AIRO

Report No. DJB/6982/H

for
GPL 2014 Ltd
9 Bridewell Place
London
EC4V 6AW

Dated: 18 May 2018

ROOF MOUNTED CONDENSERS

PLANT NOISE ASSESSMENT (REVISED)

FOR

FOUNTAIN HOUSE, WELWYN GARDEN CITY

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FOR

FOUNTAIN HOUSE, WELWYN GARDEN CITY

1. INTRODUCTION

AIRO is retained by GPL 2014 Ltd to provide independent measurement services and specialist advice in respect of proposed third floor residential development at Fountain House, 1-7 Howardsgate, Welwyn Garden City.

This report provides a revised assessment of the likely noise impact at the nearest noise sensitive locations due to proposed roof mounted condenser units.

An assessment was carried out in relation to a previous development proposal that included 22 no. condenser units mounted on the roof of Fountain House. The assessment was provided in AIRO Report No. DJB/6982/G dated 27 July 2017. This report details the revised assessment for a total of 27 no. condenser units mounted on the roof of Fountain House.

The report makes reference to external background sound level measurements made by AIRO on the roof of Fountain House. The measurement survey details and results have been reported separately in AIRO Report No. DJB/R6982/D dated 12 May 2017. A description of the site and the general proposals as well as a site location plan is also included in that report.

2. SOUND LEVEL MEASUREMENT UNITS

2.1 A-Weighted Equivalent Continuous Sound Level - $L_{Aeq,T}$

As its name suggests, the $L_{Aeq,T}$ is a measure of the acoustic energy of a fluctuating sound climate over a given period T expressed as the single continuous sound level having the same energy as the time varying signal.

The 'A' within the descriptor means A-weighted, an internationally agreed frequency response generally similar to that of the human ear so that A-weighted sound levels in dB correspond reasonably well with what is heard.

For assessment purposes, the day is typically divided into a 16-hour daytime period (07:00 to 23:00) and an 8-hour night-time period (23:00 to 07:00). The period values may be derived from the logarithmic average of the relevant hourly values.

2.2 Maximum Sound Level - L_{AFmax}, L_{ASmax}

In some circumstances it is useful to quantify the maximum level of fluctuating sound and a commonly used descriptor is L_{Amax}. The L_{Amax} represents the maximum reading given by a sound level meter for a given event or period of time and is usually qualified by F for 'Fast' or S for 'Slow' according to the response time setting of the meter.

2.3 A-Weighted Percentile Sound Levels - L_{An}

Percentile sound levels are a statistical representation of the time varying level. The value is the sound level L exceeded for n% of the period T.

To measure background environmental sound levels the statistical index L_{A90} is commonly preferred. The L_{A90} is the Sound Pressure Level that is exceeded for 90% of the measurement period. The L_{A90} therefore discriminates against short duration peaks of sound and is consequently considered to provide a better representation of typical minimum sound levels compared with, for example, the L_{Aeq}.

3. PLANNING REQUIREMENTS

3.1 Local Authority Requirements

It is understood that the local authority will require that the rating level of the sound emitted from the proposed condenser units shall be at least 10 dB lower than the existing background sound level as determined at the nearest residential premises in accordance with British Standard 4142, Methods for rating and assessing industrial and commercial sound.

3.2 BS 4142

British Standard BS 4142 (ref 1) (latest edition being October 2014) is the most commonly used method for assessing the likelihood of complaints where industrial or commercial sound sources affect dwellings. It is commonly referred to in Local Authority Planning Conditions. The BS 4142 method compares the background sound level with the rating level for the new sound source.

BS 4142 defines three main sound level parameters:

- Background Sound Level - the L_{A90} measured without the sound source in operation.
- Specific Sound Level - the L_{Aeq} due to only the sound source operating (in this case plant associated with the proposed development), when measured (or calculated) at the assessment location over a 1 hour period during the daytime and over a 15 minute period at night.
- Rating Level - the Specific Sound Level with a correction applied if the sound contains a distinguishable discrete or continuous tone, distinct impulses (e.g. bangs, clicks etc) or is irregular enough to attract attention.

