MAS ENVIRONMENTAL

Wilbraham Chalk Pit, Mill Road, Great Wilbraham CB21 4HH

Noise impact assessment for proposed erection and operation of a waste recycling and transfer station

1st July 2021

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Contents

1.0 Introduction

1.1 MAS Environmental Ltd were appointed by Ashtons Legal on behalf of Mead Construction (Cambridge) Ltd to provide a noise impact assessment for a waste recycling and transfer station (WTS) at Wilbraham Chalk Pit. This report details the methodology undertaken to assess noise impact, summarises an environmental noise survey undertaken at the site and provides an assessment of noise impact following appropriate guidance.

1.2 Wilbraham Chalk Pit is located to the south east of Cambridge, approximately 4km north of Balsham and West Wratting and 3km south of Great Wilbraham. The site is located in open countryside and is largely surrounded by agricultural fields. To the north east of the site is Great Wilbraham Solar Farm, to the south east of the site Wadlow Wind Farm and neighbouring the site is the grain storage and drying plant, Camgrain. The proposed WTS site is also adjacent an existing chalk pit, which I understand is a separate site with continuing operations. Approximately 500m to the north / north west / west of the site is the A11. The nearest residential housing is located approximately 500m to the south west of the site. Figure 1 below shows an aerial view of the locality.

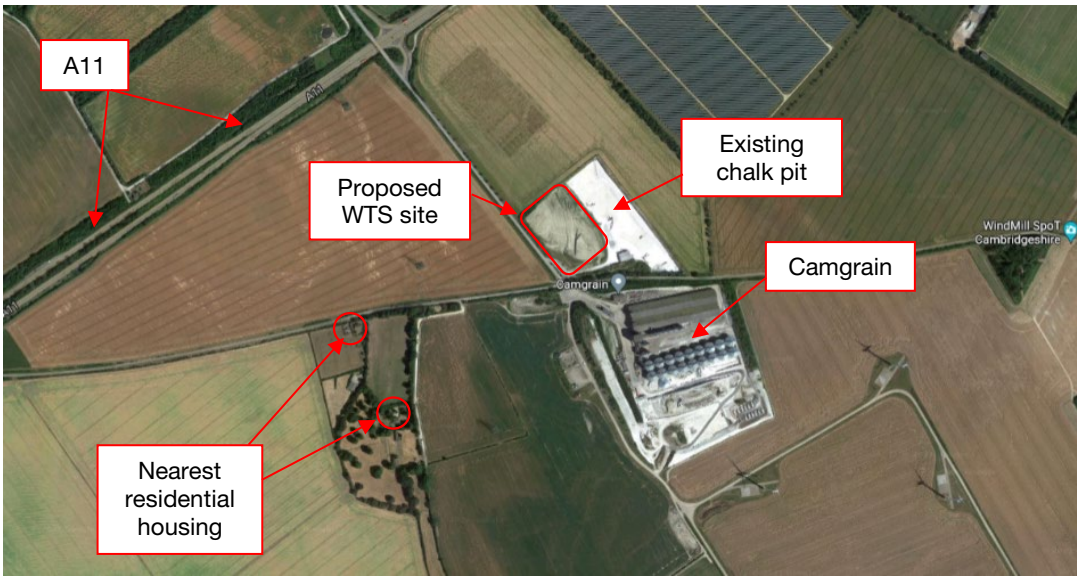

Figure 1: Aerial view showing proposed WRTS site and nearby housing

1.3 Operations at the site will primarily involve delivery of material to the site, sorting and processing of material using a crusher unit and a screening unit. Associated plant and machinery will include mobile plant such as forklift trucks /

telehandlers, shovel loaders and 360 grabs / excavators. A plan of the WTS as proposed is given in Figure 2 below.

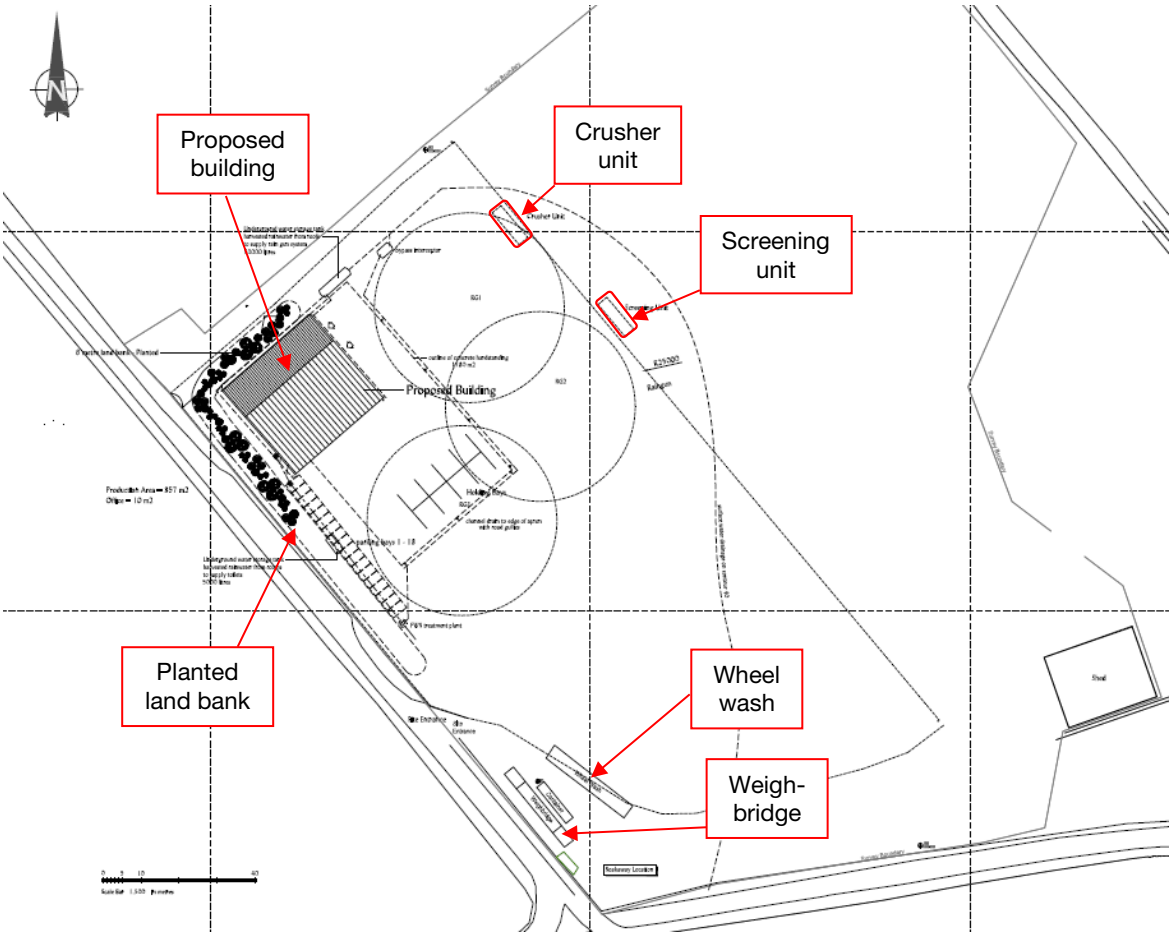

Figure 2: Proposed site plan

1.4 I understand that the operating hours of the site would run from 07:00 until 17:00 Monday to Friday and from 07:00 until 14:00 on Saturdays.

