Hayes McKenzie
Consultants in Acoustics

Former ICL Private Ground
Environmental Noise Impact Assessment

Report HM: 3139 _R01_EXT0-3

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1. INTRODUCTION

1.1 12.7 acres of private land, formerly owned by Imperial College London, located at Udney Park Road, Teddington, TW11 9BB is currently leased from Quantum Group to the Teddington Community Sports Ground CIC. Following a public consultation period, Quantum Group have submitted outline plans to The London Borough of Richmond upon Thames Council (RTC) for a scoping opinion on a proposed development at the site. QDB are now preparing a full planning application for the site which includes new sports facilities combined with a residential development. RTC have requested a noise impact assessment for the application in order to ensure that plant noise and noise from the sports facilities on the site does not generate an unacceptable impact at the proposed residential units. QDB have therefore commissioned Hayes McKenzie to carry out an environmental noise impact assessment to support the planning application.

1.2 The proposed development at Udney Park Road includes an extra care community complex incorporating a communal restaurant area along with new sports facilities including a 3G sports pitch, a multi-use games area (MUGA) and a new clubhouse. Industrial noise from plant associated with the extra care community complex and new clubhouse has been considered in terms of the impact on existing and proposed residential properties. Noise from the new sports facilities has been considered in terms of the changes that may be experienced at existing properties and the impact on proposed new residential units. Existing levels of background noise have also been considered in terms of the impact within proposed new residential units.

1.3 In order to fully assess the noise impacts at existing and proposed residential locations, a background noise survey has been conducted at two locations within the grounds of the site. The two locations were chosen to provide representative background noise levels for existing properties to the north of the site on Kingston Lane and properties to the south of the site on Cromwell Road.

1.4 A location plan for the proposed development is shown at Figure 1 highlighting the locations of the noise measurement equipment.

2. RELEVANT GUIDANCE

BS 8233:2014, Guidance on sound insulation and noise reduction for buildings

2.1 BS 8233 provides guidance on suitable internal noise levels for different types of buildings, including various home and office spaces with different uses. Section 7.7.2 of the standard (specifically Table 4) incorporates WHO guidance on acceptable noise levels for residential dwellings and this contributes to design criteria for living rooms and bedrooms which are reproduced below in Table 1.

Table 1: Extract from BS 8233, Indoor Ambient Noise Levels for Dwellings

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Footnote 4 to this table states that:

'Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,f}$, depending on the character and number of events per night. Sporadic noise events could require separate values'.

BS 4142:2014, Methods for rating and assessing industrial and commercial sounds

2.2 BS 4142 provides an assessment methodology for determining the likelihood of complaints at residential properties, as a result of noise immission levels from industrial and commercial sources. The standard describes a method for rating the difference between the existing background noise level (without the noise source) and the noise immission level of the source at a receiver location (known as the specific noise level). If the specific noise level exhibits an identifiable character such as tonality or impulsiveness, then a variable penalty of up to 6 dB or 9 dB respectively may be added to give the rating level.

2.3 The difference between the background noise level and the rating level (rating minus background) can then be used to assess the noise impact (where appropriate), as shown

in Table 2 below. BS 4142:2014 states that. '*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*'.

Table 2: Extract from BS 4142

Difference	Assessment
Around +10 dB or more	Indication of a significant adverse impact
Around +5 dB	Indication of an adverse impact
<0 dB	Indication of a low impact

2.4 Whilst BS 4142 gives an indicative assessment of the impact on residential amenity, there are no specific guidelines on acceptable criteria for noise limits and in this respect, the standard is left open to interpretation, allowing for assessment of the impact within the context of the existing environment. Generally, noise limits contained in planning conditions are derived to be suitable for the locality and development plans. Hayes McKenzie consider that a difference of 0 dB or less is suitable for constant or frequently occurring industrial or commercial noise, based on the significance criteria outlined in the table above. For noise sources operating less frequently or only during normal working hours, a margin above the background noise could be considered to be acceptable.

2.5 Section 8 of BS 4142 recommends that a measurement interval of '*normally not less than 15 min*' should be used to gather background noise data, that weekday and weekend periods may need to be considered separately and that levels are reported as integers to reflect the variability of such measurements.

2.6 The standard also gives guidance on how to take measurements and interpret the results. With regard to measurement positions it states at paragraph 6.2 that:

'Where it is necessary to make measurements above ground floor level, choose a position which is 1 m from the façade on the relevant floor of the building'

2.7 Section 7 of the standard is about determination of the specific noise level and certain paragraphs from this section are of relevance to this noise assessment. Paragraph 7.3.6 states:

'Determine the specific sound level by calculation alone if measurement is not practicable, for example if the source is not yet in operation. In such cases, report the method of calculation in detail and give the reason for using it.'

Artificial Grass Pitch (AGP) Acoustics

2.8 A design guidance note has been produced by Sport England[1] to provide advice to planners on acoustic design in relation to artificial grass pitches. The proposed '3G sports pitches' within the development are a type of artificial grass pitch in which the pile is supported by a thin base layer of sand, and by an infill of rubber crumb. It is therefore considered that the design guidance note is of relevance to the proposed development.

2.9 The document reviews relevant guidance on noise and sets out a benchmark noise limit of 50 dB $L_{Aeq,1hr}$ (outdoors) based on meeting an internal noise limit of 35 dB $L_{Aeq,16hr}$ set out within WHO guidelines. The conversion between indoor and outdoor noise levels is based on an assumed 15 dB of attenuation through a window opened for ventilation.

2.10 It is important to note that the guidance is based on designing a new site where existing properties will be exposed to new noise from an AGP and it provides an outdoor noise limit since sound insulation of existing properties cannot normally be taken into account. The proposed development in Udney Park Road, however, incorporates residential buildings in addition to the sports facilities and there is scope to assess the sound insulation of these new buildings in relation to noise impact from an AGP. Therefore, the aim of achieving an internal noise level of 35 dB $L_{Aeq,1hr}$ is relevant to the proposed residential buildings within the development.

2.11 The document also mentions analysing change in existing noise climate as an alternative methodology where there is change to an existing AGP or turf pitch or existing noise levels are high.

2.12 In addition to guidance on noise limits, the document details an investigation into 'typical' noise levels generated by an AGP. Following measurements at nine separate AGP locations covering a variety of different sports and participants the document specifies an average noise level of 58 dB $L_{Aeq,\ 1hr}$ at 10m from the side-line halfway marking with the following comments on the type of noise:

"The most significant noise levels were found to be generally derived from the voices of players, with the exception of hockey where impact noises of balls hitting perimeter strike boards and goal back boards were more noticeable. Such impact noises can be mitigated by incorporating shock absorbing noise reduction measures."

1 Artificial Grass Pitch (AGP) Acoustics - *Planning Implications*, Sports England, 2015

The document goes on to provide guidance on measures to minimise noise impact including information about acoustic barriers.

Local Authority Guidance

2.13 The London Borough of Richmond upon Thames Council (RTC) have been contacted to enquire about methodology that they would expect to see in the noise assessment. Chis Hurst from the Commercial Environmental Health team stated that the residential units should be assessed with reference to standards specified in BS8223 and that the AGP/MUGA should be assessed against the 50 dB $L_{Aeq,1hr}$ limit set out in the Sport England guidance.

2.14 The location of noise measurement equipment was also discussed with RTC and Chris Hurst agreed in principle to the two locations that were selected. An invitation was made for a representative from RTC to attend when equipment was installed to agree on the exact positioning but this was declined on the grounds that it should not be necessary.

3. METHODOLOGY

3.1 BS4142 is generally aimed at mechanical plant noise and is therefore considered entirely appropriate for assessing noise emissions from proposed kitchen extraction systems and air-conditioning or refrigeration plant. The proposed development includes this type of plant in a number of different locations and background noise has therefore been measured at the site as part of this assessment. The proposed criteria of 0 dB or less mentioned at paragraph 2.4 has been used as part of the assessment.

3.2 Advice on background noise levels within the proposed residential units has been given with reference to the BS8233 criteria for daytime resting and sleeping (35 dBA and 30 dBA respectively) listed at Table 1. This is in accordance with the guidance received from RTC regarding this aspect of the noise assessment.

3.3 Predicted noise from the proposed artificial grass pitch (AGP) and multi-use games area (MUGA) has been assessed against the 50 dB $L_{Aeq\ 1hr}$ limit suggested in the Sport England document (see paragraph 2.8 above). This is also in accordance with the guidance received from RTC regarding this aspect of the noise assessment.

4. NOISE MEASUREMENTS

4.1 Noise measurements have been carried out to assess the current level of background noise at the site and also to provide information on noise levels associated with proposed sports activities at the site. The measurements are therefore split into two types, background and source noise measurements.