BS 4142 provides indicators of the likely impact based on the resultant value of the Rating Level minus the lowest background sound levels.

BS 4142 says

> ***"a) Typically, the greater this difference, the greater the magnitude of the impact.***
>
> ***b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.***
>
> ***c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.***
>
> ***d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have***

an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

The assessment location is defined as 3.5 metres in front of the nearest residential façade (or 1 metre in front of the façade for receiver positions above ground floor level).

4. NOISE ASSESSMENT AND DISCUSSION

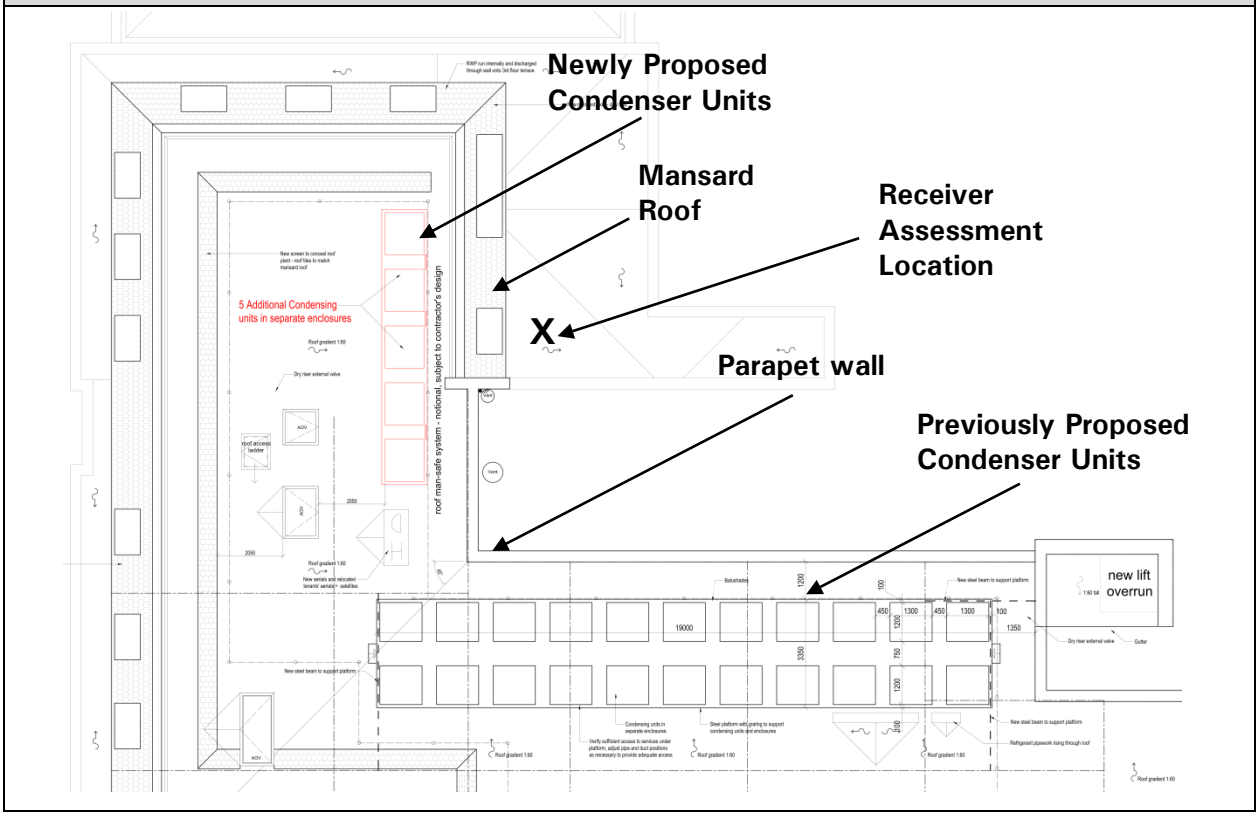
The following information and assessment is based on information and drawings supplied to AIRO (ref 2).

A total of 27 roof mounted condenser units are proposed as part of the development. The closest noise sensitive locations, and therefore locations that will yield the worst case noise impact assessment(s) are outside the windows to the top floor flats, directly below the condenser units on the car park facing elevations.