1.5 The following sections provide an assessment of noise impact from the site in accordance with relevant guidance. Section 2.0 below sets out relevant policy and guidance against which an assessment is made. Section 3.0 summarises the findings of an environmental sound survey undertaken at the site as well as measurements of activities proposed at the site. Section 4.0 provides the main assessment of noise impact including noise mapping. Section 5.0 and 6.0 provide discussion and finally a summary and conclusion of the assessment.

2.0 Guidance

2.1 National planning policy

2.2 Government guidance on planning and noise can be found primarily in the Planning Practice Guidance (PPG) and also with reference to key planning documentation such as the Noise Policy Statement for England (NPSE) and National Planning Policy Framework (NPPF). [1] [2] [3]

2.3 The NPSE sets three core aims:

- Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
- Where possible, contribute to the improvement of health and quality of life through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.

2.4 The NPSE defines environmental noise as primarily including noise from transportation sources, neighbour noise is that from inside and outside people's homes. Neighbourhood noise is defined as including noise from within the community, for example industrial and entertainment premises, trade and business premises, construction sites and noise in the street.

2.5 In terms of noise impact, terminology in the NPSE uses key phrases 'significant adverse' and 'adverse' and, adopting concepts from toxicology, defines effect levels relating to levels of adverse impacts and effects:

[1] Great Britain. Department for Communities and Local Government (2019) *Planning Practice Guidance*. London: TSO. Available from: http://planningguidance.planningportal.gov.uk/
2 Great Britain. Department for Environment and Rural Affairs (DEFRA) (2010) Noise Policy Statement for England. London: TSO
3 Great Britain. Department for Communities and Local Government (2019) National Planning Policy Framework. London: TSO. Available from: http://planningguidance.planningportal.gov.uk/

- NOEL No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level there is no detectable effect on health and quality of life due to the noise.

- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.

- SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

2.6 The NPPF adopts the values set out in the NPSE in terms of minimising and mitigating noise and reiterates the aim for planning policies and decisions to:

…enhance the natural and local environment by… preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution…

2.7 This should include mitigating and reducing to a minimum potential adverse noise impact from new development and should "avoid noise giving rise to significant adverse impacts on health and the quality of life". The NPPF also highlights the consequence of development and the need for effective integration of development:

Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities… Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

2.8 The 'agent of change' principle introduced by the NPPF aims to prevent new development placing unreasonable burdens on existing development. Where the operation of an existing business or community facility could impact the proposed development, the applicant (for the proposed development) is required to suitably mitigate any noise impacts prior to the development being completed.

2.9 Planning practice guidance (PPG) expands further on principles and concepts outlined in the NPSE and NPPF. A noise exposure hierarchy table assists in setting out principles and concepts of noise impacts and effects with examples of outcomes and the relevant action that must be taken. This is reproduced from the PPG in Table 1 below.

Table 1: Noise exposure hierarchy table (PPG)

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unaccept-able Adverse Effect	Prevent

2.10 The PPG identifies a number of factors that could influence whether a noise could be a concern and includes absolute level of the noise, time of day that the noise occurs, how the noise relates to the existing sound environment, frequency and pattern of the noise (e.g. number of noise events) and spectral content of the noise.

2.11 Additional factors influencing noise impact can also include the wider context of the area, for example cumulative impacts of more than one noise source, scope for mitigating noise impacts (by closing windows, having access to protected external amenity spaces) and, for example, minimising noise impacts where existing noise levels are already high.

2.12 Noise impact should be determined by considering:

- whether or not a significant adverse effect is occurring or likely to occur;
- whether or not an adverse effect is occurring or likely to occur; and
- whether or not a good standard of amenity can be achieved.

2.13 Recommendations on reducing the adverse effects of noise are given in the PPG and include consideration of:

- engineering (reducing noise at source / containing the noise generated)
- layout (e.g. using good design to minimise noise transmission)
- using planning conditions/ obligations (e.g. specify permissible noise levels)

2.14 BS4142: 2014 +A1:2019 - Methods for rating and assessing industrial and commercial sound.[4]

2.15 BS4142:2014 provides guidance for sound from industrial and manufacturing processes, fixed plant and equipment, loading and unloading of goods / materials at industrial or commercial premises and sound from mobile plant that is part of the overall sound emanating from the premises. The general contextual approach of the guidance is applied in a wide range of situations and can help to identify the impact of a noise source relative to the existing environment. It also includes assessment of noise with particular characteristics, such as tonality and impulsivity.

2.16 The assessment method of BS4142 involves comparing the level of source noise to the existing background sound environment. Typically, the greater the

[4] British Standards Institution (2014) *BS4142:2014: Methods for rating and assessing industrial and commercial sound*. London: BSI.

difference the greater the impact. The source under assessment must be measured or calculated at the receiver location and is termed the specific sound level. If there are any particular features that draw attention a range of decibel penalties are applied by adding the relevant total penalty to the specific sound level giving the rated sound level. The background sound level is then subtracted from the rated sound level to give a level difference.

2.17 Noise character, including acoustic features that attract attention, is known to increase adverse impact of sound when considered subjectively. BS4142:2014 identifies two main character features, tonality and impulsivity. Where tonality, a hum or whine, is present a penalty of between 0dB and 6dB can be applied. For impulsive sounds a penalty of up to 9dB can be applied. If the sound is intermittent, it has certain on / off conditions, then a penalty of 3dB can be applied. If there are other sound characteristics that cannot be defined as tonal or impulsive but nevertheless are distinctive in relation to the sound environment absent the noise, then a 3dB penalty can be applied. The penalties are applied cumulatively based on the existence of the separate characteristics.

3.0 Environmental sound survey

3.1 Background sound survey

3.2 The method used to assess noise impact in this case follows the methodology set out in BS4142:2014. As such background sound levels in the area need to be measured, against which an assessment of noise impact from the proposed WTS can be made. A class 1 sound level meter (Norsonic 140) was set up in a field to the north of the nearest dwellings to establish typical background and ambient sound levels in the area. The approximate location of the equipment is shown in Figure 3 below. Photographs of the equipment in situ are provided in Appendix B.