Source Noise Measurements

4.2 Source noise measurements were taken at 1m from a variety of different key noise sources associated with possible sports activity at the site. These were carried out using a Rion NL52 Sound Level Meter (SLM) measuring fitted with a ½" microphone complying with the Class 1 standard in IEC 61672-1. The SLM was set to measure L_{eq} in ⅓-Octave bands averaged over 1 second periods and was fitted with a 45mm diameter foam ball windshield. For all measurements the SLM was mounted on a camera tripod at a height of approximately 1.2 m but the relative location of the source and microphone varied (i.e. football kicked at ground level but tennis ball hit at 1 - 1.5m height in mid-air).

4.3 The Key potential noise sources that have been identified and measured are football kick, basketball bounce, tennis ball hit, MUGA backboard and goal impact (basketball and football respectively), tennis court fence impact. Pictures of the measurement equipment set up at 1m from a tennis court fence and MUGA backboard are shown at Figure 2.

4.4 In addition to source measurements at 1m from individual noise sources, measurements were also made at 3m from the side-line halfway marking during a busy football training session considered to be representative of the normal activity from Teddington Athletic Football Club. These measurements were carried out over a period of 30 minutes using the same equipment setup. During the measurements, noisy events were noted along with times in order to enable evaluation of peak noise levels. The 30 minute period selected for the measurements started once all three practice sessions were underway and finished at half time in order to ensure that measurements only captured actual training noise levels.

4.5 Calibration was carried out using a B&K type 4231 Acoustic Calibrator (s/n 2699281) set at a level of 94.05 dB before measurements were carried out and checked at the end. No drift in the calibration was observed and no correction has been made to the measured levels. All equipment was within its relevant calibration period.

Background Noise Survey

4.6 Unattended background noise measurements were conducted between Friday the 21st and Tuesday the 25th April 2017 at the Former ICL Private Ground, Udney Park Road, Teddington. The two measurement locations are highlighted at Figure 1.

4.7 The noise equipment for the background noise survey was installed within the sports field, using microphones mounted on survey tripods at a height of approximately 1.5m. The two measurement locations were chosen to provide noise levels considered to be representative of background noise at nearby properties in Kingston Lane and Cromwell Road. A rain gauge was also installed at one of the locations (location 1) and photographs of the in-situ equipment are shown at Figure 3 and Figure 4.

4.8 Noise measurements were carried out over a four day period at a height of 1.5 m, positioned within the sports field in order to provide representative measurements for existing properties and the proposed residential development. The weather during the survey was generally bright and sunny with a few very brief periods of rain and there was little or no wind (<5 m/s, particularly in this very sheltered measurement location). The survey period was chosen to include weekday and weekend periods allowing potential differences to be assessed in accordance with recommendations in BS 4142.

4.9 The equipment at each location consisted of a Rion NL-52 Sound Level Meter, fitted with a ½" microphone complying with the Class 1 standard in IEC 61672-1. The microphone was fitted with a 45mm radius foam ball windshield surrounded by a 125mm radius secondary windshield of 40mm thickness and mounted on a survey tripod at a height of approximately 1.5 m. The equipment was positioned close enough to boundary fences to allow it to be chained to railings for security purposes but the microphones were positioned as far as possible from nearby foliage to minimise any effect that wind in the trees may have on the results. The meter was programmed to measure a number of statistical noise indices, including the L_{A90}, together with the maximum and minimum levels and the L_{Aeq} over consecutive 15-minute periods. The meter was also set to record audio whenever a noisy event occurred and continuous 1 second L_{Aeq} data to allow detailed analysis of any noisy events.

4.10 A Pluvimate rain gauge fitted with a Tinytag logger was used to collect rainfall data (in consecutive 15-minute periods) at the site during the monitoring period.

4.11 Calibration was carried out using a B&K type 4231 Acoustic Calibrator (s/n 2699281) set at a level of 94.05 dB at the start of the survey and checked at the end. A drift in the calibration of -0.8 dB was observed at location 1 (no drift at location 2). No correction has

been made to the measured levels[2]. All equipment was within its relevant calibration period.

Measurement Results

4.12 Measurements of training noise levels highlighted that the main noise sources were instructions being shouted from the coaches and whistle blows. The results of the source noise measurements gave the average L_{Aeq} ⅓-octave band noise levels at the specified distances detailed in Table 3 below. The 'General Training' noise level presented in Table 3 is an L_{Aeq} over a one and a half minute period considered to be representative of continuous training. All other noise levels presented in Table 3 are logarithmic averages of a varying number (between 4 and 15) of 1 second L_{Aeq} measurements which were noted to contain the peak noise of each particular event.

Table 3: Measurement results

Descriptor	Distance from Source (m)	Total dB L_{Aeq}	Octave Band (Hz) L_{Aeq}							
			63	125	250	500	1000	2000	4000	8000
General Training	3*	53.5	29.1	35.6	37.6	42.9	46.8	49.1	48.2	28.0
Coach Shouting	3*	57.4	28.6	33.3	38.9	43.0	51.1	53.8	51.5	34.0
Whistle Blow	3*	67.9	30.5	35.1	36.1	40.6	45.5	47.4	67.8	36.8
Football Kick	1	74.7	64.1	67.1	66.0	66.5	68.2	65.8	62.7	60.1
Backboard Impact	1**	77.0	47.8	56.7	70.9	71.5	70.6	68.7	65.7	56.4
Goal Impact***	1	71.7	56.0	62.5	62.5	64.4	64.7	64.4	61.1	59.9
Tennis Fence Impact	1	78.3	40.2	47.5	67.7	70.8	68.2	74.7	70.2	65.7
Tennis Racket Hit	1	74.7	37.3	48.8	61.3	66.0	72.3	66.6	64.0	55.3
Basketball Bounce	1	76.0	49.2	67.2	64.5	63.6	69.3	70.0	69.4	64.0

* Measurement taken at 3m from side-line halfway marking, actual source roughly in centre of pitch.
** Measurement taken at 1m from rear of MUGA goal area which is ~ 3m from the basketball backboard
*** Combined goal and backboard structure associated with MUGA, not standard goalpost.

4.13 The results of the background noise survey, in terms of the L_{Aeq}, L_{A90} and L_{Amax} for each 15 minute measurement have been plotted in time history charts covering the entire survey period for each location and these are shown at Figure 5 and Figure 6. These results show that the L_{A90} has a typical diurnal variation with Sunday giving the lowest daytime levels as might be expected. The L_{Aeq} varies significantly and activity from football training on Saturday morning has affected the measurements which is clearly visible on the results at location 1 (where the L_{A90} has also been affected) and to a lesser extent at location 2.

4.14 The measured noise levels do not seem to have been affected by aircraft overflights and it appears that the main noise source influencing background noise in the area is road traffic

[2] the data was reviewed and equipment checked and was functioning correctly

on the A313 Teddington High Street. It is considered that apart from Saturday daytime at location 1 (where football training activity close to the microphone has affected L_{A90} levels), the measured background noise levels are broadly representative of existing properties within the vicinity of each location.

4.15 Table 4 and Table 5 show day-time (0700hrs – 2300hrs) and night-time (2300hrs – 0700hrs) noise levels in L_{Aeq} and average L_{A90} for the weekday and weekend periods measured during the survey. Any periods where rain was recorded have been excluded from the derivation of the daytime and night-time noise levels. There was very little rain during the survey and excluded periods are clearly marked on the time history charts.

Table 4: Location 1 - Average Daytime and Night-Time Noise Levels (Excluding Rain)

Period (24hrs from 0700 to 0700)	Day-time 0700 – 2300 Average Noise Level		Night-time 2300 – 0700 Average Noise Level	
	dB $L_{Aeq\ 16\ Hour}$	dB L_{A90} (Ave.)	dB $L_{Aeq\ 8\ Hour}$	dB L_{A90} (Ave.)
Fri 21st - Sat 22nd Apr			44.3	35.2
Sat 22nd - Sun 23rd Apr	59.1	41.5	46.8	30.1
Sun 23rd - Mon 24th Apr	50.4	36.3	43.8	34.6
Mon 24th - Tue 25th Apr	51.8	42.3	44.7	36.1
Overall	**55.5**	**40.0**	**45.1**	**34.0**

Table 5: Location 2 - Average Daytime and Night-Time Noise Levels (Excluding Rain)

Period (24hrs from 0700 to 0700)	Day-time 0700 – 2300 Average Noise Level		Night-time 2300 – 0700 Average Noise Level	
	dB $L_{Aeq\ 16\ Hour}$	dB L_{A90} (Ave.)	dB $L_{Aeq\ 8\ Hour}$	dB L_{A90} (Ave.)
Fri 21st - Sat 22nd Apr			43.1	32.1
Sat 22nd - Sun 23rd Apr	52.4	36.6	45.2	30.2
Sun 23rd - Mon 24th Apr	46.9	35.0	44.6	33.0
Mon 24th - Tue 25th Apr	48.5	39.4	42.6	34.0
Overall	**49.9**	**37.0**	**44.0**	**32.3**

4.16 The noise levels measured over 3 days and 4 nights indicate that night background L_{A90} levels were lowest at both locations on Saturday night but that, conversely, the ambient L_{Aeq} noise levels were highest on Saturday night at both locations suggesting loud transient events were more prevalent on Saturday night.