It may be noted that as the condenser units are arranged in two locations (one bank with the previously proposed 22 no. units and the other with the 5 no. additional units) consideration has been given to a number of receiver locations that are more exposed to either condenser unit bank (i.e. less building screening). The assessment provided here is for the worst case receiver location, which was found to be close to the newly proposed condenser units where the proposed mansard roof provides minimal shielding and the previously proposed units are also less shielded by the adjacent parapet wall.

Figure 1 provides an extract of the roof plan drawing annotated to illustrate the assessment location in relation to the condenser unit locations.

Figure 1 – Proposed roof plan extract indicating the assessment position



The following assessment has been carried out using the methodology principles set out in BS 4142. The calculations have been made using data for octave bands. A copy of the calculations is provided in Appendix A whilst the assessment below provides a summary quoting estimated equivalent single figure values.

The calculation considers the noise levels associated with each condenser bank location and the propagation path for each to the receiver location.

The assessment provided is for the night-time (23:00 to 07:00 hours) period as this was when the lowest background noise level measurements prevailed during the measurement survey (see AIRO Report No. DJB/R6982/D for more information) and therefore provides the worst case assessment (given that the condenser unit noise output should be consistent regardless of whether operated during the daytime or night-time).

The lowest hourly background sound level measured during the survey was 48 dB L_{A90} and therefore this level has been used in the assessment.

It is understood that consideration is currently being given to three Mitsubishi condenser unit models (PUMY-P112 VKM, PUMY-P152 VKM and PUMY-P140 VKM). For assessment purposes the PUMY-P140 VKM model has been assumed to be operating in heating mode as this model and mode is quoted as producing the highest noise levels.

The Quiet Box VI enclosure produced by Sound Planning Limited is currently proposed and therefore the transmission loss data provided (reproduced in Appendix A for reference) has been incorporated into the assessment calculations. It is assumed that any reflections associated with the enclosure have been accounted for in the values supplied.

Distance and screening corrections have also been incorporated in order to calculate the noise level at the receiver location.

It may be noted that no acoustic features correction has been applied. The calculated noise level at the receiver location is significantly below the lowest background noise level and therefore it is unlikely to be perceptively audible at this location. This being the case no acoustic features should be discernible.

Table 1 provides the assessment for the night-time (worst case) period.

Table 1 – BS 4142 Assessment for roof mounted condenser units: Night-time (23:00 to 07:00 hours)				
Results				**Commentary**
		22 no. Condensers	5 no. Condensers	
Specific Noise Level: 1 m from PUMY-P140 VKM Condenser Unit	$L_{Aeq,60mins}$ =	53 dB	53 dB	Specific sound source on and the level unaffected by any other sound sources.
Correction to be applied due to residual noise influence is		0 dB	0 dB	
Assessment made during the night-time. The reference time interval is 15 mins.				
Enclosure transmission loss		-20 dB	-20 dB	Quiet Box VI enclosure. Data sheet in Appendix A. All reflections assumed to be incorporated.
Scaling factor: 1 to 22 & 1 to 5 condensers		+13 dB	+7 dB	For a worst case assessment all condensers run simultaneously.
Distance correction to receiver location.	20 lg (1/d) =	-19 dB	-12 dB	Assessment location is 1m in front of the window, 3.9 m and 8.7 m away from the condenser locations.
Screening correction(s)		0 dB	0 dB	No screening to the assessment location for either set of units.
Resultant Specific Noise Level at receiver location	$L_{Aeq,60mins}$ =	28 dB	28 dB	
Total Resultant Specific Noise Level at receiver location	$L_{Aeq,60mins}$ =	31 dB		
Acoustic Feature Correction		+0 dB		The condenser noise level is significantly below background and therefore should not be perceptively audible.
Rating Level		31 dB		

Table 1 – Continued			
Results			**Commentary**
Night-time Period Background Noise Level	$L_{A90,60mins}$ =	48 dB	
Excess of Rating Level over background level	31 - 48 =	-17 dB	
Assessment indicates a likelihood of low impact.			
Uncertainty of the assessment			The excess of the rating level over the background sound level is -17 dB and in this instance the uncertainty of the measurement does not have any significance to the outcome of the assessment.