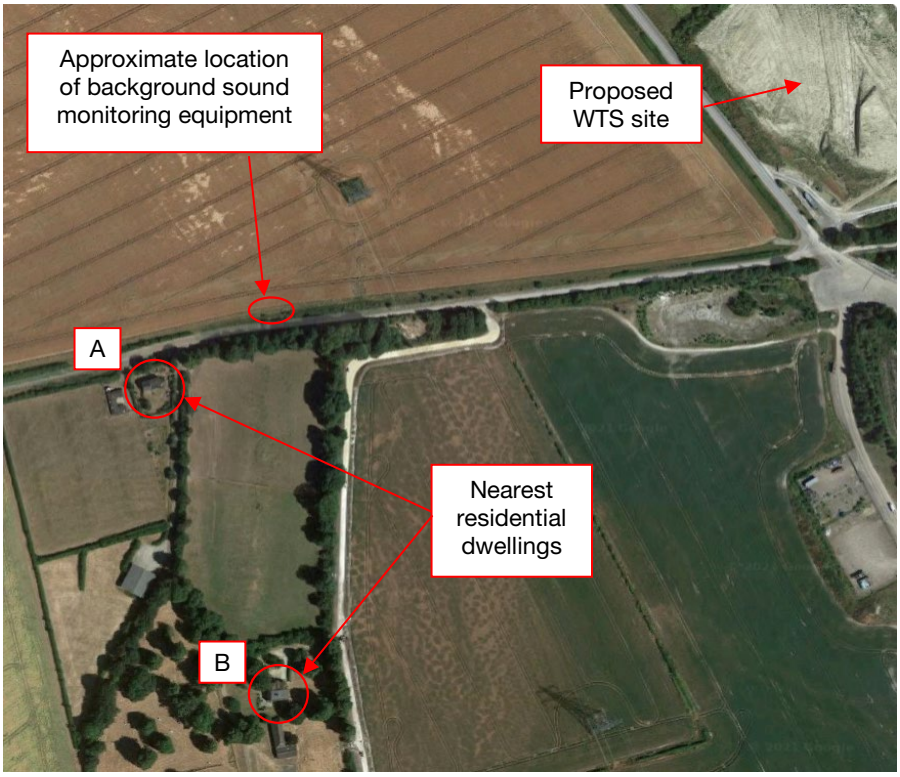

Figure 3: Aerial view showing location of background sound monitoring equipment

3.3 The dwelling labelled “A” in Figure 3 above is closer to the A11 than the dwelling labelled “B”. However, dwelling B is closer to the operations at Camgrain, which could also influence background sound levels measured at this dwelling. The measurement location used was considered a fair compromise between the dominant existing sources of background sound in the area. Dwelling A is approximately 470m from the A11 whereas dwelling B is approximately 700m from the A11. Assuming simple line source distance propagation this could

result in background sound levels being approximately 1-2dB(A) lower at dwelling B. This assumes that the predominant source of background sound in the area is from road traffic noise, which is discussed further below.

3.4 An environmental sound survey was undertaken between 16th and 25th June 2021. The sound level meter was set to record the 100ms LAeq, 100ms third octave band data, period (1 hour) LAeq and LA90 and audio data. The equipment was field calibrated at the start and end of the survey and no significant drift (+/- 0.5dB(A)) was observed.[5]

3.5 The weather during the survey was mixed with periods of dry, warm weather and low wind speeds but also periods of wet and windy weather. Figure 4 below shows a global overview of the measured sound levels during the survey. The graph is split into daily measured levels and a note regarding the day of the week and weather conditions is made above the measured levels on each day.[6]

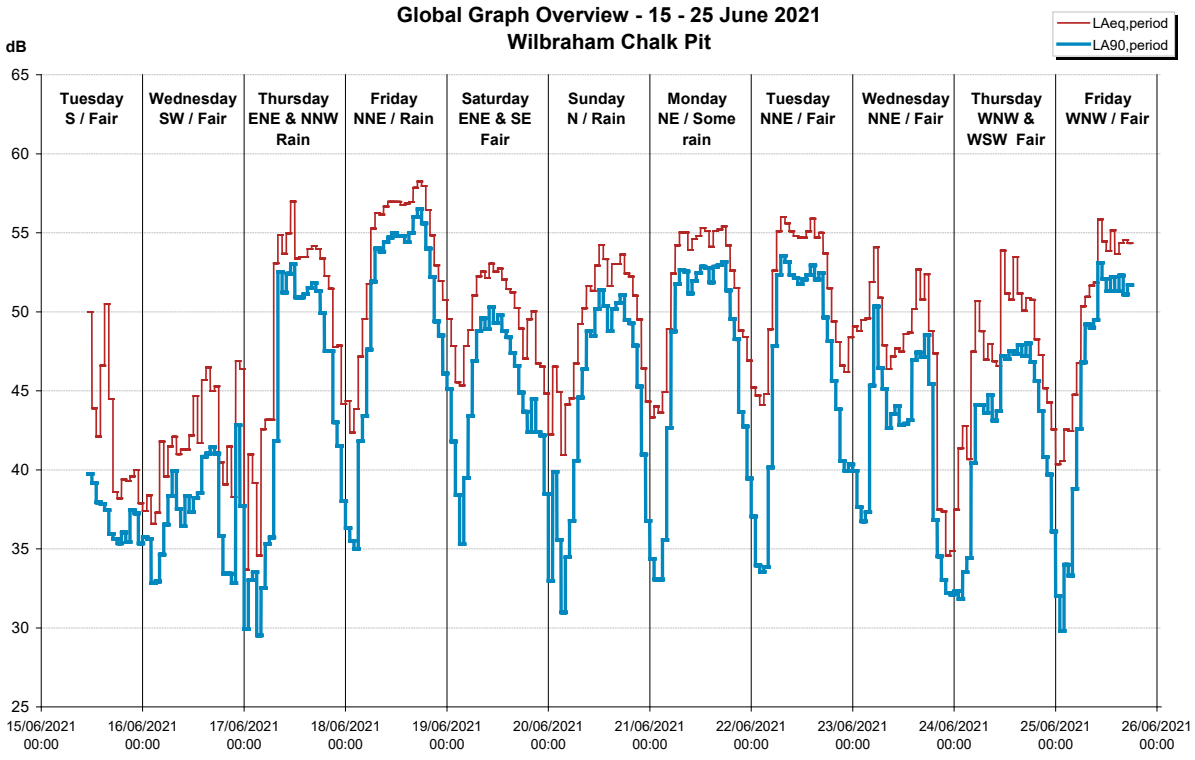

Figure 4: Global overview of measured sound levels during survey

[5] Calibration certificates can be provided on request.
[6] Weather observations were made during the survey and also referenced against weather data logged at Cambridge Airport and historical almanac reports.

3.6 The graph shows a typical diurnal variation in sound levels as would be expected particularly in a locality impacted primarily by road traffic noise. Days when there was rainfall generally resulted in higher measured sound levels, again as would be expected where the dominant source of noise is road traffic and wet roads lead to increased tyre noise.

3.7 At the start of the survey there are two days (15th and 16th June) that have lower measured sound levels. Whilst the background and ambient sound levels on these days was still dictated by road traffic noise, with the A11 being situated to the north of the monitoring location lower overall road traffic noise was observed on these days likely due to wind direction but also as the weather was very sunny and warm with clear skies. This will result in refractive effects that also reduce road traffic levels measured at the monitoring location.