4.17 Excluding Saturday when football training has affected results, daytime L_{Aeq} levels are between 50 – 52 dB L_{Aeq} at location 1 and between 47 – 49 dB L_{Aeq} at location 2. The average L_{A90} noise levels are very similar at both locations over the weekend but during the week, location 1 seems to be 2 – 3 dB higher than location 2 which is suggests there could be more traffic on Cromwell Road compared to Kingston Lane.

4.18 Figure 7 through to Figure 10 give statistical frequency analyses of the L_{A90} for the night and day, separating results into each 16 hour or 8 hour period over the survey at each location. The analysis at Figure 7 shows that the most commonly occurring values of L_{A90} during the night at location 1 are 30, 33, 33, and 34 on Saturday, Friday, Sunday and Monday respectively. The analysis at Figure 9 shows that the most commonly occurring values of L_{A90} during the night at location 2 are 28, 29, 31, and 41 on Saturday, Friday, Monday and Sunday respectively. Apart from Saturday night at location 1 and Sunday night at location 2, this is quite consistent with a 2 – 4 dB range. Comparing these results with average values at Table 4 and Table 5, it is considered that night time background noise levels of **33** and **30 dB L_{A90}** are representative for locations 1 and 2 respectively.

4.19 During the day, Figure 8 shows that the most commonly occurring values of L_{A90} during the day at location 1 are 37, 40 and 43 on Sunday, Saturday and Monday respectively. The analysis at Figure 10 shows that the most commonly occurring values of L_{A90} during the day at location 2 are 36, 36 and 39/40 on Saturday, Sunday and Monday respectively. These results have a 3 – 6 dB range and are consistent with average values at Table 4 and Table 5. It is therefore considered that day time background noise levels of **37** and **40 dB L_{A90}** are representative for locations 2 and 1 respectively.

4.20 Apart from the results at location 1 on Saturday, the ambient L_{Aeq} noise levels presented at Table 4 and Table 5 are fairly consistent generally with a 2 – 3 dB range. For the purposes of comparison with guidelines provided in BS8233, overall daytime and night-time noise levels of **50dB $L_{Aeq,16\ hour}$** and **44 dB $L_{Aeq,\ 8\ hour}$** respectively have been assumed to be representative at location 2. For location 1, daytime and night-time noise levels of **51 dB $L_{Aeq,16\ hour}$** and **45 dB $L_{Aeq,\ 8\ hour}$** respectively have been assumed to be representative.

5. NOISE PREDICTIONS

5.1 Noise predictions for the development can be categorised into three main noise sources and predictions will therefore be separated into plant noise, AGP/football noise and MUGA noise. Detailed noise predictions have been carried out in accordance with ISO 9613:2 *Acoustics, Attenuation of Sound During Propagation Outdoors* implemented through the use of CadnaA noise modelling software. It should be noted that all noise contours and prediction points use a receiver height of 4m to provide worst-case predictions representative of 1st floor bedroom windows.

Plant Noise

5.2 There are two types of plant associated with the development that have been highlighted for inclusion within the noise predictions; extractor fans and compressor/condenser units. There are two standard kitchen extractor fans and 8 combined compressor/condenser units planned across the entire development. The proposed compressor/condenser unit to be used throughout is a Mitsubishi MXZ-5B42NA and a standard Manrose 150mm Axial Kitchen Fan has been assumed for the 2 extractor fans. Data sheets for both these items of plant are included at Appendix A.

5.3 The Mitsubishi datasheet provides measured octave band noise levels at 1m from the unit resulting in an overall level of 58 dBA. Assuming hemispherical propagation, this equates to a sound power level of **66 dBA L_w**. The Manrose datasheet provides a measured overall level of 40 dBA. Assuming the measurements were made at 1 m and also assuming hemispherical propagation, this noise level equates to a sound power level of **48 dBA L_w**. Since there is no spectral information supplied for the extractor fan it is assumed to have a similar spectrum to the compressor/condenser units. The spectrum provided in the Mitsubishi datasheet has been normalised to the calculated sound power levels above for use in the noise predictions and these levels are shown below at Table 6.

Table 6: Octave Band Sound Power Levels – proposed plant (dB L_{WA})

	Overall	Octave Band Centre Frequency (Hz)							
		63	125	250	500	1000	2000	4000	8000
Mitsubishi MXZ-5B42NA	66	42.8	55.9	57.9	58.8	61.5	57.2	52.5	50.9
Manrose 150mm Axial Kitchen Fan	48	24.8	37.9	39.9	40.8	43.5	39.2	34.5	32.9

5.4 Results of the noise predictions are shown in the form of noise contours and presented in a full page figure attached to the end of this report (Figure 11). Details of the locations (OSGB36 eastings and northings) of the compressor/condenser units and kitchen extract fans are specified on this figure.

5.5 The closest property on Kingston Lane, highlighted on the noise contours, has a predicted noise level of 33 dBA due to plant noise. All other nearby existing or proposed residential properties would have lower predicted noise levels due to plant.

Football Noise

5.6 Teddington Athletic Football club is specifically for children and teenagers with 37 boys' and girls' teams ranging from U6 to U20 age groups. During the measurements of training noise, the main noise sources appear to be from coaches shouting and using their whistles which is consistent with guidance from Sport England. It is therefore considered that the

level of noise is unlikely to change much when moving to an artificial grass pitch. Although there could be slightly more noise during a match, it is considered that the measured noise levels during training are representative of the noise that is likely to be present most of the time and that any potential increases during a match would be unlikely to significantly affect the overall noise level.

5.7 Predictions have been carried out using the measured noise levels from 'general training' listed at Table 3. Pitches have been modelled as area sources and the octave band sound power levels have been adjusted to give the overall measured levels at 3m from the side-line halfway marking. It is considered that these predictions are representative of the noise levels that are likely to be experienced at the site but since there are also guidelines from Sport England on the expected noise levels from an AGP, these have also been considered in order to provide a robust assessment of the potential noise. Sport England guidance states that an average of 58 dB $L_{Aeq, 1hr}$ at 10m from the side-line halfway marking can be expected and this figure has been used to adjust the sound power levels used for the first set of predictions. A second set of noise predictions has been produced based on the guidance for AGP noise levels (for the proposed AGP but not the secondary grass pitch) and it is noted that this results in predicted noise levels which are roughly 4-6 dB higher depending on location.

5.8 Results of the noise predictions are shown in the form of noise contours and presented in two full page figures attached to the end of this report (Figure 12 and Figure 13). Since the agreed methodology for football noise is to work towards a limit of 50 dB $L_{Aeq, 1hr}$, the noise contours have been formatted to finish at 50 dB to make it clear where the noise limit is being met.

5.9 Generally speaking, noise from the football pitches will generate the biggest impact at proposed residential properties within the development. In order to assess this impact, four receiver locations have been selected to be representative of first floor windows with the highest predicted noise levels within each of the 3 residential plots (A, B and C). Receivers 1 and 2 are representative of first floor windows in Plot A; Receiver 3 is representative of first floor windows in Plot C and Receiver 4 is representative of first floor windows in Plot B. The positions of all four receivers are highlighted on the noise contours (Figure 12 and Figure 13).

5.10 The closest residential window within the proposed development (Receiver 1), has predicted noise levels of 50.8 dBA and 55.5 dBA based on measured training noise levels and AGP guidelines respectively. All other nearby properties have lower predicted noise levels due to football training.

5.11 The results of the noise predictions for each of the locations highlighted on the noise contours are shown at Table 7.

Table 7: Predicted Free-field Football Training Noise Levels

Location	Easting	Northing	Predicted Noise Level (dB L_{Aeq})	
			(Measured training)	(Guideline AGP)
Receiver 1 (Plot A)	516449	170864	51	56
Receiver 2 (Plot A)	516488	170878	50	53
Receiver 3 (Plot C)	516360	170800	48	54
Receiver 4 (Plot B)	516370	170863	46	53

MUGA Noise

5.12 There is no specific guidance relating to MUGA noise levels but the proposed MUGA is intended to be used for tennis and netball only and the relevant measured noise levels for these activities presented at Table 3 are useful for deriving some assumptions. In comparison to the measured levels for a football kick, all measured noise levels for potential MUGA activities are no more than 3 dB higher. In comparison with the measured levels for football training, the measured levels relevant to the MUGA are generally low when compared to a coach shouting and blowing a whistle at a much greater distance away. It is therefore considered that a coach or referee shouting and blowing a whistle during a netball training session or match would be the most significant noise source and that measured general training noise levels would be representative for the intended use of the MUGA. The MUGA has been modelled as an area source and the octave band sound power levels have been adjusted to give the overall measured levels at 3m from the side-line halfway marking in the same way as the football pitches.

