

SHARPS REDMORE

ACOUSTIC CONSULTANTS ▪ Established 1990



Report

Ylem Energy

Proposed Grid Capacity
Generation Site, Llay

Sound Level Assessment

Prepared by

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1.0 Introduction

- 1.1 Ylem Energy Limited propose to operate a grid capacity (electric power) generating compound at Llay, Wrexham. The compound has a previous use and consent¹ for power generation using mines gas as the fuel. The current proposal is to operate from piped-in natural gas.
- 1.2 The compound lies on the western fringe of the Llay Industrial Estate and former colliery. The nearest neighbours are commercial/industrial. Residential receptors are at a distance of notionally 500 metres from the compound.
- 1.3 This assessment considers the sound levels likely to arise from the proposed operation of the compound for gas engines. Sharps Redmore make a forecast of sound levels reaching receptors on the basis of an assumed constant (24/7) power delivery. Appropriate weight is attached to the previous use and consent, as well as current guidance on acceptable sound levels for commercial and residential environments.

¹ Wrexham County Borough. 24th January 2003. Decision Notice. Code ref: LLAP/2002/0985

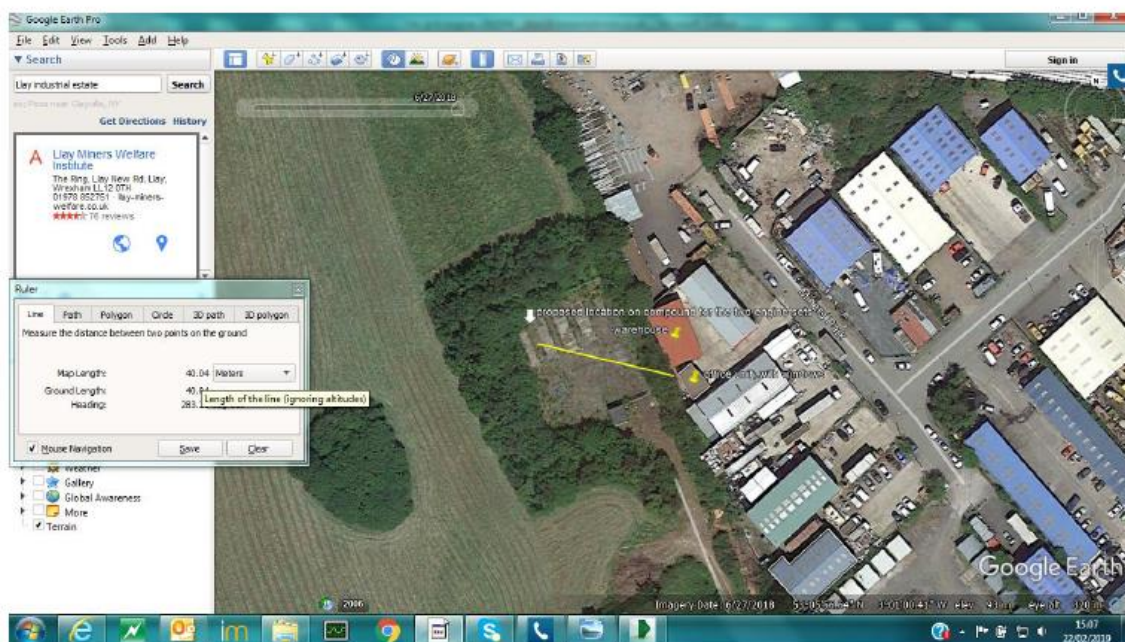
- 2.3 The various elevations are shown on the drawing attached as Figure 1. The arrangement of engines is likely very similar to that which prevailed during the period of mines gas abstraction.
- 2.4 Based on a combination of equipment suppliers information and measurement on engine-sets of similar capacity, the average sound level at a reference distance of 40m from the exhaust pipe is expected to be:
- 60 dBA (60 dB $L_{Aeq,continuous}$) for the 1.9MW unit
 - 53 dBA (dB $L_{Aeq,continuous}$) for the 1.1MW unit
- 2.5 Being a 'grid capacity' development, the engines would operate at any time of the day or night, as demanded by the grid. To be robust, they have been assessed as if in constant running mode.