3.8 Towards the end of the survey the wind direction was predominantly northerly. This places the monitoring location downwind of the A11. It is noted that the proposed WTS is located to the north east of dwellings. As such the nearest existing residential dwellings will be downwind of the proposed development site and the A11 under northerly wind directions.

3.9 The different wind directions and variability in measured road traffic noise does mean that there is a large range of measured background sound levels. Table 2 below summarises the measured background sound levels against the time of day. This allows an analysis of typical daytime background sound levels when the proposed development site will be operating (Note: the site will not operate on Sundays).

3.10 As there is some activity at the proposed development site from existing operations and activity associated with Camgrain, the shoulder hours around rush hour periods (i.e. 06:00 – 07:00 and 19:00 – 20:00) have also been included as part of a more detailed analysis of what was recorded to help ascertain whether there is any noticeable contribution from other constant non-road traffic related sources. There is no clear evidence of continuous plant noise measured at the monitoring location in the audio samples analysed and this is also supported by a comparison of background sound levels around site start and finish times (around 07:00 and 17:00) where there is no significant increase or decrease in background sound levels due to neighbouring site activity.

Table 2: Summary of measured background sound levels (dB LA90,1hour) 06:00 – 20:00

	Weather	Hour beginning (24 hour clock) and dB LA90,1 hour														
		06	07	08	09	10	11	12	13	14	15	16	17	18	19	20
15/06/21 Tue	S / Fair	No data						39	38	38	38	36	36	36	36	36
16/06/21 Wed	SW / Fair	39	40	38	37	39	38	38	39	41	41	42	41	36	34	34
17/06/21 Thu	ENE&NNW / Rain	36	42	53	51	53	53	51	51	51	52	52	52	50	48	48
18/06/21 Fri	NNE / Rain	52	54	54	55	55	55	55	55	55	55	56	57	56	54	52
19/06/21 Sat	ENE & SE / Fair	47	49	50	49	51	50	50	49	49	48	47	45	44	43	45
20/06/21 Sun	N / Rain	41	45	47	49	49	50	52	51	49	50	51	51	50	50	48
21/06/21 Mon	NE/Some rain	52	53	53	51	52	53	53	53	52	53	53	53	52	50	49
22/06/21 Tue	NNE / Fair	53	54	53	53	52	52	52	53	53	52	53	50	48	46	44
23/06/21 Wed	NNE / Fair	47	45	43	44	44	43	43	43	47	48	47	48	46	37	35
24/06/21 Thu	WNW&WSW / Fair	44	44	45	43	44	48	47	48	48	48	48	48	47	46	44
25/06/21 Fri	WNW / Fair	47	50	49	50	53	52	52	53	52	53	51	52	No data		

3.11 When determining the background sound level to use within a BS4142:2014 assessment, the guidance itself notes that a typical value should be used and not necessarily the lowest. In this case there appear to be two distinct conditions, southerly wind directions and other north westerly or north easterly wind directions. As the development site is to the north east of existing dwellings, it is considered most appropriate to use the background sound level data gained from northerly wind directions.

3.12 Use with winds from the proposed development to the dwellings is also consistent with BS7445:2003 which defines procedures for environmental noise measurements and seeks winds from source to receiver to be applied. Whilst noise from the A11 will reduce with southerly winds the site noise will also be reduced as it will be upwind.

3.13 Even using northerly wind direction data there is still a range of background sound levels. Between 07:00 and 17:00 when the proposed development site would be operational background sound levels range from 43dB LA90,1hour to

54dB LA90,1hour. In this case an assessment has been made assuming a lower end value under northerly wind directions of 43-44dB LA90,1hour. This then ensures a conservative assessment compared to use of the "typical" background sound level.

3.14 Source noise levels

3.15 Measurements of typical activities proposed at the WTS were undertaken on 15th June 2021 at existing Mead Construction sites that undertake the same activities. The noisiest activity proposed at the site is likely to be that of loading and operating the concrete crusher. Measurements were made at approximately 10m from a concrete crusher, being loaded with a single digger. The average sound level at approximately 10m was 81dB LAeq,15min. An extract from the monitoring period is shown below.

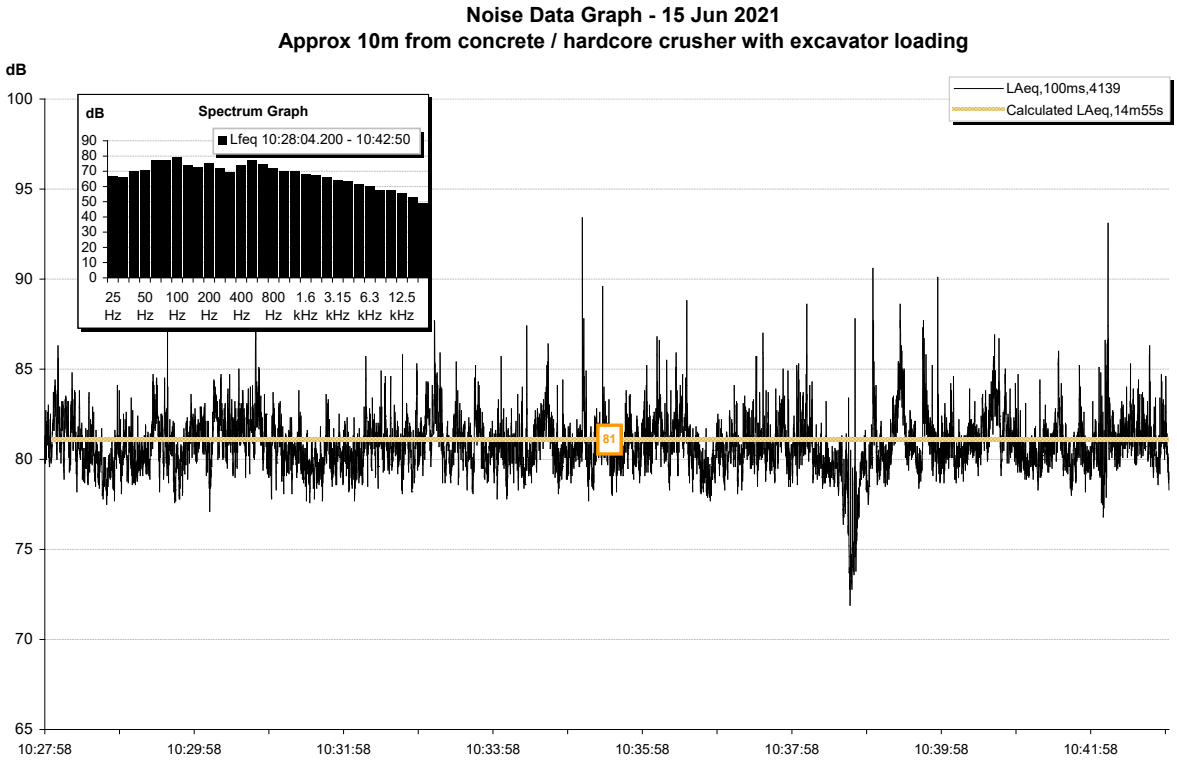

Figure 5: Extract from monitoring of concrete crushing / loading approximately 10m from source

3.16 In the top left hand corner of the graph shown in Figure 5 above is an inset spectrum graph. This shows the measured third octave band levels and indicates an absence of tonality from the activity and a broad spectrum of noise. Peaks on the graph indicate that there are some impact type events. When assessed using the objective (Nordtest) method in BS4142:2014 the majority of

peaks do not attribute an impulse penalty. There were a few isolated peaks where an impulsivity penalty of 1-3.5dB was calculated.