5.13 Results of the noise predictions are shown in the form of noise contours and presented in a full page figure attached to the end of this report (Figure 14). Since the agreed methodology for MUGA noise is to work towards a limit of 50 dB $L_{Aeq, 1hr}$, the noise contours have been formatted to finish at 50 dB to make it clear where the noise limit is being met. It can be seen that the predicted noise levels from the MUGA are below 50 dBA at all nearby residential properties. At the closest property on Cromwell Road the predicted noise level is 46 dBA.

Peak Noise Levels

5.14 In addition to the average L_{Aeq} noise levels for the AGP, grass pitch and MUGA which are considered to be representative of a 1 hour training session, it is also useful to understand the peak noise levels for individual noisy events. For the purposes of this exercise, worst

case situations assuming individual noisy events are taking place at nearby locations to Receiver 1 (nearest to the football pitches) and the closest property on Cromwell Road (considered in the MUGA predictions).

5.15 Predictions have been carried out using point sources and the measured noise data presented at Table 3. It should be noted that no predictions have been carried out for the MUGA goal impact noise as the intended use of the proposed MUGA does not include football. Results for the peak noise level predictions are presented below at Table 8.

Table 8: Predicted Peak Noise Levels

Individual Noisy Activity	Predicted Noise Level (dB L_{Aeq})	
	Receiver 1	Closest Property on Cromwell Road
Whistle Blow on AGP	62	-
Coach Shouting on AGP	52	-
Football Kick on AGP	50	-
Backboard on MUGA	-	53
Basketball Bounce on MUGA	-	46
Tennis Racket Hit on MUGA	-	45
Tennis Fence Impact on MUGA	-	51

6. NOISE IMPACT ASSESSMENT

6.1 There are several elements to the noise assessment for this site and this section will describe each assessment criteria separately to provide a clear summary of the noise impacts. The existing background and ambient noise levels are considered in the context of BS8233 and appropriate internal noise levels for the residential part of the development. The predicted plant noise and measured background noise is considered in terms of BS4142 for all existing and proposed residential receivers. Football training noise and noise from the MUGA has been considered in terms of the fixed limit recommended for AGPs by Sport England that has also been agreed with the Council.

BS8233 Design Criteria

6.2 Location 2 provides representative noise measurements for Kingston Lane and this is considered to be the most appropriate location to provide representative levels for the proposed residential units within the development. Background noise levels have been

found to be 37 dB L_{A90} during the daytime and 30 dB L_{A90} during the night at measurement location 2. Ambient Noise levels have been found to be 50 dB L_{Aeq} during the daytime 44 dB L_{Aeq} during the night at measurement location 2.

6.3 Assuming 15 dB of attenuation through a window opened for ventilation, day-time and night-time background noise levels reduce to internal levels of 22 dB L_{A90} and 15 dB L_{A90} for day and night respectively. Ambient noise levels would reduce to internal noise levels of 35 dB $L_{Aeq, 16\ hour}$ and 29 dB $L_{Aeq, 8\ hour}$. Internal ambient noise levels would all be within the criteria for sleeping within bedrooms and daytime resting within living rooms presented at Table 1. Internal background noise levels are quite low and given the location close to the centre of Teddington, this is considered to be a fairly high standard for internal noise levels and should not require any mitigation. In terms of the impact, the existing ambient and background noise levels are not considered to be significant in relation to the proposed new residential development.

BS4142 Assessment

6.4 The highest predicted plant noise levels around the development are 33 dB L_{Aeq} at the closest residential property on Kingston Lane, this is referred to as the specific noise level within BS4142. It is considered possible that a combined compressor/condenser unit could potentially run for 15 minutes during the night time hours and there is therefore no on-time correction required. It is not considered that there is anything about the manufacturer's octave band data to suggest that a tonal penalty or a correction for impulsivity would be required so the rating level is the same as the specific noise level.

6.5 Background noise levels during the night in Kingston Lane are 30 dB L_{A90} which means that the rating level exceeds the proposed BS4142 criterion of 0 dB above the background noise level by 3 dB. For all other residential properties around the development the predicted noise levels would be lower and along Cromwell Road the night time background noise levels are 3 dB higher indicating that the greatest impacts are limited to existing properties in Kingston Lane that are close to the proposed doctors surgery. According to the BS4142 criteria, this is somewhere between a low and adverse impact during the night. During the daytime the impact would be very low and this predicted night time impact is considered to be of slight marginal significance. Mitigation to reduce the predicted impact to a level which is considered to be negligible is discussed below at paragraph 6.10.

Football Training and MUGA noise assessment

6.6 Predicted football training noise based on measured noise levels is shown to slightly exceed the agreed 50 dBA noise limit at two proposed buildings within Plot A (receiver 1

and receiver 2) clearly highlighted in the contours presented at Figure 12. The results at Table 7 show that this is a maximum exceedance of 1 dB which is considered to be negligible. However, when looking at the predictions based on guideline values for AGP noise levels, presented at Figure 13, it is clear that this prediction is quite sensitive to the assumed source noise levels and if football training noise levels are higher on the AGP then receiver 1 and receiver 2 could experience greater impacts.

6.7 The results presented at Table 7 show that predicted noise levels based on AGP guidance exceed the noise limit by around 3 – 6 dB at all 4 receiver locations. These predictions are quite high when compared with results based on measured noise levels and it is considered that they are not representative of the likely noise levels within the development. However, the comparison does highlight that receivers 1 and 3 are particularly sensitive to the assumed source noise level and could therefore be subject to a slight exceedance of the noise limit (perhaps 2 – 4 dB) which would be considered to be of marginal significance. Mitigation to reduce the predicted impact to a level considered to be negligible is discussed below at paragraph 6.11.

6.8 Predicted MUGA noise based on measured football training noise levels is shown to be below the agreed 50 dBA noise limit at all residential properties surrounding the development as highlighted in the contours presented at Figure 14. The impact of average noise levels from the proposed MUGA are therefore not considered to be significant.

6.9 The predicted peak noise levels presented at Table 8 show that a whistle blow on the AGP could be up to 12 dB above the 50 dBA noise limit at proposed first floor windows in Plot A (receiver 1), all other noisy events have predicted noise levels around the limit or slightly exceeding by a maximum of 3 dB. A common guideline for maximum noise levels is that they should not regularly exceed 45 dB within a residential property. Assuming 15 dB of attenuation through a window opened for ventilation, the predicted whistle blow would reduce to an internal noise level of 47 dB L_{Aeq} whilst all other activities would produce internal noise levels below 40 dB L_{Aeq}. This assessment again indicates that there could be an impact of marginal significance at receiver 1 due to the football training noise on the proposed AGP. Mitigation to reduce the predicted impact to a level considered to be negligible is discussed below at paragraph 6.11.

Proposed Mitigation

6.10 The BS4142 assessment indicates a slight impact during the night, for a limited number of properties in Kingston Lane. This impact can easily be reduced to an acceptable level by installing a small closed boarded fence enclosure around the compressor/condenser unit associated with the proposed doctors' surgery. The fence would simply have to block the

line of site from the unit to the nearest house to the north.

6.11 The assessment of noise from the AGP indicates that a marginal impact could be generated at receiver 1 and receiver 3. A suitable barrier could be installed (a closed boarded fence would suffice but it may need to be something more substantial if it is to withstand football impacts) to break the line of site from the western edge of the AGP to receiver 3 which would reduce noise levels by a few decibels ensuring that the agreed noise limit is met. However, the building highlighted as receiver 1 is closer to the pitch and is several stories high which renders a barrier ineffective for the top floors. Mitigation for the affected areas of the building at receiver 1 (south and west façades) would have to be in the form of improved sound insulation to ensure that an internal noise level of 35 dBA (on which the Sport England limit is based) could be achieved. The 50 dB limit in the Sport England guidance is based on an attenuation of 15 dB through an open window and the easiest way to improve this level of attenuation would be to provide mechanical ventilation so that windows would not need to be opened for ventilation. Standard double glazing generally provides 25 – 30 dB of attenuation through a closed window and this would be more than enough of an improvement to mitigate the potential impact of football training noise.

7. CONCLUSIONS

7.1 A noise assessment has been carried out to assess existing levels of noise in respect of proposed residential dwellings at the Former ICL ground, Udney Park Road, Teddington.

7.2 A noise assessment has been carried out to assess the noise impact in respect of proposed plant noise levels (from the same site) at existing and proposed residential dwellings.

7.3 A noise assessment has been carried out to assess predicted levels of noise from football training on the proposed artificial grass pitch along with noise generated by the proposed MUGA.