The Rating Level is significantly below the background sound level indicating a low impact. Furthermore, the Rating Level is more than 10 dB below the lowest background sound level and therefore the assessment threshold understood to be required by the local authority should be satisfied.

7. CONCLUSIONS

This report has presented a revised assessment of the potential noise impact of 27 no. proposed roof mounted condenser units at Fountain House, 1-7 Howardsgate, Welwyn Garden City.

It has been found that the noise associated with the operation of the proposed condenser units is of low noise impact in relation to nearby residential accommodation.

Report Approved by:

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Principal Consultant

Report Author:

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Managing Consultant

REFERENCES

1. British Standard BS 4142:2014
Method for rating and assessing industrial and commercial sound
British Standards Institution, 2014

2. Household Henderson Drawings:

Date	Drawing No.	Title
13.02.2017	4898 A_250 rev. P3	Proposed Elevations: South & East Elevations
30.06.2017	4898 SK004 rev. P2	Roof: Services Coordination
Undated	Untitled	Roof Condensing Units Section BB
March 2018	4898 A-032 rev. P1	Scheme for 27 Flats Roof Plan

APPENDIX A

PLANT NOISE LEVELS AND CALCULATIONS

AIRO

PLANT NOISE INFORMATION SHEET

Job no:	6982		
Client:	GPL 2014 Ltd		
Site:	Fountain House, Welwyn Garden City		
Date:	July 2017		
Engineer:	DJB		

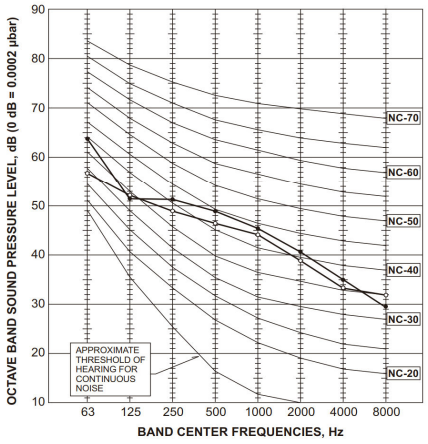
CONDENSER NOISE DATA

Condenser	Mode	Sound Pressure Level (dB) at Centre Band Frequency (Hz)								A-Weighted
		63	125	250	500	1000	2000	4000	8000	
PUMY-P112 VKM	Heating	64	52	52	49	46	41	35	30	51
	Cooling	57	52	49	47	44	39	34	32	49
PUMY-P125 VKM	Heating	56	53	52	51	46	42	36	30	52
	Cooling	60	53	51	48	45	40	33	30	50
PUMY-P140 VKM	Heating	59	60	50	52	47	42	37	31	53
	Cooling	64	52	51	50	46	40	34	28	51

Notes: Sound Pressure Levels measured at 1 metre distance - see manufacturer data. Octave band values estimated from graphs.

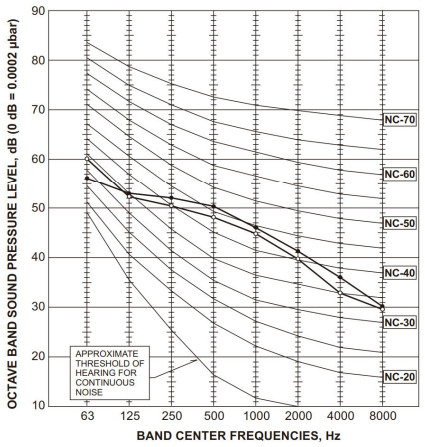
PUMY-P112VKM(-BS)
PUMY-P112YKM(-BS)