3.17 During the concrete crushing activity, a lorry arrived at site and tipped material on to the existing heap. The meter was located approximately 20m from the tipping event. The average level of the event was 72dB LAeq,4min30s and this included periods of the engine idling, some intermittent bangs from the tailgate of the lorry and the lorry reversing / driving away. The concrete crusher noise at this location was approximately 66dB LAeq,30s and as such would contribute to the overall levels. No additional reduction for the contribution of the concrete crushing noise has been deducted from the tipping event to ensure a conservative assessment.

3.18 Measurements of soil screening were made approximately 10-15m from the screener. Two diggers were loading the screening plant but as they were further away from the monitoring location and not in direct line of sight for much of the time, the sound level from these items of plant are unlikely to be accounted for in the overall measurements. The soil screener was measured at 76dB LAeq,10min.

3.19 A summary of the monitored noise sources is given in Table 3 below.

Table 3: Summary of measured noise levels

Source	LAeq,T	1/1 octave sound pressure levels (dB(A)) (Hz)								
		31.5	63	125	250	500	1k	2k	4k	8k
Lorry tipping material	72	34.0	51.6	57.1	60.8	64.6	67.0	65.9	61.9	54.5
Concrete crusher being loaded by a single excavator	81	36.2	56.2	63.9	68.2	77.2	75.5	73.1	68.7	62.3
Soil screener	76	37.2	52.8	63.0	67.3	71.1	69.8	67.9	66.2	63.7

3.20 The background sound levels and measured source noise levels summarised above have been used to make an assessment of the impact from the proposed site as set out in section 4.0 and 5.0 below.

4.0 Assessment of impacts

4.1 Noise modelling

4.2 The site has been modelled using noise mapping software CadnaA. Two scenarios have been modelled based on information provided regarding typical activities at the site. It is estimated that in an hour period there would be 4-6 lorry movements, approximately one every 10-15 minutes. Whilst there is both a concrete crusher and soil screener proposed on site, I understand it would be very rare that they would both be operating together. Whilst there would always be something running during the working day, it is highly unlikely that both would operate simultaneously. The modelled scenarios are set out below. In both cases it is assumed that the assessment period is 1 hour.

- Scenario 1 – soil screening plus other sources. This scenario predicts the impact from continuous running of the soil screener, two tracked excavators working (continuously) in and around the soil screener area and five lorry tipping events (i.e. an operational time for the lorry tipping of approximately 23 minutes within an hour period based on the times experienced / recorded).

- Scenario 2 – concrete crushing plus other sources. This scenario predicts the impact from continuous running of the concrete crusher for the entire hour. As the measured levels upon which this source level is based also included the noise from the concrete crusher being loaded it also includes noise from a digger operating continuously. This scenario also includes two tracked excavators working (continuously) in and around the concrete crusher / soil screener area and five lorry tipping events (i.e. an operational time for this additional source of approximately 23 minutes within an hour period).

4.3 In addition to the sources measured and summarised in Table 3 above, source sound pressure levels have been taken for mobile plant expected to be used at the site from Table C.2 in BS5228:2014 and reproduced in Table 4 below.[7]

[7] British Standards Institution (2014) *BS5228-1:2009+A1::2014: Code of practice for noise and vibration control on construction and open sites*. London: BSI.

Table 4: Additional source noise levels used in noise modelling

Ref no	Equipment	LAeq,T at 10m	1/1 octave band sound pressure levels at 10m (dB Lin) (Hz)							
			63	125	250	500	1k	2k	4k	8k
16	Tracked excavator (30t)	75	72	71	74	73	69	66	63	58

4.4 A summary of the source sound power levels and source heights assumed in the model are summarised in Table 5 below.

Table 5: Summary of modelled source sound power levels

Source	Sound power (Lw) dB(A)	Source height (m)
Concrete Crusher	109	3.5
Soil screener	104	3
Tipping lorry	106[8]	2
Excavator	103	2

4.5 A plan of the modelled site is shown in Figure 6 below. The model includes some mitigation already proposed at the site, for example the 8m high site building and a 3m high earth bund around the building and extending along the south western perimeter of the site.

[8] Excludes on time correction of approximately 4dB(A) reduction.

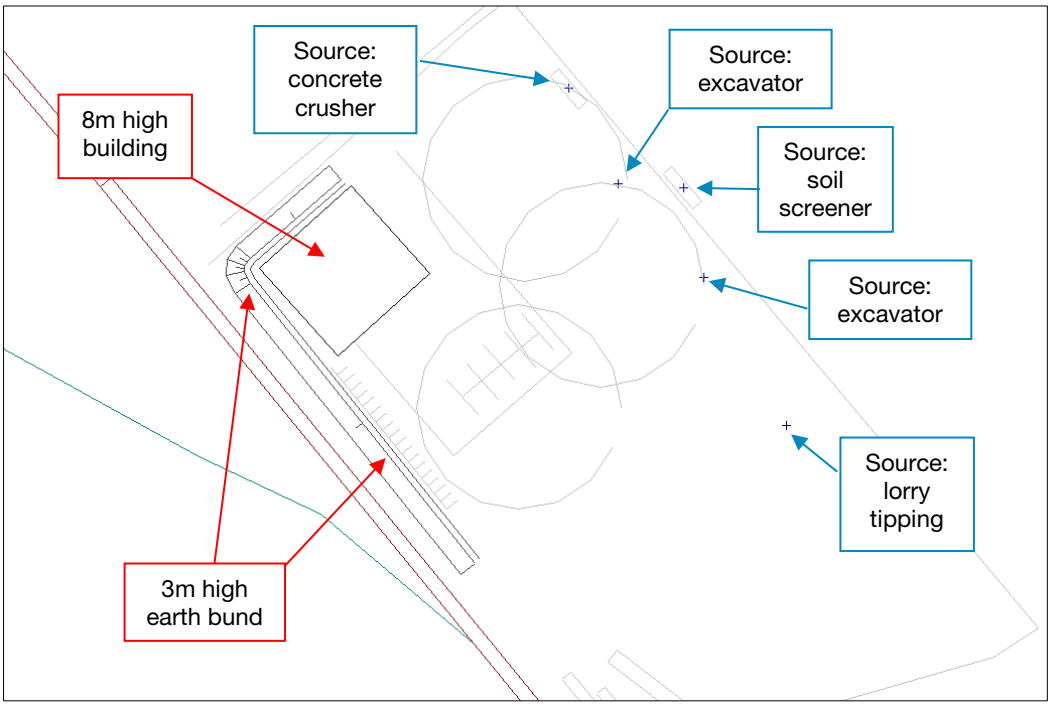

Figure 6: Plan showing proposed site and modelled sources / mitigation and screening

