Design and Validation Note – Planning Condition 17 – Plant Noise Impact Assessment

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GMMH Park House	1028427	16/08/2024
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1.0 Introduction

This purpose of this design memorandum is to present a design and verification noise impact assessments for new external plant items associated with the Park House development at North Manchester General Hospital, in accordance with the requirements of Planning Condition 17 attached to the proposed development (Application Ref: 132567/JO/2021)

Planning Condition 17 relates to noise from items of external plant and states :

"Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. The scheme shall be submitted to and approved in writing by the City Council as Local Planning authority in order to secure a reduction in the level of noise emanating from the site. The approved scheme shall be completed before the apartments are occupied.

Upon completion of the development a verification report will be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria has been met. Any instances of nonconformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

Reason - To safeguard the amenity of existing and future occupiers of nearby

residential accommodation, pursuant to saved policy DC26 of the Unitary Development Plan for the City of Manchester and policies SP1 and DM1 of the Core Strategy."

2.0 Environmental noise survey

The determination of existing representative background sound levels at the site has been informed by environmental noise survey results presented in the WSP acoustic report submitted in support of the initial application (Ref: 70069934-R1 September 2020).

The WSP environmental noise survey was undertaken between approximately 11:30 hours on Tuesday 8 September 2020 and 14:30 hours on Tuesday 15 September 2020. The survey consisted of continuous unattended measurements at two measurement locations as highlighted in Figure 1, below. Also presented is the approximate red line site boundary and worst case affected off-site noise sensitive receptors.