3.0 The Neighbourhood

- 3.1 There are two neighbour classes to consider. Firstly, the commercial neighbour, daytime and secondly, the residential receptors, night-time. This assessment assumes the engine-sets would operate at night. Each receptor is considered in turn.

Commercial neighbour

- 3.2 An aerial image is inserted below. Commercial buildings are established warehouse/workshop/manufacturing and in exactly the same proximity of the proposed engine sets as the previous installation. The image is taken from GoogleEarth for the year 2018. The 4-off sets pads are evident. The nearest office with windows is high-lighted. A distance marker has been applied to illustrate a 45m separation to the proposed engine-sets.

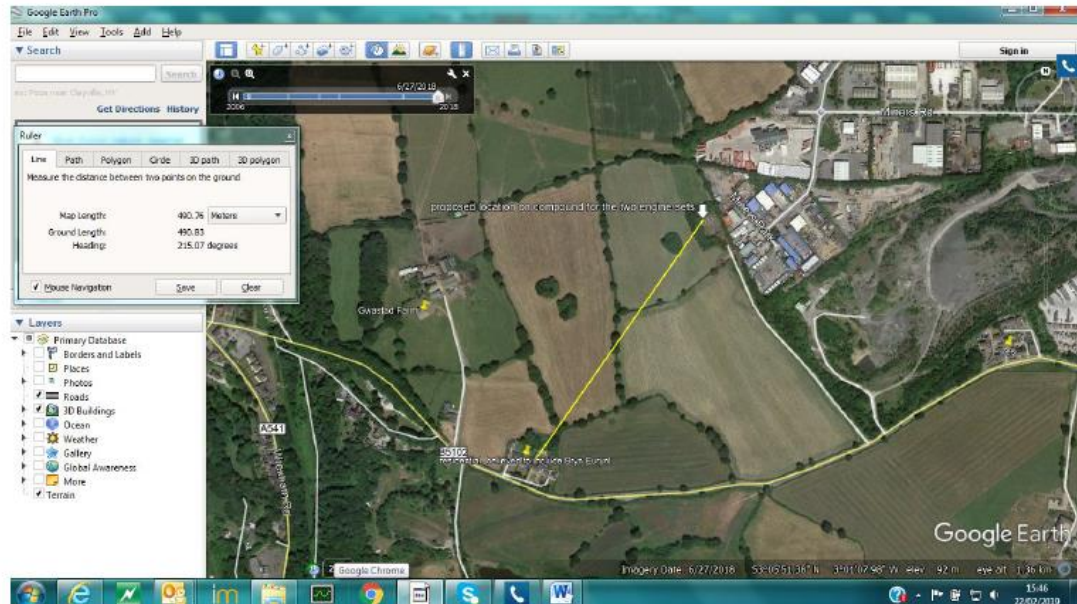


- 3.3 The windows of the office unit are assumed openable for ventilation and affording an outside-to-inside sound level difference of notionally 15 dBA.

Residential Neighbours

Residential Neighbours

- 3.4 By reference to the image inserted below, three main residential receptor locations are high-lighted, all of which correspond to a radius of notionally 490m from the proposed engine-sets.



- 3.5 The properties to the south-east of the compound are shielded by the substantially elevated land form of the former colliery. Those to the south-west are not shielded and hence represent the more 'exposed' to sound propagation from the compound.
- 3.6 Sharps Redmore note the sound level limits imposed for the previous mines-gas engine installation for the receptors named as Gwastad Farm house and Bryn Eurn. These are deemed relevant for this application.