7.4 Background noise levels representative of residential properties in the vicinity Kingston Lane and Cromwell Road have been measured within the site.

7.5 Existing noise levels have been found to be acceptable for a residential development

7.6 The BS4142 assessment highlighted a minor impact which can easily be mitigated through using a noise barrier, in the form of a close-boarded fence to remove ‘line-if-sight’ between

the compressor/condenser units and the residential properties.

7.7 The assessment of football training noise highlighted a marginal impact which can be easily mitigated through improvements to sound insulation on some of the proposed residential units and through use of a suitable noise barrier that is appropriate for installation around the proposed AGP.

7.8 The assessment of MUGA noise found noise levels to be acceptable at all existing and proposed residential properties.

Figures

Figure 1 – Location Plan

Figure 2 – Source noise Measurement positions and MUGA Backboard

Figure 3 – Measurement Equipment (including rain gauge) Installed at location 1

Figure 4 – Measurement Equipment Installed at location 2

Figure 5 – Time History Results: Location 1

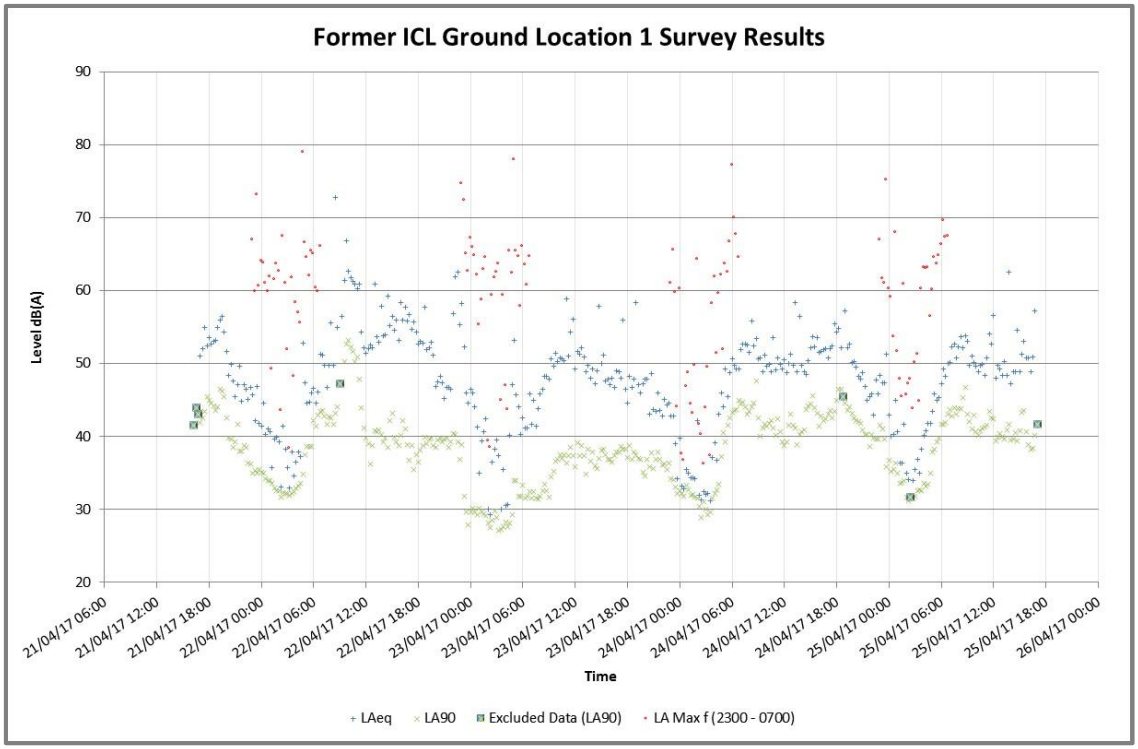


Figure 6 – Time History Results: Day 2

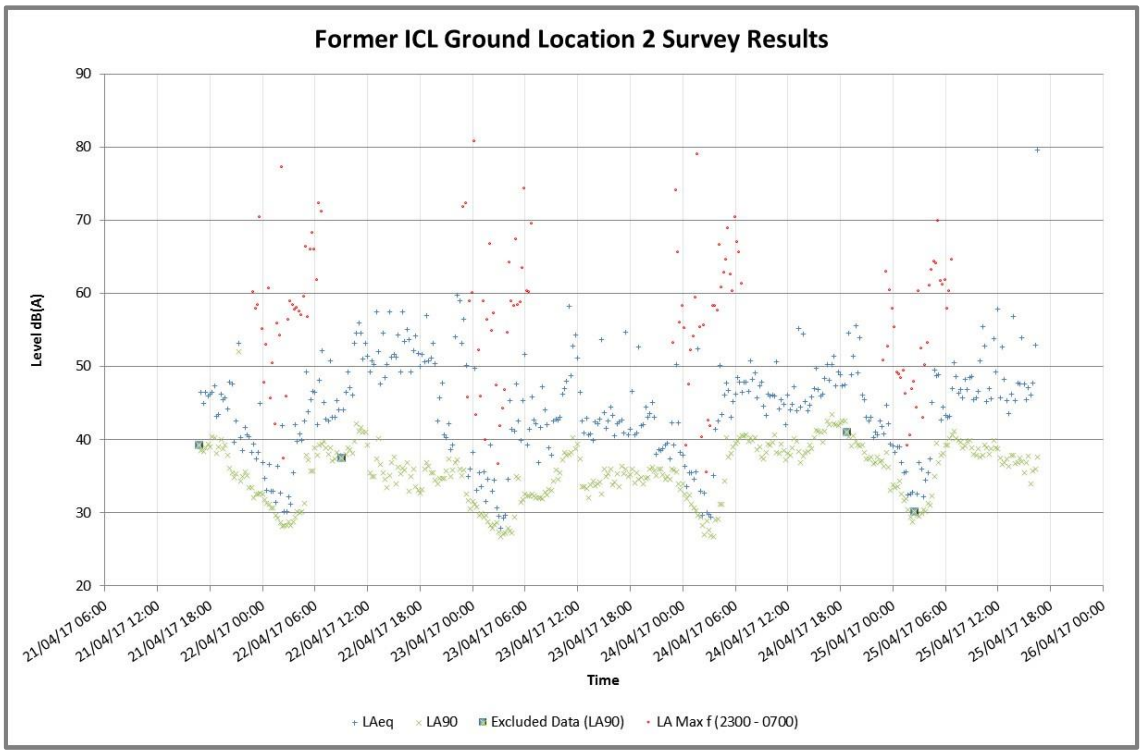


Figure 7 – L_{A90} Frequency (Location 1 Night)

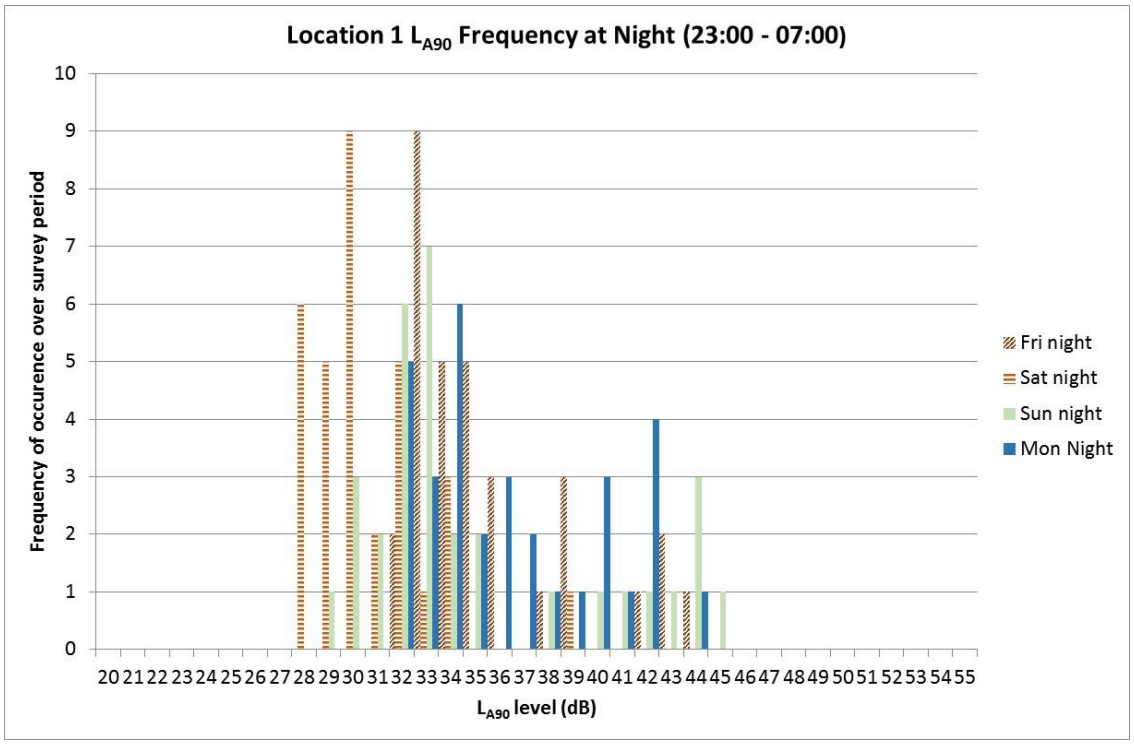


Figure 8 – L_{A90} Frequency (Location 1 Day)

