>	<p>DRG. No. 113-DM-0019</p>
				<p>REV. 1</p>



ENGINE HALL						
Item No.	Pcs.	Code	Description	Volume [m ³]	Weight [kg] Operative	Mounting level (Floor level)
1	10	SCA	W20V31 Generating set		187908	+0.000
5	10	MOD	W31 Engine auxiliary module (EAM)		2525	+0.000
7a	10	PCC	W31D Engine fuel booster 1		810	+0.000
7b	10	PCC	W31D Engine fuel booster 2		4775	+0.000
27	10	MOD	Pipe rack		800	+0.000
143	2	PCC	LFO Automatic filter		380	+0.000
144	10	-	LFO Radiator		63	+3.700
157	10	QBF	Oil mist separator unit		480	+4.880
252	10	VEA	Expansion vessel	0.6	758	+5.280
300	20	NGA	Intake air filter		2260	+1.600
350	10	NHA	W31 Exhaust gas module, 1-C		10153	+4.780
688	10	CFE	Local control panel			+0.000
670b	20	BLP	Frequency converter for ventilation unit			+1.380
681	10	BAG	Surge arrester			+0.000
702	20	EAA	Ventilation unit, engine hall	15	1900	+0.000
SITE AREA						
Item No.	Pcs.	Code	Description	Volume [m ³]	Weight [kg] Operative	Mounting level (Floor level)
124	10	ZAC	Fuel gas supply unit		1355	+0.000
134	1	-	Real-time gas analyser		65	
251	30	VCA	Radiator		5500	+5.000
351	10	NHA	Exhaust gas silencer		7405	+4.855
356	16	-	Rupture disc			
659	2	BFB	Station transformer			

SECTION A-A

WÄRTSILÄ

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Energy Business

Master Layout
Engine hall, Section

Product: W20V31DF

Project: 20-Jan-2025

Drawn: 21-Jan-2025

Appr: 22-Jan-2025

ASLY DRG:

1/1

Zenith Energy Northern Star

10(+2) x W20V31DF

Customer Document

Project no. P24046

Rev.	Date	Made	Checked	Appr.	Explanation
b	21/03/2025	JSA/X20	JJUX/11	KVE/01	Layout updated
a	06/03/2025	JSA/X20	JJUX/11	KVE/01	Layout updated

Scale: 1:100

Sheet: A1

Doc. No: **DECA00045229 b**

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