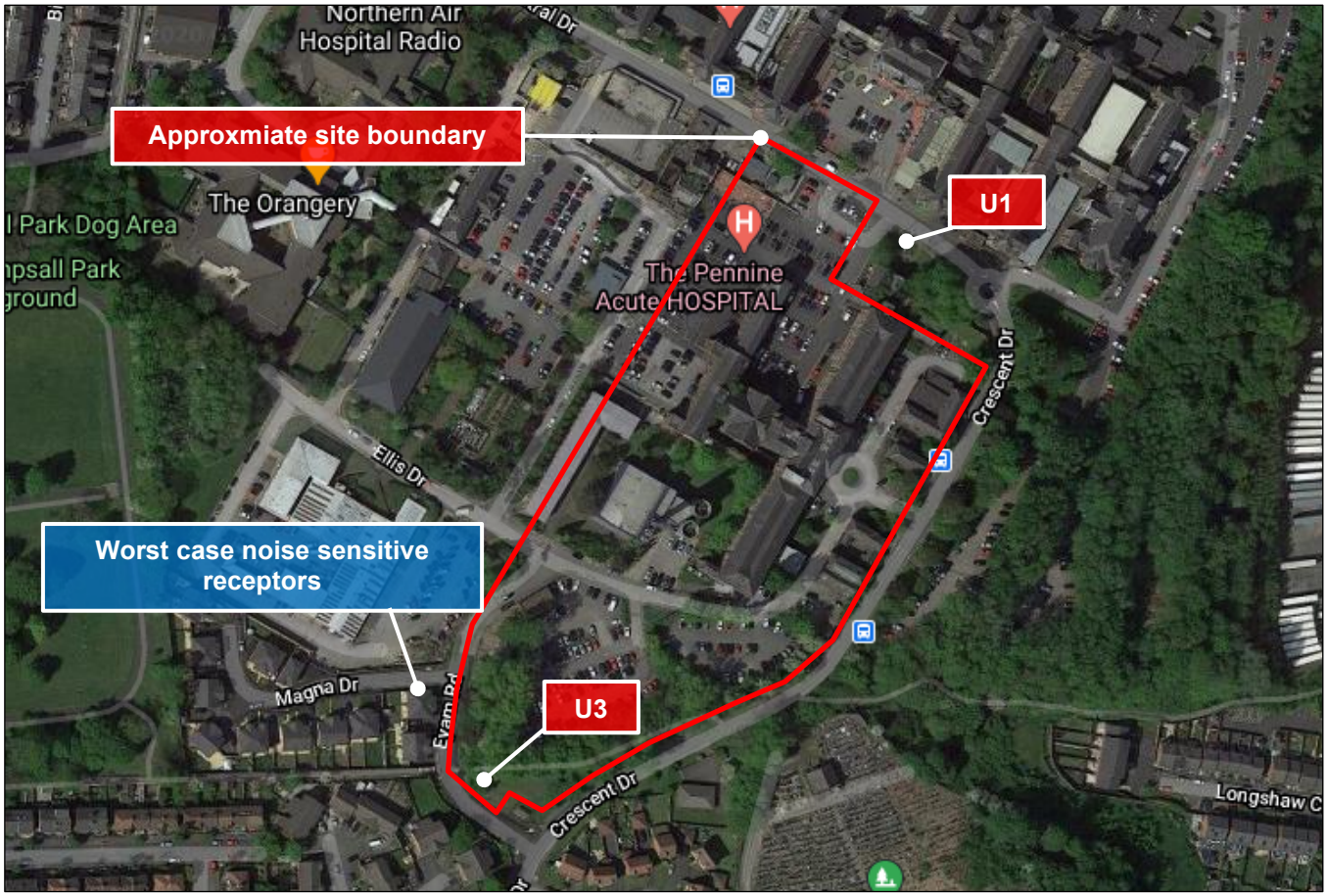


Figure 1: WSP noise measurement positions

The representative background sound level results for positions U1 and U3 are shown in Table 1, below. This has been reproduced from Table 3-7 of the WSP report.

Location	Period	$L_{A90,15mins}$
U1	Daytime	44 dB
	Night-time	40 dB
U3	Daytime	42 dB
	Night-time	35 dB

Table 1: Representative background levels (Table 3-7 of WSP report)

3.0 Proposed plant noise emission limits

Based on WSP noise survey results obtained at position U3, the resultant plant noise emission limits in accordance with Planning Condition 17 requirements (i.e. 5 dB below representative background sound level) are presented in Table 2:

Time period	Representative background sound level dB $L_{A90,T}$	BS 4142 plant noise rating level limit dB $L_{Ar,Tr}$ to be achieved at 1 m from the nearest residential dwelling
Daytime (07:00-23:00 hrs)	42	≤ 37
Night-time (23:00-07:00 hrs)	35	≤ 30

Table 2: Limiting noise level for non-emergency plant

The above limit is applicable to the cumulative noise level from all new items of plant when running under normal operation. Where applicable, acoustic feature corrections shall be applied to the specific plant noise level to account for any distinguishable acoustic characteristics (e.g. tonality, impulsivity, intermittency).

4.0 Plant proposals

The dominant source of new noise generating plant associated with the scheme will be attributable to Air Handling Units (AHUs) and Air Source Heat Pumps (ASHPs). The proposed locations of new AHUs and the external ASHPs are detailed in the layout reproduced in Appendix I to this Design Note.

Data provided by Ramboll UK quotes the following maximum design duty sound power levels for new AHUs associated with the scheme:

AHU reference	Fan reference	Spectral sound power level, L_W (dB)							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
AHU Entrance Block	Supply Inlet	48	69	60	50	45	33	19	0
	Extract Outlet	52	65	69	72	74	64	62	54
	Casing Breakout	60	67	57	48	51	39	34	27
AHU FM	Supply Inlet	49	61	63	52	41	35	23	5
	Extract Outlet	54	57	72	70	72	69	66	62
	Casing Breakout	61	59	59	47	49	42	38	34
AHU Kitchen	Supply Inlet	53	75	62	51	41	33	17	2
	Extract Outlet	59	69	71	72	70	68	64	60
	Casing Breakout	69	72	59	50	49	43	37	32
AHU Wards 1 & 4	Supply Inlet	51	76	66	55	48	36	24	8
	Extract Outlet	58	75	76	77	76	68	67	64
	Casing Breakout	65	75	62	53	52	42	39	36
AHU Wards 2 & 5	Supply Inlet	50	73	62	55	48	39	25	8
	Extract Outlet	55	67	72	77	73	70	67	61
	Casing Breakout	63	70	58	53	51	44	39	34