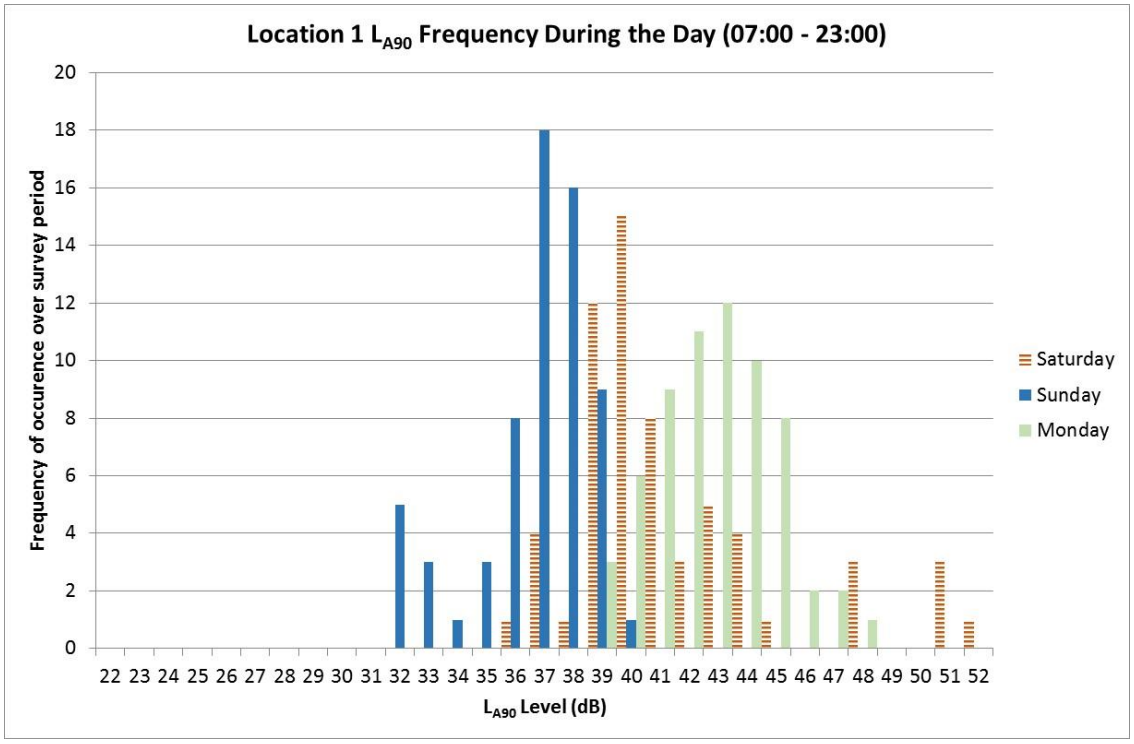


Figure 9 – L_{A90} Frequency (Location 2 Night)

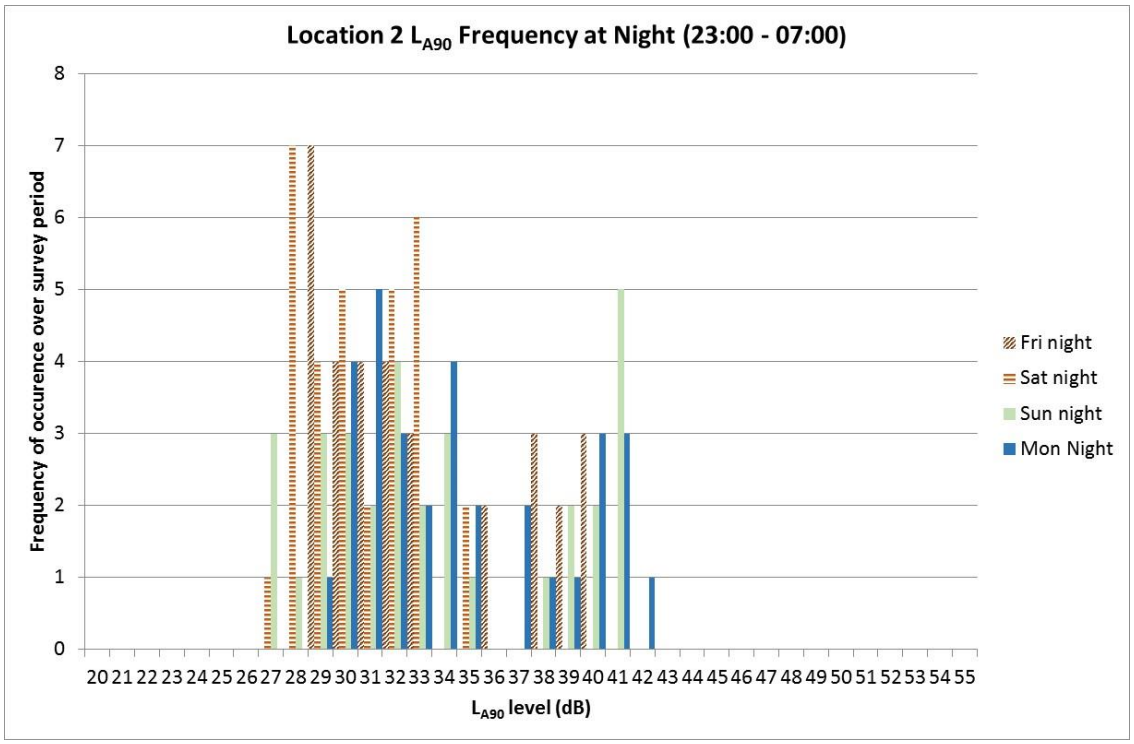
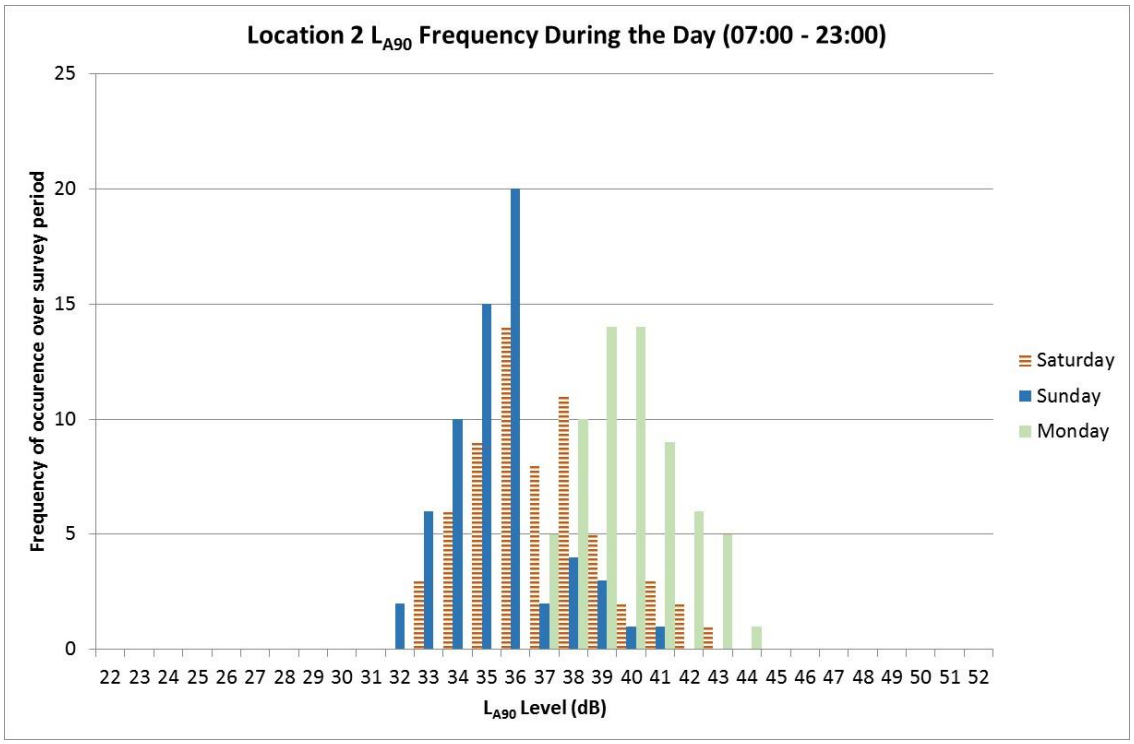
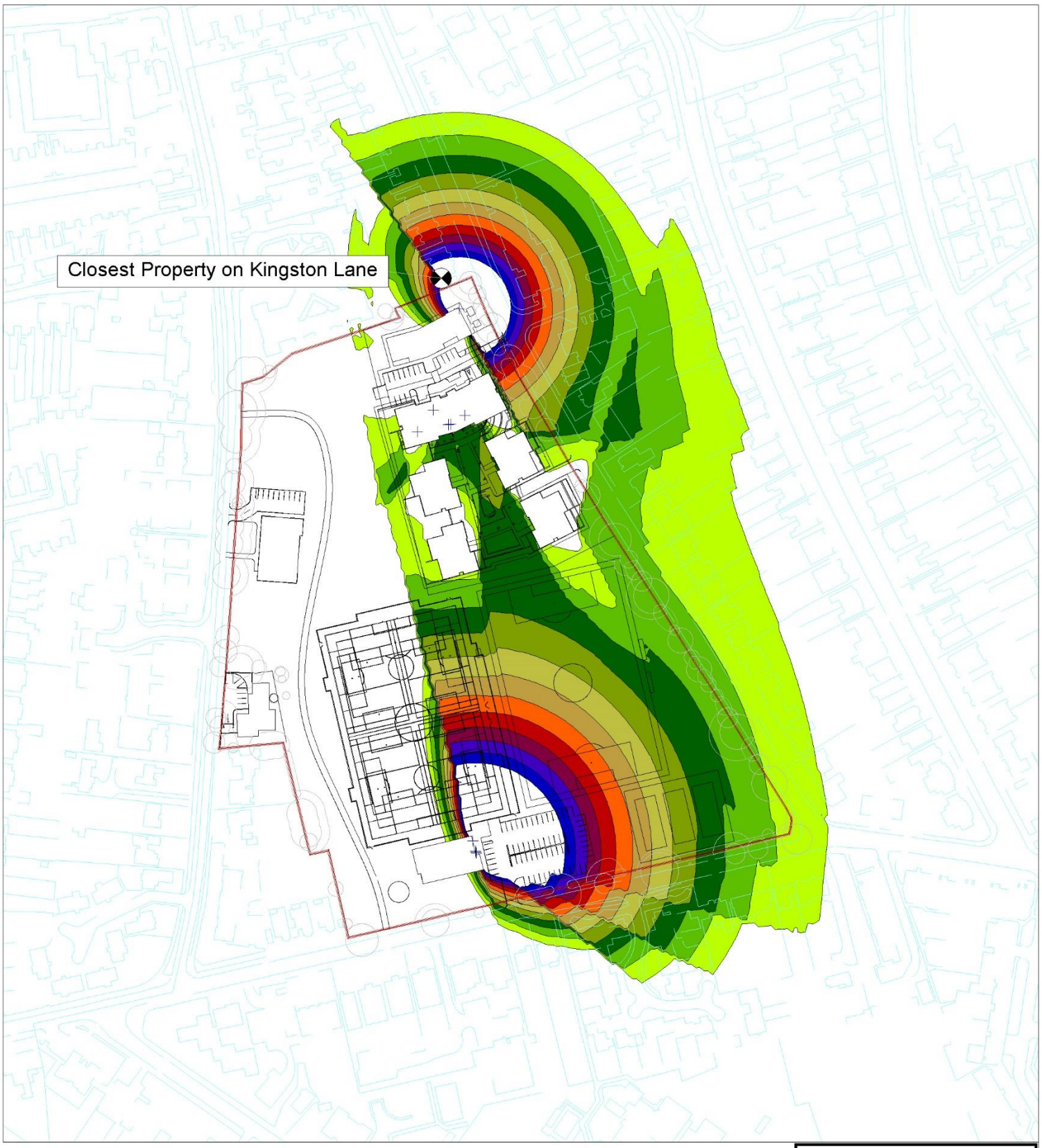