4.6 There is currently an earth heap at the site which is to be removed and levelled. At the time of writing it is not known what the final ground height of the site will be. The site has been modelled assuming the ground contours as shown on OS maps, i.e. a relatively level ground height but that reduces towards the southern end of the site. Between the site and the nearest receivers, the model uses the natural ground contours taken from OS maps.[9]

4.7 The predicted noise levels are given at 1.5m height above ground level and are shown in the rectangular boxes plotted on the noise maps at the nearest residential locations to the south west of the site. The predicted noise levels are plotted at least 3.5m from the residential dwelling facades and so show free field predicted noise levels. The receiver grid spacing is 5m and hard (reflective) ground is assumed (G=0.0) with 2nd order reflections. Predictions are made in accordance with ISO9613-2.

[9] See for example the ground contours available here: https://www.streetmap.co.uk/map?x=556556&y=254796&z=120&sv=556556,254796&st=4&ar=y&mapp=map&searchp=ids&dn=678&lm=0

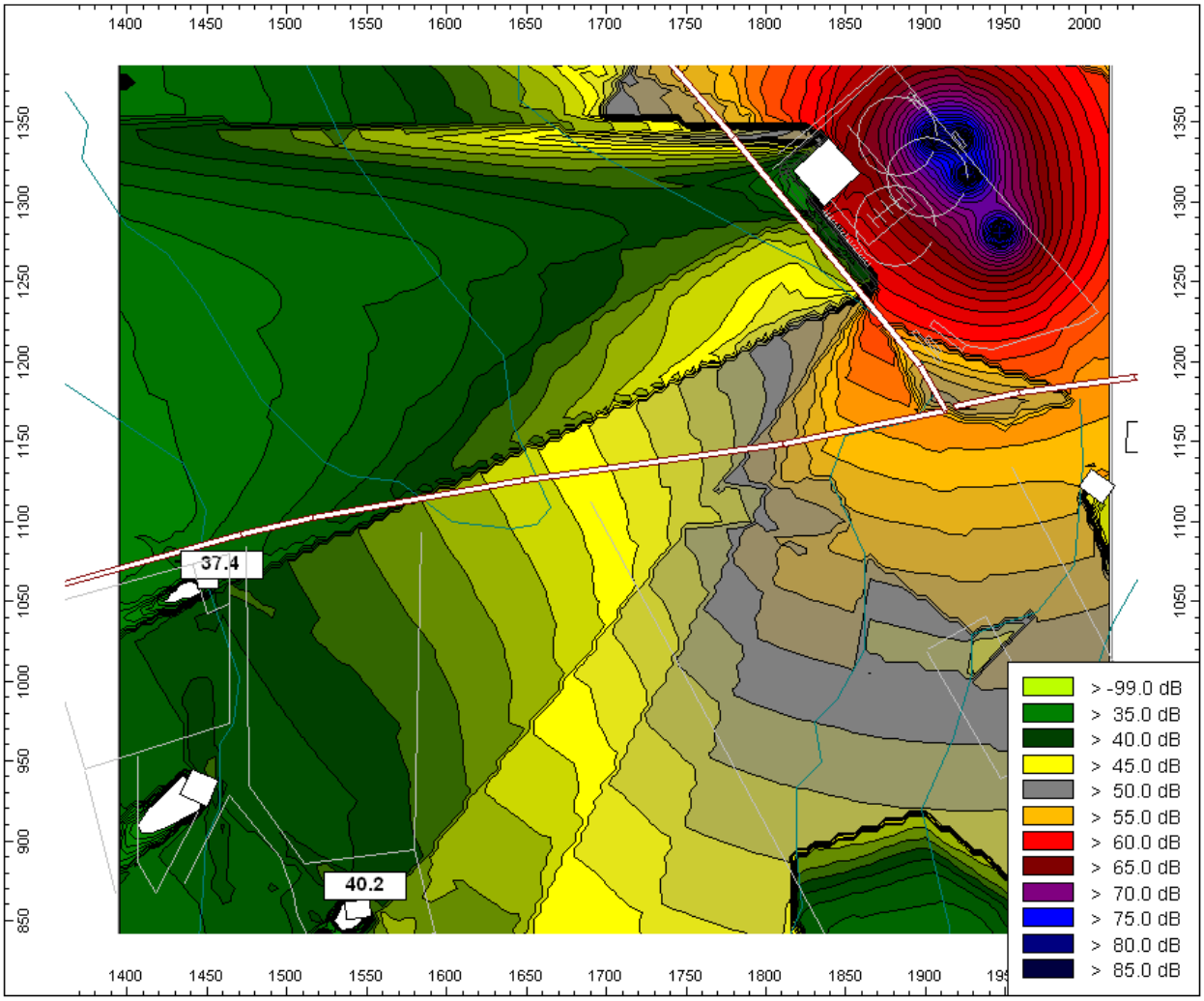

Figure 7: Predicted noise levels – scenario 1

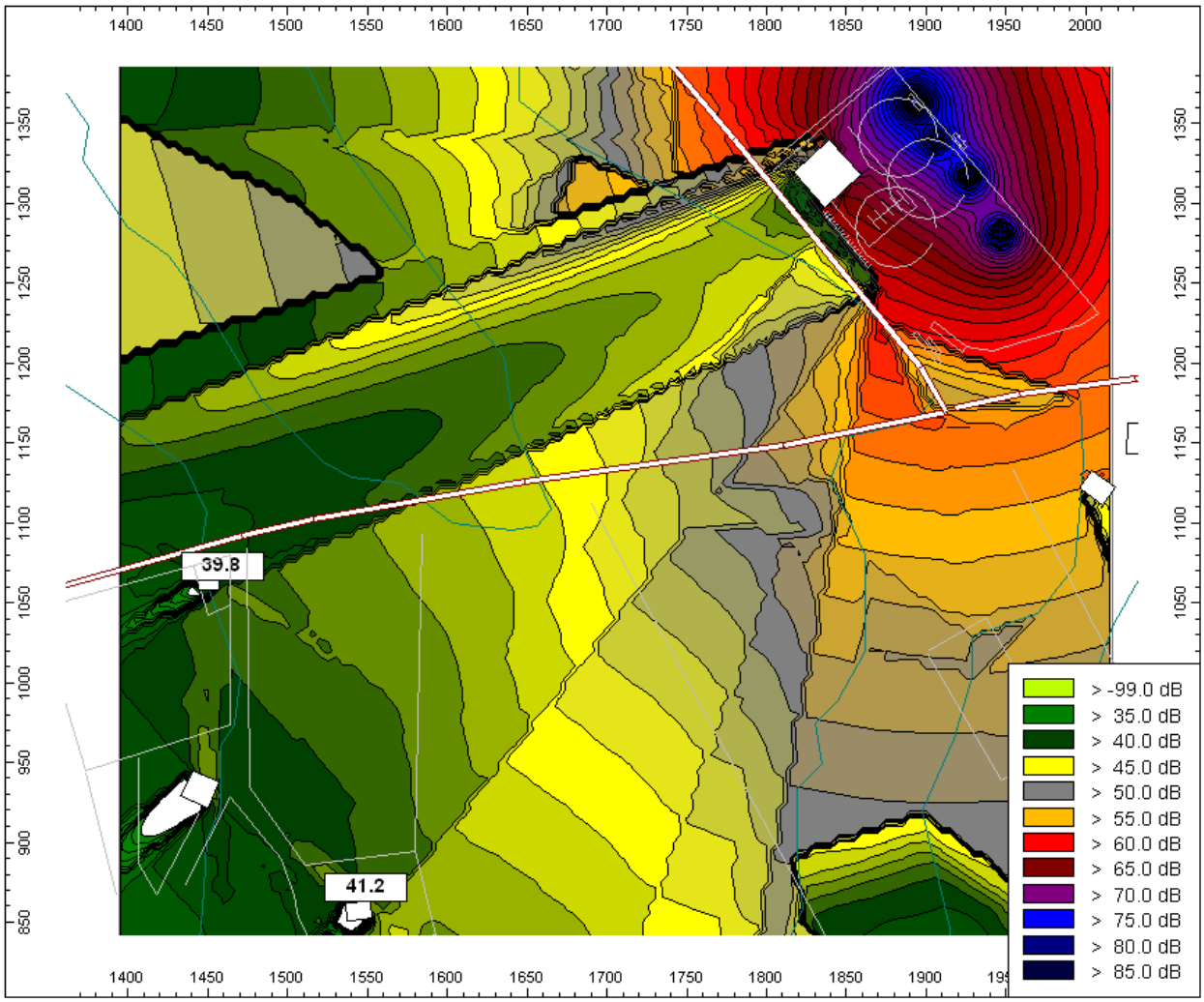

Figure 8: Predicted noise levels – scenario 2

4.8 BS4142:2014 assessment of impact

4.9 The following tables set out the assessment of impact at the nearest dwellings following the methodology set out in BS4142:2014. BS4142:2014 requires an assessment of impact to also consider the context and any uncertainty in the assessment. This aspect of the assessment is detailed in the discussion section (5.0) that directly follows.

4.10 Table 6 below summarises the assessment of impact for scenario 1, i.e. with the soil screener operating. Both dwellings are considered in the same table as predicted noise levels are similar at both locations (see Figure 3 for identification of dwelling A and B). As the assessment is based on predicted noise levels no adjustment for residual sound is necessary. Table 7 summarises the assessment of impact for scenario 2, i.e. with the concrete crusher operating instead of the soil screener.

Table 6: Assessment of noise impact – scenario 1

Results		**Commentary**
Specific sound level	A: 37dB LAeq,1hour B: 40dB LAeq,1hour	As predicted in Figure 7.
Background sound level	43-44dB LA90,1hour	Typical lower background sound level measured in northerly wind conditions.
Acoustic feature correction	+3dB	There was no clear tonality associated with the sources, though some sporadic impact noises. Whilst it is unlikely this would be readily discernible at the receiver location a 3dB penalty had been added for 'other features'
Excess of rating over background sound level	A: -4dB(A) / -3dB(A) B: -1dB(A) / 0dB(A)	
Assessment		Positive indication that there will not be adverse impact

Table 7: Assessment of noise impact – scenario 2

Results		**Commentary**
Specific sound level	A: 40dB LAeq,1hour B: 41dB LAeq,1hour	As predicted in Figure 8.
Background sound level	43-44dB LA90,1hour	Typical lower background sound level measured in northerly wind conditions.
Acoustic feature correction	+3dB	There was no clear tonality associated with the sources, though some sporadic impact noises. Whilst it is unlikely this would be readily discernible at the receiver location a 3dB penalty had been added for 'other sound character'