4.0 Sound Level Limits

Previous Limits

4.1 Condition 3 of the 2003 consent specified limits as follows:

- 50 dB (rating level), 0700 to 1930 hours at the nearest noise-sensitive premises
- 35 dB (rating level), 1930 to 0700 hours at the nearest noise-sensitive premises
- Rating levels in accordance with BS 4142: 1990*

*Actually states '1190' but probably intended to be 1990 or indeed the then current 1997

4.2 There were no limit values specified for commercial-use neighbours on the industrial estate. Consideration now can be given to BS 8233:2014² and the guidance therein at Table 2 for an indoor ambient sound level for open plan offices of 45 to 50 dB $L_{Aeq,t}$. Such a level would be expected to arise in an office environment with an external sound climate due to continuously running engine-sets of 60 to 65 dB ($L_{Aeq,t}$) at notionally 1m from the window. (The 'façade' value).

Proposed Thresholds

4.3 For this assessment, Sharps Redmore consider the residential receptors should not be exposed to engine-set sound levels in excess of 35 dB (rating level) for the 1930 to 0700 hours period, where the rating level is as defined by BS 4142:2014³. A 50 dB (rating level) would be applicable for the 0700 to 1930 hour period. These align with the limits for the previous use of the compound.

4.4 For office accommodation on the Llay Industrial Estate, the sound level external to the office windows should be controlled to 63 dB $L_{Aeq,1hr,façade}$ for office hours. (Note that a 'free-field' value of 60 dB $L_{Aeq,t}$ would normally correspond to a 'façade' value of 63 dB $L_{Aeq,t}$)

² BSI. BS 8233: 2014. Guidance on sound insulation and noise reduction for buildings.

³ BSI. BS 4142:2014. Methods for rating and assessing industrial and commercial sound.

5.0 Sound Level Predictions and Assessments

5.1 A prediction of engine-set sound levels reaching the commercial and residential neighbour locations can be made using standard techniques. In brief, these are as follows:

- Extrapolation for distance, beyond the 40m reference distance given in this Report for the likely engine-sets. The sound level is modelled to decay at the rate of 6 dB per doubling of distance.
- Adjustment for 'soft' ground attenuation. Guidance is provided by BS 5228. Part 1.⁴
- Adjustment for 'air absorption.' For a typical broad-band source, allow 4 dBA per km.
- Adjustment for 'downwind' enhancement. This is an additive factor. It allows for meteorological conditions that are favourable to sound propagation. A +2 dB adjustment is appropriate and accords with BS 8233.
- A correction, if applicable, for the façade. A +3 dB adjustment is the convention.
- Corrections, if applicable, for the perceived character of the sound at the receptor, as guided by BS 4142: 2014.

5.2 Each receptor is considered in turn.

⁴ BSI. BS 5228-1:2009 + A1:2014

Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.

Commercial Neighbour

5.3 A sound level prediction and assessment is presented in Table 5.3 below.

Table 5.3
Engine-sets
Sound Level to Office Accommodation, at 45 metres

Prediction steps	Level	
Level at 40m, 1.9MW engine, typically	60 dB	$L_{Aeq,t}$
Level at 40m, 1.1MW engine, typically	53 dB	$L_{Aeq,t}$
Level at 40m, combined	61 dB	$L_{Aeq,t}$
Extrapolate to 45m	-1 dB	
Façade correction	+3 dB	
Estimated level at façade	63 dB	$L_{Aeq,t}^*$
*where t = 1hr		
Assessment steps		
Estimated level at façade	63 dB	$L_{Aeq,t}$
Threshold, as paragraph 4.4 above	63 dB	$L_{Aeq,t}$
Is threshold value forecast to be achieved satisfactorily?	Yes	

5.4 The expectation is that the proposed twin engine-set installation would be capable of achieving a satisfactory sound level outside the windows of office units on the adjacent Industrial Estate.