MODE	SPL(dB)	LINE
COOLING	49	
HEATING	51	



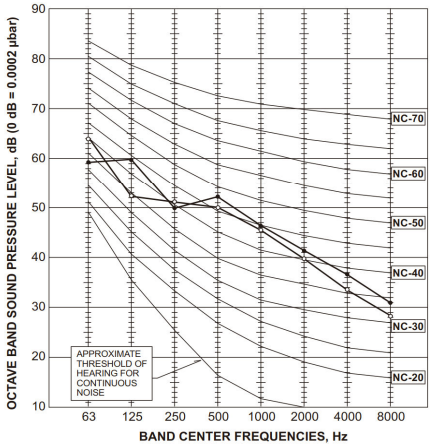
PUMY-P125VKM(-BS)
PUMY-P125YKM(-BS)

MODE	SPL(dB)	LINE
COOLING	50	
HEATING	52	



PUMY-P140VKM(-BS)
PUMY-P140YKM(-BS)

MODE	SPL(dB)	LINE
COOLING	51	
HEATING	53	



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PLANT NOISE CALCULATION SHEET

Job no:	6982
Client:	GPL 2014 Ltd
Site:	Fountain House, Welwyn Garden City
Date:	MAY 2018
Engineer:	DJB

Noise Source	NOISE FROM CONDENSERS ON ROOF
Reciever Position	1 m in front of dormer window on mansard roof nr. 5 new condenser location

5 Newly Proposed Condensers:

Condenser				Octave Centre Band Frequency (Hz) 63	125	250	500	1000	2000	4000	8000	dB (A)
A	PUMY-P140 VKM	Heating	SPL	59.0	60.0	50.0	52.0	47.0	42.0	37.0	31.0	53
B	Quiet Box VI Enclosure transmission loss			-4.0	-15.0	-20.0	-26.0	-28.0	-27.0	-23.0	-23.0	
C	Scaling Factor from 1 to 5 units		5	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
D	Distance to Receiver (m)		3.9	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	-11.8	
E	Screening Correction due to building		0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
F	SPL at receiver	Heating		50.2	40.2	25.2	21.2	14.2	10.2	9.2	3.2	28

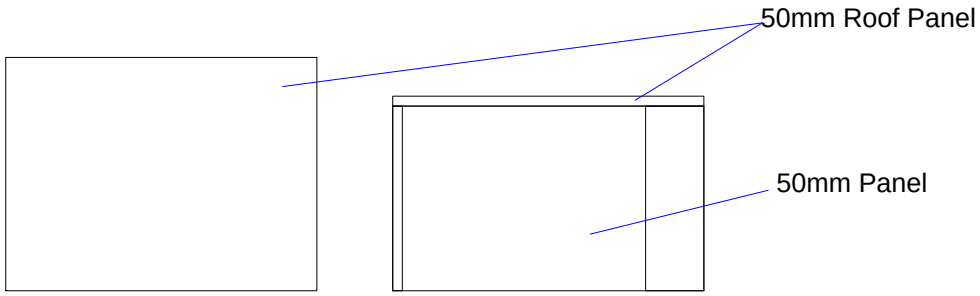
Notes: The heating operation of the condenser illustrated is the noisiest heating / cooling operation of all condensers considered.
Enclosure transmission loss values are from Sound Planning Ltd data sheet. It is assumed that the figures presented include all reflection effects associated with the enclosure.

22 Previously Proposed Condensers:

Condenser				Octave Centre Band Frequency (Hz) 63	125	250	500	1000	2000	4000	8000	dB (A)
A	PUMY-P140 VKM	Heating	SPL	59.0	60.0	50.0	52.0	47.0	42.0	37.0	31.0	53
B	Quiet Box VI Enclosure transmission loss			-4.0	-15.0	-20.0	-26.0	-28.0	-27.0	-23.0	-23.0	
C	Scaling Factor from 1 to 5 units		22	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	
D	Distance to Receiver (m)		8.7	-18.8	-18.8	-18.8	-18.8	-18.8	-18.8	-18.8	-18.8	
E	Screening Correction due to building		0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
F	SPL at receiver	Heating		49.6	39.6	24.6	20.6	13.6	9.6	8.6	2.6	28