Excess of rating over background sound level	A: -1dB(A) / 0dB(A) B: 0dB(A) / +1dB(A)	
Assessment		Positive indication that there will not be adverse impact

5.0 Discussion

5.1 Activity typical of that proposed at the WTS has been measured and modelled to assess impact at the nearest dwellings. The assessment indicates that the rated sound levels are generally at or below existing background sound levels even when applying the lowest recorded for these conditions. BS4142:2014 requires consideration of both context and uncertainty, both of which are discussed further below.

5.2 Uncertainty

5.3 There is some uncertainty in the assessment relating to background sound levels and the ground levels at the development (WTS) site. As highlighted above background sound levels were variable and although a background sound level at the lower range under northerly conditions has been used in the assessment, lower background sound levels were measured under southerly conditions. The southerly background sound levels were approximately 5dB(A) lower. However, in the same southerly conditions predicted noise levels would not be as high as in downwind conditions and would also be subject to the same propagation effects as the road traffic noise, which primarily dictates the background sound levels.[10] Thus, it is reasonable to assume that the reduction in background sound levels in these meteorological conditions would have a similar reductive effect on the site noise levels and variations in the resulting assessment are small.

5.4 Background sound levels were measured in closer proximity of dwelling A than dwelling B. Dwelling B is further away from the A11 and as such background sound levels here could be 1-2dB(A) lower in some circumstances. If background sound levels were 1-2dB(A) lower this would increase the difference between the rated sound level (i.e. site noise) and the background sound level, but would still be below the point at which adverse impact would arise. It is also noted that the lower range of background sound levels has been used in this assessment and not the typical value as identified by BS4142:2014. This provides a more significant margin indicating the assessment remains

[10] Under south westerly winds, at more than 450m away the site noise could reduce typically 8-10dBA following the reductions identified in BS8233:2014 and ISO1996:2017 when upwind and even in a cross-wind (south-easterly) it will reduce more than 2-3dBA.

conservative. Using the middle or upper range of measured background sound levels, rated source levels would still be below the background sound levels.

5.5 There is some uncertainty regarding the final ground height of the WTS site. The predicted noise levels are based on the natural ground profile as detailed in OS maps of the area. Unless the site is going to be raised significantly above the existing ground levels, for example higher than the road height level and adjacent fields, then there is unlikely to be any significant effect on predicted noise levels. If the ground height of the WTS is lower than that assumed this could help to reduce noise impact as source heights would be lower than assumed relative to the receiver locations.