AHU reference	Fan reference	Spectral sound power level, L_W (dB)							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
AHU Wards 3 & 6	Supply Inlet	53	79	68	56	51	38	25	13
	Extract Outlet	61	75	77	79	78	70	70	68
	Casing Breakout	67	78	64	55	55	44	41	40
AHU Ward 7	Supply Inlet	75	69	64	61	64	59	49	39
	Extract Outlet	58	72	76	76	74	70	68	64
	Casing Breakout	65	73	63	52	50	44	40	36
AHU Wards 8 & 9	Supply Inlet	48	69	60	50	45	33	19	0
	Extract Outlet	52	65	69	72	74	64	62	54
	Casing Breakout	60	67	56	48	51	39	34	26

Table 3: AHU noise data

The sound power data for the five proposed ASHPs is given below:

Plant item	Quantity	Spectral sound power level, L_W (dB)						
		125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Powermaster WSAN-YSC4 120.4	3 units	70	79	81	83	80	72	62
Powermaster WSAN-XSC3 120.4	2 units	85	85	83	83	80	66	57

Table 4: ASHP noise data

5.0 Assessment procedure

In order to determine plant noise propagation to the nearest effected residential properties, a model has been produced using SoundPLAN 8.2 acoustic modelling software. This model is capable of accurately determining sound propagation by taking into account variations in topography, barrier attenuation provided by existing landscaping and buildings, and distance attenuation.

The noise propagation at the nearest-noise sensitive receptors identified has been calculated. The nearest off-site residential noise sensitive receptors have been identified as residential properties located on Eyam Road.

Spectral data indicates that items of plant do not require a feature correction for tonality. It is understood that plant items will generally operate in a steady state and will not rapidly ramp up or down, and as such no acoustic feature corrections for impulsivity and intermittency have been applied.

It is understood that no more than four of the Air Source Heat Pumps will be operational simultaneously.

The modelling process has also considered proposals to mitigate noise from the ASHP compound with a 4 m tall imperforate timber barrier with a minimum surface density 10 kg/m^2. A visualisation of the ASHP compound screen is presented in Figure 2, overleaf.

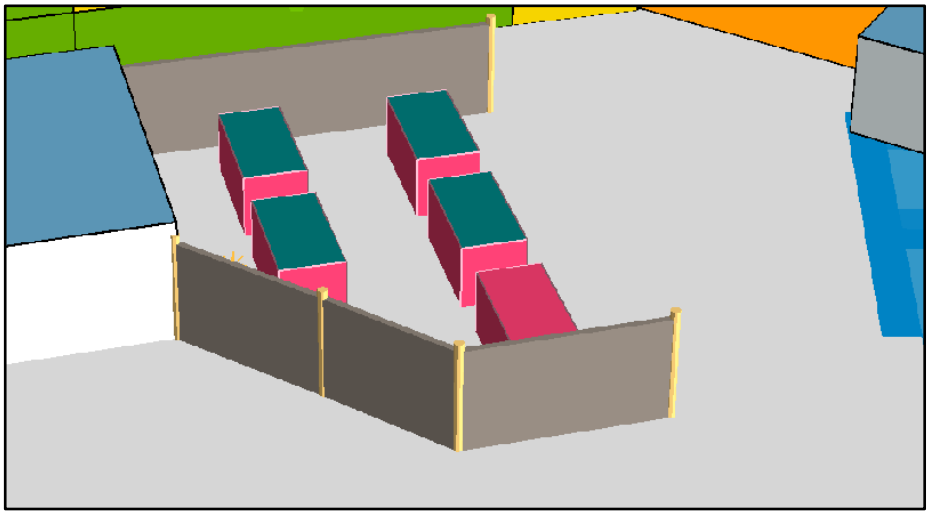


Figure 2: Extent of 4 m tall acoustic barrier

It should also be noted that the noise model has not considered atmosphere-side supply ductwork losses or additional acoustic screening afforded by plant weather screen louvres. As such, predicted levels from the model can be considered worst-case.