Figure 10 – L_{A90} Frequency (Location 2 Day)





Receiver

Scale 1:2500 @A4 (Date created:12.07.17)

Contour dB L_{Aeq}
= 20.0
= 21.0
= 22.0
= 23.0
= 24.0
= 25.0
= 26.0
= 27.0
= 28.0
= 29.0
= 30.0

Sources

ID	Easting	Northing
Condenser	516447.17	170991.43
Condenser	516450.03	170940.69
Condenser	516443.21	170936.49
Condenser	516442.26	170936.17
Condenser	516427.35	170932.71
Condenser	516455.43	170731.63
Condenser	516455.26	170732.17
Condenser	516455.16	170732.79
Kitchen Fan	516435.07	170943.28
Kitchen Fan	516453.81	170737.57

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3139 Former ICL Private Ground,
Figure 11: Noise contours, Electrical Plant

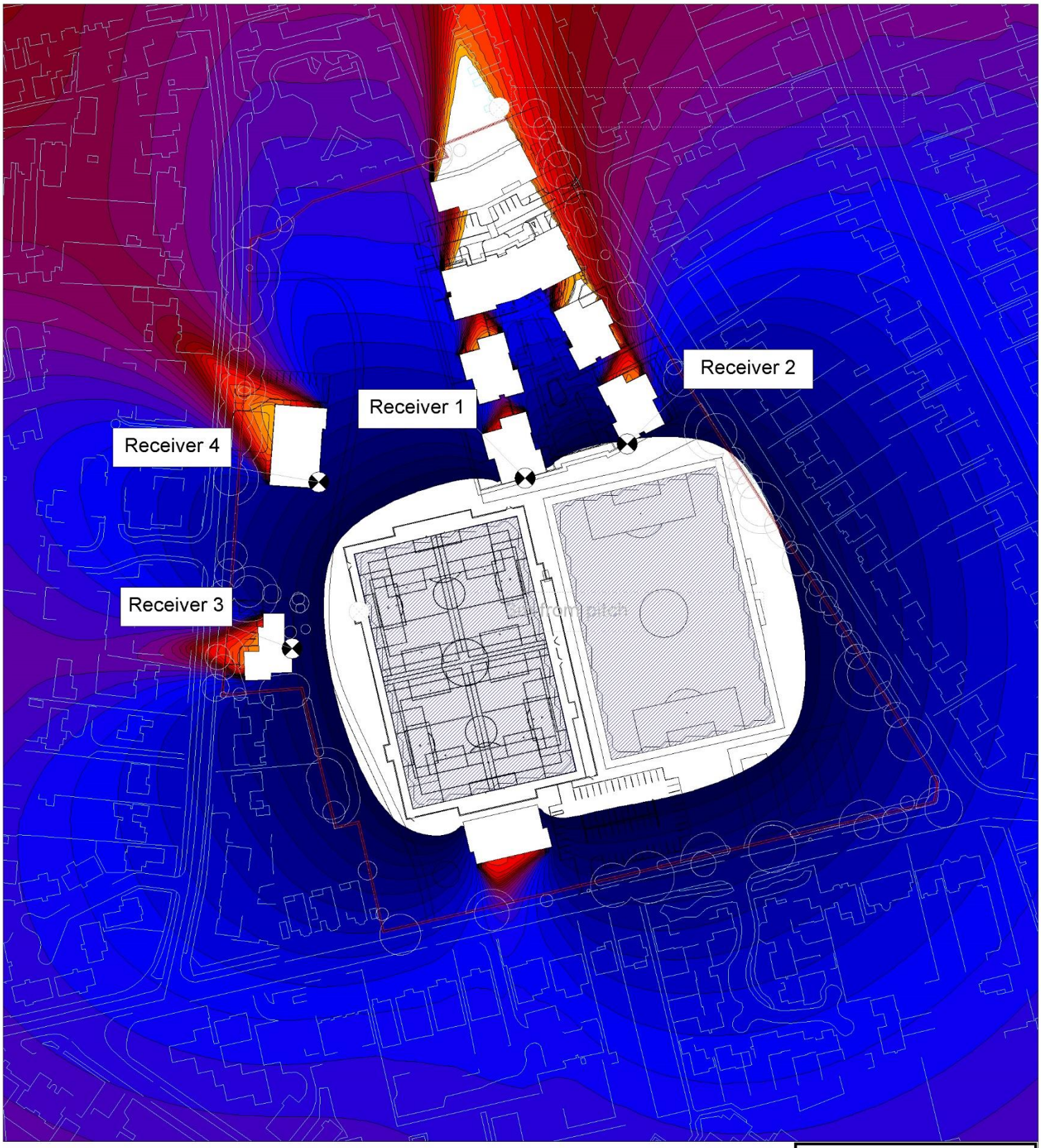

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Figure 12: Noise contours, Football training, Measured training noise