Residential Neighbours

- 5.5 A sound level prediction and assessment is presented in Table 5.5 below. In this case, the time period 't' is taken to be at least 15 minutes in order to allow comparison with BS 4142: 2014.

Table 5.5
Engine-sets
Sound Level to Residential Accommodation, at 490 metres

Prediction steps	Level	
Level at 40m, combining both sets	61 dB	$L_{Aeq,t}$
Extrapolate to 490m	-22 dB	
Soft ground correction	-6 dB	
Air absorption correction	-2 dB	
Light downwind correction	+2 dB	
Estimated level, free-field	33 dB	$L_{Aeq,t}^*$
*where t = 15 minutes (night-time assessment period) although for a continuously running sound source, this is not critical.		
Assessment steps		
Estimated level near receptor, 'Specific' level	33 dB	$L_{Aeq,t}$
Character corrections:		
Impulsive character expected?	No	
Tonal character expected? (Exhaust note)	Potentially just perceptible	
Adjust for exhaust note	+2 dB	
Rating level, free-field	35 dB	$L_{Ar, 15mins, free-field}$
Threshold, as paragraph 4.3 above	35 dB	$L_{Ar, 15mins, free-field}$
Is Threshold value forecast to be satisfactorily achieved?	Yes	

- 5.6 The forecast is that the rating level of sound from the proposed gas engines would satisfactorily comply with a 35 dB threshold imposed for almost identical activities on the application site in the past.
- 5.7 It is worth adding that a sound source giving rise to a *specific* level of 33 dB $L_{Aeq,t, free-field}$ outside a bedroom window of a residential property at night, would typically equate to an internal sound level of 21 dB $L_{Aeq,t}$. (A 12 dBA correction applies to a free-field level). The guidance in BS 8233: 2014 for internal ambient sound levels in bedrooms (Table 4 therein) is to not exceed 30 dB $L_{Aeq,8hr}$. In this case, the likely level indoors at night with the engines operating of 21 dB $L_{Aeq,t}$ would not be regarded as unsatisfactory.
- 5.8 Additionally, this assessment has considered engine-set sound propagation under easterly breeze conditions, for which the receptors at Gwastad Farm house and nearby would be 'downwind' and likely to experience enhanced sound. Ordinarily, a south-westerly breeze is more common. A south-westerly wind direction would suppress engine-set sound by around 6 dB compared to the prediction at Table 5.5. Accordingly, the normal situation would be for engine-set sound at a level below 33 dB $L_{Aeq,t}$ /35 dB L_{Ar} at night.

6.0 Summary and Conclusion

- 6.1 This Report has considered the proposal for 2-off gas engine-sets on the compound at Llay where once there were similar units running on mines gas. The proposed engine-sets would operate at any time of the day or night. However, to be robust and in the context of residential receptors, night-time running has been assumed continuous.
- 6.2 Using sound source values typical of the engine-set type, and applying calculation (prediction) techniques featuring appropriate influences to sound propagation, it is forecast that engine-set sound levels would be 63 dB $L_{Aeq,1hr,façade}$ at nearby office accommodation and 35 dB $L_{Ar,15mins,free-field}$ at more distant residential receptors. The sound level affecting the offices would be in-line with guideline thresholds. The sound level affecting dwellings would be in-line with limit values stipulated for the previous mines-gas installation.
- 6.3 It is concluded that sound levels would be deemed satisfactory in the light of recognised guidance.