The results are summarised in Table 5 below:

Location	Scenario	Rating level limit, $L_{Ar,Tr}$ dB	Worst case calculated cumulative specific sound level, L_{Aeq} dB	Acoustic feature correction, dB	Calculated rating level at noise-sensitive receptors, $L_{Ar,Tr}$ dB	Assessment outcome
Nearest off-site residential receptors (Eyam Road)	Daytime plant limits	37	30	+0	30	Compliance with proposed plant noise level rating level limits
	Night-time plant limits	30	30	+0	30	

Table 5: Plant noise assessment results

As can be seen from the results detailed in Table 5, plant proposals are expected to comply with Local Authority Planning requirements as detailed in Planning Condition 17.

6.0 Validation testing

Planning Condition 17 states that pre completion testing must be undertaken with a validation report provided to ensure compliance with the proposed noise limits.

A site visit was undertaken on 13/08/2024 to undertake noise validation measurements. Table 6 summarises the equipment used in testing:

Item of equipment	Serial number	Calibration certificate	Date of last calibration	Next calibration due
NTi Audio sound level meter Type XL2	A2A-16315-E0	06292/2	07/07/2023	06/07/2025
NTi Audio pre-amplifier Type MA220	8550			
NTi Audio microphone Type MC230A	A17555			
Larson Davis Calibrator Type CAL200	16781	06292/1	22/07/2024	21/07/2025

Table 6: List of equipment used

Measurements were undertaken in the ASHP compound (i.e. the dominant source of plant noise contributions) at five locations, each being 1 m from each individual ASHP unit. This methodology allows for source level measurements to be distance corrected to determine plant noise levels at worst case affected residential properties (Eyam Road) whilst minimising contributions from the existing ambient sound level.

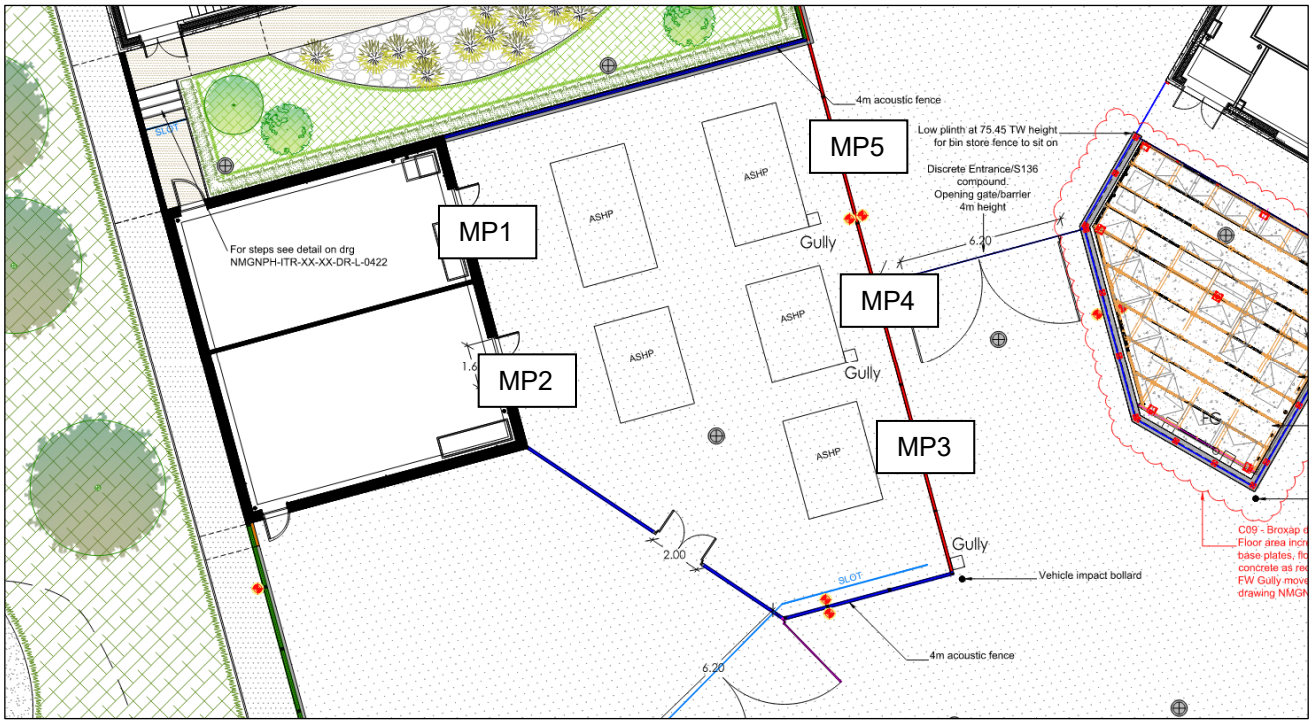


Figure 3: Noise measurement positions

Monitoring equipment was set up by competently trained Cundall staff and all measurement have been reported for free-field conditions.