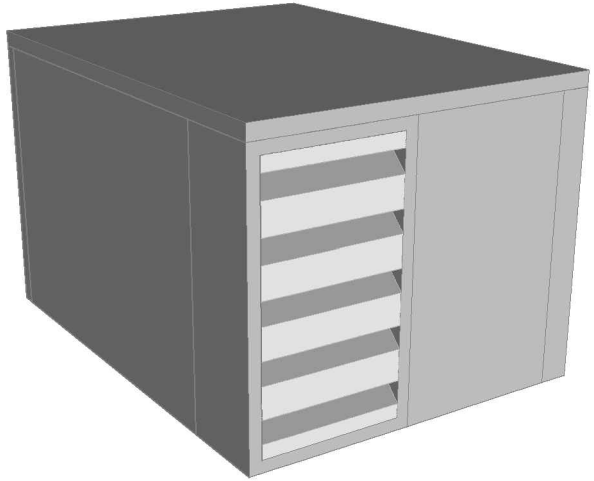
Notes: The heating operation of the condenser illustrated is the noisiest heating / cooling operation of all condensers considered.
Enclosure transmission loss values are from Sound Planning Ltd data sheet. It is assumed that the figures presented include all reflection effects associated with the enclosure.

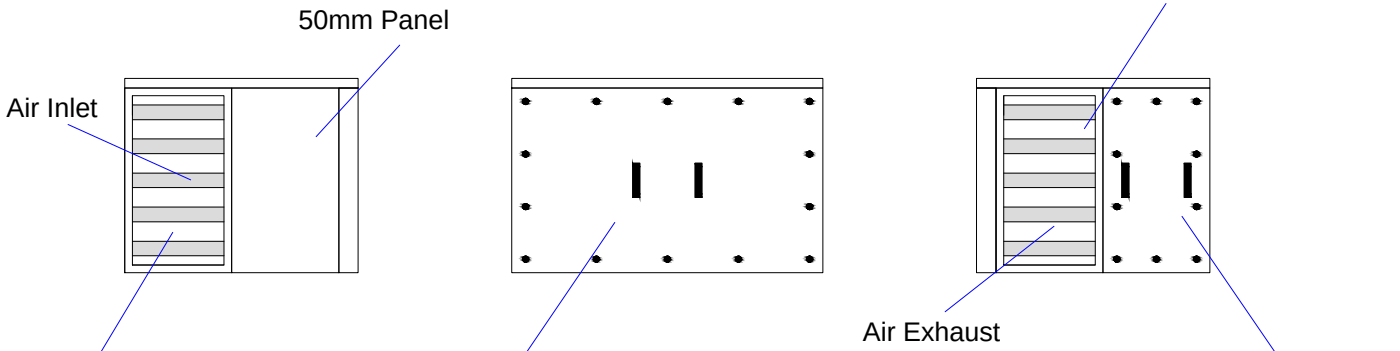
Total Noise Level, in dB(A), due to all contributions = 31



Plan View

Rear Elevation



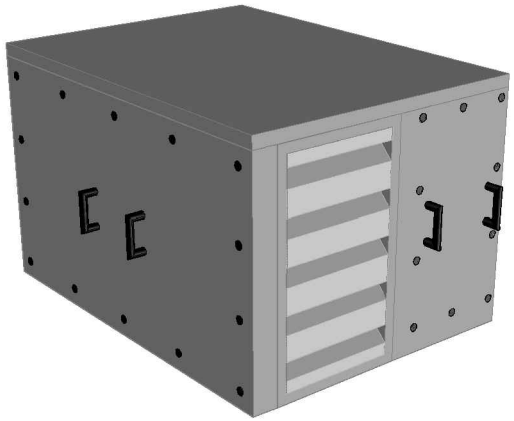


Left Elevation

Front Elevation

Right Elevation

3D Views (not to scale)



Notes

- Paint
- Bird Mesh
- Septum Plate & Angle

SOUND REDUCTION									
Frequency (Hz)	63	125	250	500	1k	2k	4k	8k	Overall dBA
IL (to 1DP) (dB)	4	15	20	26	28	27	23	23	20

Rev	Amendment	Date

Notes
No scaling permitted from this drawing. All dimensions shown to be verified prior to construction / manufacture.

Project: Sound Enclosure

Title: Quiet Box VI

Scale: NTS @A4

Drawn: B.Walker

Drawing No: Quiet Box VI

Date: 19/06/17

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