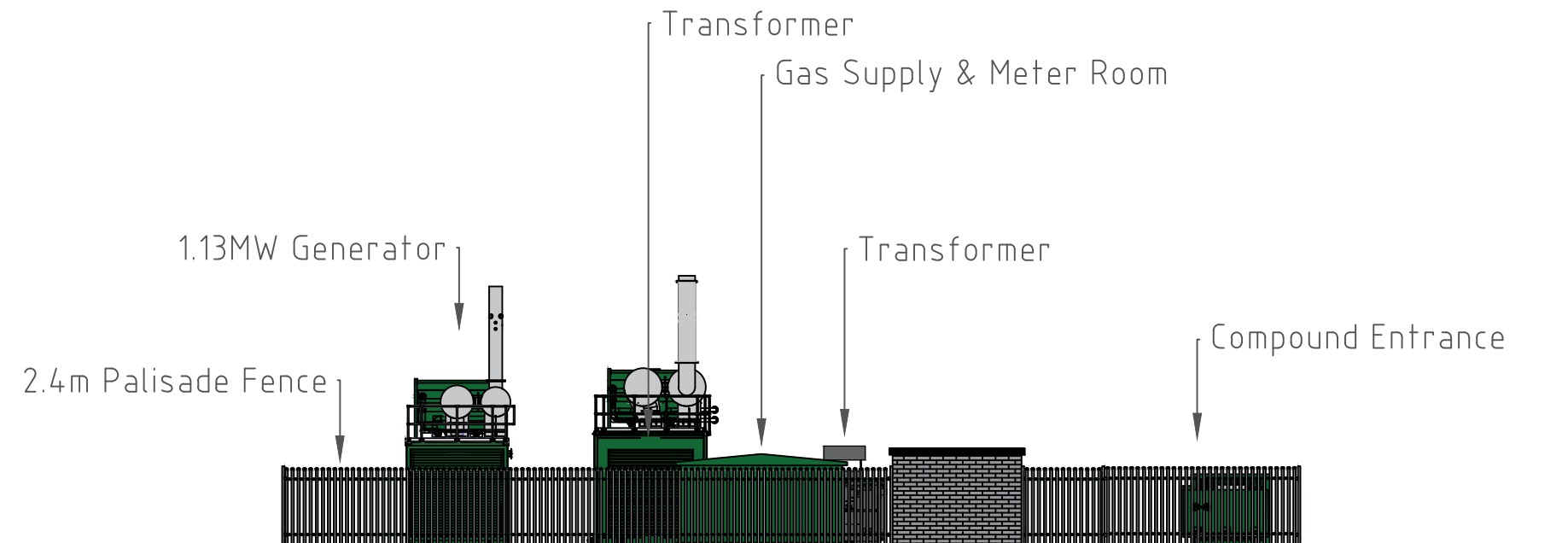
7.0 Recommendations

- 7.1 Gas engine sound emissions can be dominated by the exhaust system. Sharps Redmore recommend the primary exhaust silencer 'boxes' are acoustically lagged, including back to the pipe penetration point through the engine container/enclosure roof. The treatment need not be excessive. It is recommended that the combined sound level of the two engines, when operational, does not exceed a value of 60 dB $L_{Aeq,15mins,free-field}$ at a reference distance of 40m from the exhaust stacks, and at a point not less than 4.5m above the engine-set base/pad height.