It was confirmed by site operatives that all external noise generating plant was fully balanced and operating at design duty levels at the time of the measurements. A visual inspection confirmed that plant models installed are the ones included in the design stage 3D noise prediction model.

A summary of noise level measurements is shown in Table 7 overleaf.

All values have been rounded to the nearest integer value (as fractions of a decibel are imperceptible) and are given in dBA.

Measurement	Sound pressure level @ 1m $L_{Aeq,T}$ (dB)
MP1	48
MP2	51
MP3	52
MP4	52
MP5	53

Table 7: Noise level measurements

The plant items were fully commissioned at the time of measurements and were operating at the necessary design duty values as specified by the centralised Building Management System (BMS). The measured ASHP values ranged from 48 to 53 dB $L_{Aeq,T}$, and subsequent distance attenuation calculations have determined that the resultant rating level at the worst-case affected Noise Sensitive Receptor (NSR) is approximately 20 dBA, which is 15 dB below the representative background sound level.

However, under theoretical maximum load conditions, anticipated during winter heating, it is acknowledged that the source sound pressure level from each unit could increase to 65 dB $L_{Aeq,T}$ at 1 metre. In this scenario, resultant noise impacts of 30 dB $L_{Aeq,T}$ would be expected, as assessed in the design stage 3D noise propagation model.

Given that measurements under potential 'worst-case' heating conditions were not available, it is considered that the 3D modelling process remains valid for determining the maximum worst-case potential effects and compliance.