Receiver

Scale 1:2000 @A4 (Date created:12.07.17)

Sources

Artificial Grass Pitch - (measured training noise)
Grass Pitch - (measured training noise)

Contour dB L_{Aeq}

- = 20.0
- = 25.0
- = 30.0
- = 35.0
- = 40.0
- = 45.0
- = 50.0

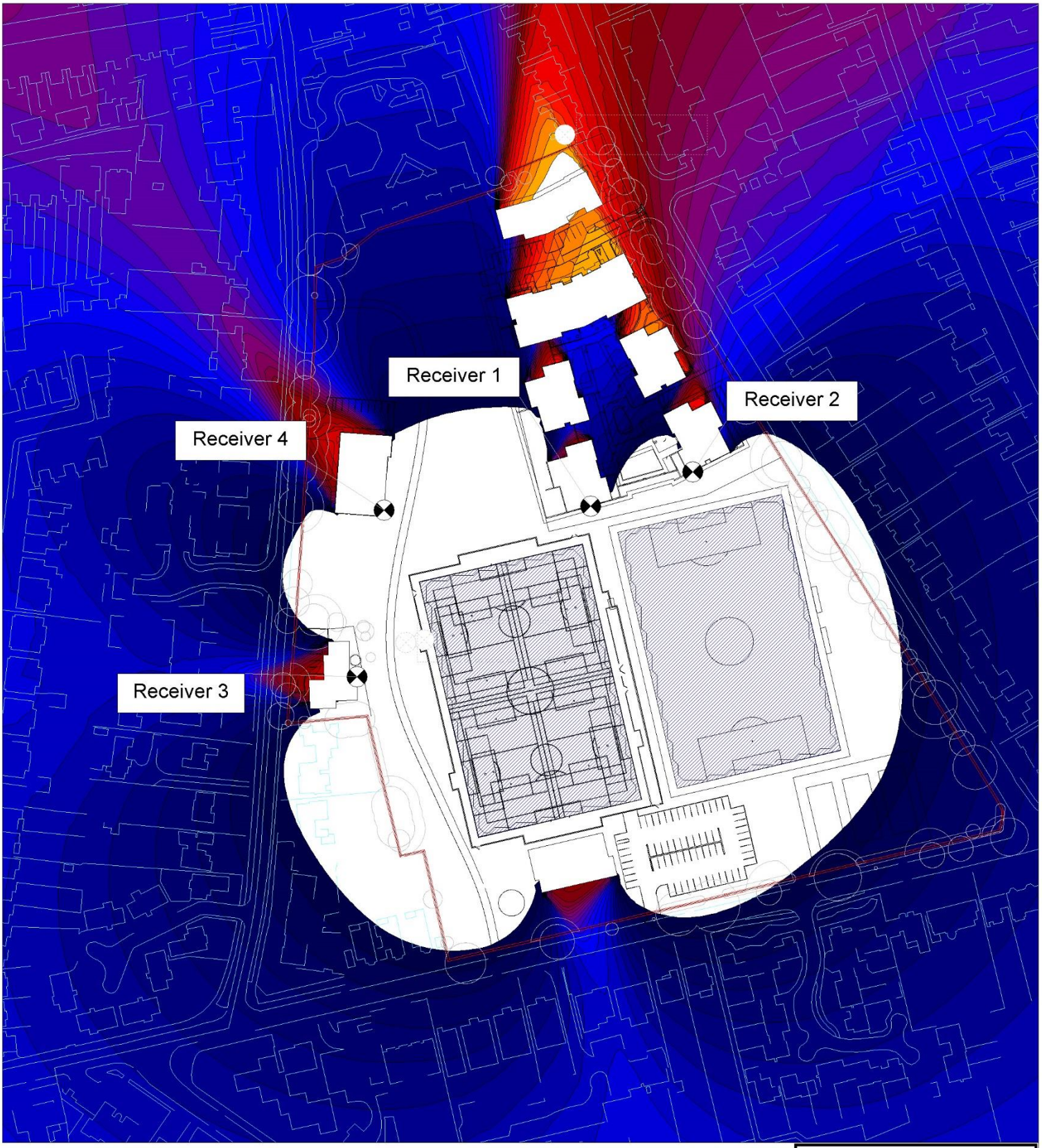

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Figure 13: Noise contours, Football training, Guideline AGP noise

Receiver

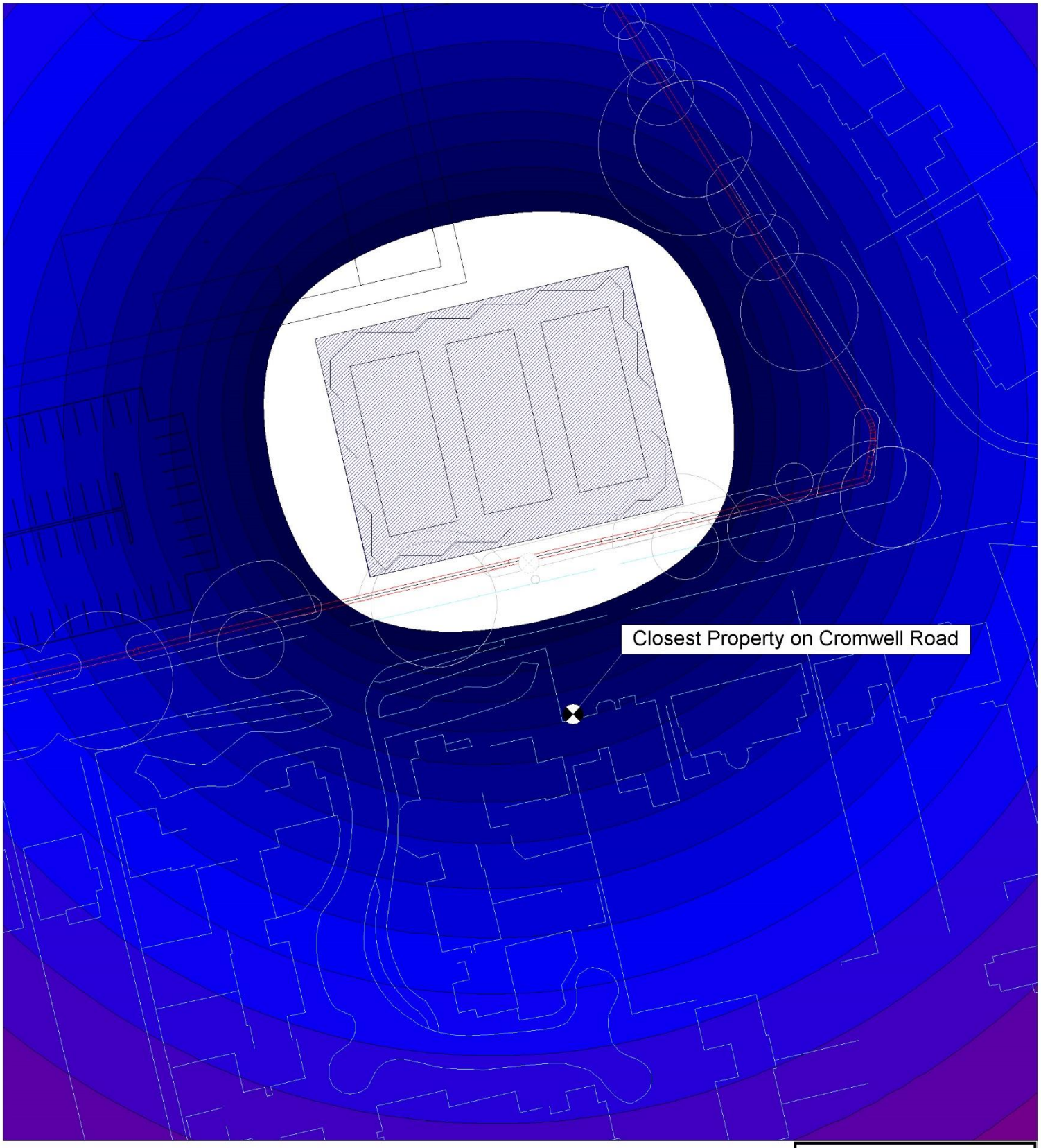
Scale 1:2000 @A4 (Date created:12.07.17)

Sources

Artificial Grass Pitch - (Guideline AGP noise)
Grass Pitch - (measured training noise)

Contour dB L_{Aeq}

= 20.0
= 25.0
= 30.0
= 35.0
= 40.0
= 45.0
= 50.0



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Receiver

Scale 1:750 @A4 (Date created:12.07.17)

Sources

MUGA - (measured training noise)

Contour dB L_{Aeq}

- = 20.0
- = 25.0
- = 30.0
- = 35.0
- = 40.0
- = 45.0
- = 50.0

3139 Former ICL Private Ground,
Figure 14: Noise contours, MUGA,
Measured Training noise