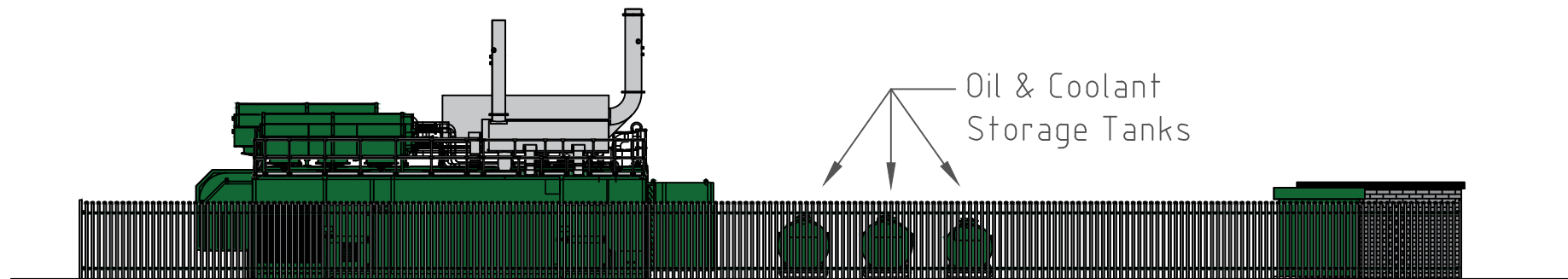
Figure 1

Llay – GC-002B Elevations A3L

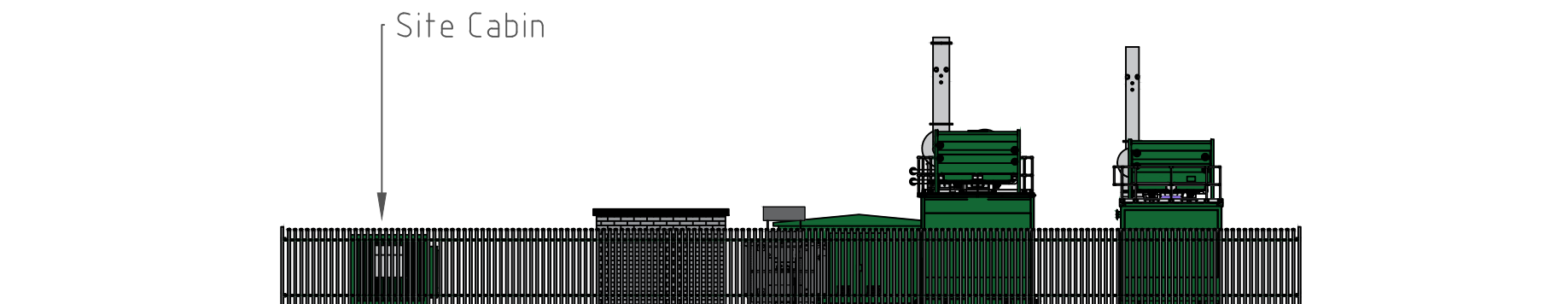
Elev. A



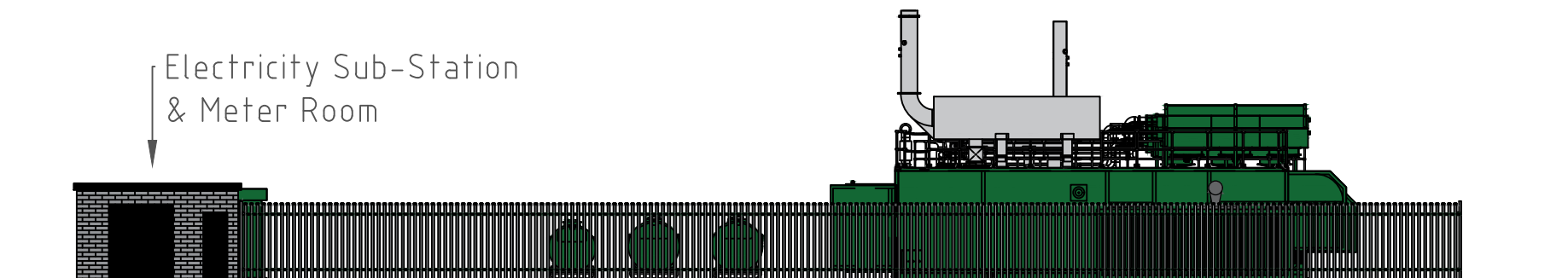
Elev. B



Elev. C



Elev. D



LEGEND

Rev. Suffix	Date	Details
SITE		
LLAY GRID CAPACITY GENERATION SITE		
TITLE		
COMPOUND LAYOUT ELEVATIONS		
DWG. No.	REV	
LLAY-GC-002B	2	
SCALE	DATE	
1:200 @ A3	20/2/19	
DRAWN	STATUS	
JKW	PLANNING	