6.1.1 Validation testing summary

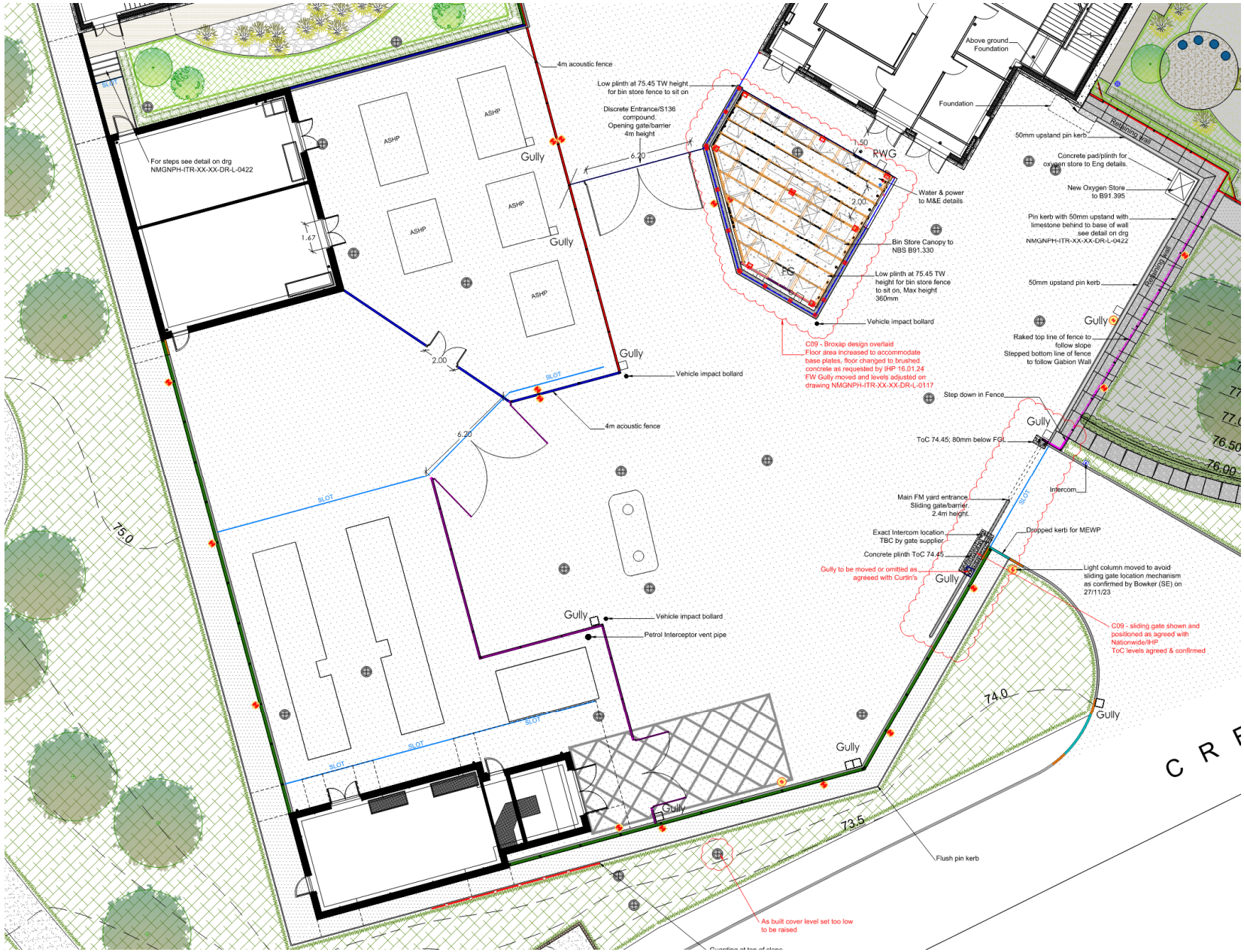
Based on the verification testing it can be reasonably concluded that the findings of the plant noise prediction model of the site are therefore valid, with on-site validation measurements and inspections of plant providing no evidence to the contrary, and that the resultant rating level due to new items of building services plant is at worst case expected to be equal to the representative background sound level, demonstrating compliance with the requirements of Planning Condition 17.

CUNDALL

Appendix I Plant layout



1 20_00-ZZ-0001_Proposed Roof Plan
1 : 250


4m acoustic fence
Low plinth at 75.45 TW height for bin store fence to sit on
Discrete Entrance/S136 compound. Opening gate/barrier 4m height
6.20
ASHP
Gully
For steps see detail on drg NMGNPH-ITR-XX-XX-DR-L-0422
1.67
2.00
SLOT
Vehicle impact bollard
4m acoustic fence
Above ground Foundation
Foundation
RWG
1.50
2.00
Water & power to M&E details
Bin Store Canopy to NBS B91.330
FG
Low plinth at 75.45 TW height for bin store fence to sit on, Max height 360mm
Vehicle impact bollard
C09 - Broxap design overlaid Floor area increased to accommodate base plates, floor changed to brushed concrete as requested by IHP 16.01.24 FW Gully moved and levels adjusted on drawing NMGNPH-ITR-XX-XX-DR-L-0117
Retaining Wall
50mm upstand pin kerb
Concrete pad/plinth for oxygen store to Eng details.
New Oxygen Store to B91.395
Pin kerb with 50mm upstand with limestone behind to base of wall see detail on drg NMGNPH-ITR-XX-XX-DR-L-0422
Raked top line of fence to follow slope
Stepped bottom line of fence to follow Gabion Wall
Step down in Fence
ToC 74.45; 80mm below FGL
Intercom
Main FM yard entrance Sliding gate/barrier. 2.4m height.
Exact Intercom location TBC by gate supplier
Concrete plinth ToC 74.45
Gully to be moved or omitted as agreed with Curtin's
Dropped kerb for MEWP
Light column moved to avoid sliding gate location mechanism as confirmed by Bowker (SE) on 27/11/23
C09 - sliding gate shown and positioned as agreed with Nationwide/IHP ToC levels agreed & confirmed
Petrol Interceptor vent pipe
Flush pin kerb
As built cover level set too low to be raised
75.0
74.0
73.5
76.50
76.00