5.6 With regards to the predicted noise levels, these have been calculated at 1.5m height as impact arises during daytime hours. Predicted noise levels at 4.5m height typically assess noise levels at bedroom heights. At 4.5m predicted noise levels were not found to increase significantly above those predicted at 1.5m height, less than 1dB(A). Furthermore, background sound levels will equally increase with height above the ground by 1-2dB(A). This is therefore not considered to influence the outcome of the assessment acceptability. Furthermore, a ground assumption of G=0.0 has been used, which assumes hard / reflective ground. Much of the ground in and around the source and receiver locations could more appropriately be described as semi-reflective and this would lower the predicted noise levels.

5.7 In summary whilst there are some uncertainties with the assessment of impact, as arises with any assessment, they are not sufficient to change the outcome of the assessment.

5.8 Context

5.9 A contextual assessment includes factors that are not accounted for in the difference between rated sound level and background sound level, for example the existing character of the area and duration of the noise. In this case the character of the area is a relevant consideration. The setting is, on the face of it, rural and agricultural. However, the WTS is adjacent an existing operational chalk pit and the Camgrain site. Both existing sites result in an expectation of some noise and particularly from lorry movements along the local roads.

5.10 Lorry movements leaving and entering the proposed WTS site have not been specifically accounted for in the assessment apart from the five tipping movements on site per hour. Whilst the lorry movements associated with the WTS will increase the total number of movements along the nearby roads, this is within the context of existing regular lorry movements both to the quarry site and to Camgrain. Furthermore, the dominant background and ambient sound levels in the area are dictated by road traffic noise along the A11. Thus, individual lorry movements may be identifiable but will be within the context of road traffic noise and will not arise to the same extent as, for example, an area where there is only intermittent road traffic.

5.11 This is not a 24/7/365 source of noise with most of the weekend period and evenings unaffected. Wind is predominately with a westerly component and whilst easterlies can rise for significant periods, most of the time it is westerly where the source will be upwind . crosswind and lower in level.

5.12 In summary, contextual considerations do not change the outcome of the assessment primarily as there is a history, and therefore an expectation, of this type of noise in the area. There is also clear evidence it will be of limited frequency and duration.

5.13 Assessment against policy

5.14 Government planning practice guidance requires determination of whether adverse or significant adverse effects are likely to occur. In this case an assessment has been made following the methodology set out in BS4142:2014 and it has been found that impact is below the point at which adverse effects could be expected to arise.

5.15 In terms of observed effect levels, in this case the assessment falls within the no observed adverse effect level. When background sound levels are lower, noise from the WTS may be heard and the noise may affect the acoustic character of the area, for example additional lorry movements, but not to the extent that there is a perceived change in the quality of life. As discussed above, there is an expectation of this type of noise in the area. However, when background sound levels are higher due to increased road traffic noise, much of the noise from the WTS is likely to be masked.

5.16 At this effect level no specific action is required. However, it is noted that at the lowest observed adverse effect level, the relevant action is to mitigate and reduce impacts to a minimum. This action has been taken at the site as screening elements have been included in the site design with the 8m high building and a 3m high earth mound along the western / south western perimeter of the site. Thus, the objectives of the planning practice guidance and NPPF have been met both in terms of reducing impact and as adverse effects are highly unlikely to arise.

6.0 Summary and conclusions

6.1 MAS Environmental Ltd were appointed by Ashtons Legal on behalf of Mead Construction (Cambridge) Ltd to provide a noise impact assessment for a waste recycling and transfer station (WTS) at Wilbraham Chalk Pit.

6.2 Operations at the site will primarily involve delivery of material to the site, sorting and processing of material using a crusher unit and a screening unit. Associated plant and machinery will include mobile plant such as forklift trucks / telehandlers, shovel loaders and 360 grabs / excavators.

6.3 An environmental sound survey was undertaken between 16th and 25th June 2021. Whilst road traffic noise from the A11 dictated background sound levels, there were two distinct conditions, southerly wind directions and other north westerly or north easterly wind directions. As the proposed WTS is to the north east of existing dwellings, it is considered most appropriate to use the background sound level data gained from northerly wind directions. Using northerly wind direction data there is still a range of background sound levels. Between 07:00 and 17:00 when the proposed development site would be operational, background sound levels range from 43dB LA90,1hour to 54dB LA90,1hour. In this case an assessment has been made assuming a lower end value under northerly wind directions of 43-44dB LA90,1hour.

6.4 The site has been modelled using noise mapping software CadnaA and ISO9613-2. Two scenarios have been modelled based on information provided regarding typical activities at the site. Scenario 1 includes site activities with continuous use of the soil screener, scenario 2 includes site activities with continuous use of the concrete crusher. Whilst there would always be something running during the working day, it is understood that it is highly unlikely that both the concrete crusher and soil screener would operate simultaneously.

6.5 The assessment follows the methodology outlined in BS4142:2014 and indicates that the rated sound levels are generally at or below existing background sound levels. Consideration of uncertainties in the assessment and of context do not change the outcome of the assessment but serve to support it.

6.6 Government planning practice guidance requires determination of whether adverse or significant adverse effects are likely to occur. In this case an

assessment has been made following the methodology set out in BS4142:2014 and it has been found that impact is below the point at which adverse effects could be expected to arise. When background sound levels are lower, noise from the WTS may be heard and the noise may affect the acoustic character of the area, for example additional lorry movements, but not to the extent that there is a perceived change in the quality of life. There is an expectation of this type of noise in the area. However, when background sound levels are higher due to increased road traffic noise and wind direction, much of the noise from the WTS is likely to be masked.

6.7 Acoustic screening elements have been included in the site design with the 8m high building and a 3m high earth mound along the western / south western perimeter of the site. In the absence of the physical mitigation, proposed impact would increase and a revised assessment would need to be made. However, based on the typical activities described and the mitigation upon which predicted noise levels are based, the assessment falls within the no observed adverse effect level. The objectives of the planning practice guidance and NPPF have been met both in terms of reducing impact and as adverse effects are highly unlikely to arise.

Sarah Large **1st July 2021**
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Appendix A - Glossary of terms

This glossary is harmonised with relevant British and ISO standards which are referenced. Some definitions vary slightly due to updates since written and with other noise guidance documents.

A-Weighting - This is a function which attempts to simulate the characteristics of human hearing at lower levels. Hence a dB(A) reading is an estimate of what we actually hear for quieter sounds whereas dB(LIN), {dB(C) on simpler instruments}, is an objective reading of what is actually physically present. However, for louder and low frequency sounds dB(C) correlates better to the human ear.

> **Note**, dB(A) has been proven not to be so effective in weighting for human hearing at low frequencies.

Acoustic environment – Sound at the receiver from all sounds as modified by the environment. The acoustic environment can be the actual environment or simulated, outdoors or inside, as experienced or in memory. [ref BS ISO 12913-1 2014]

Ambient sound – Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far. The ambient sound comprises the residual sound and the specific sound when present. [ref BS4142 2014]

Ambient sound level (La = LAeq,T) – Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far at the assessment location over a given time interval, T. [ref BS4142 2014]

Amplitude Modulation - The cyclic rise and fall in noise level (loudness) often described as a 'swish', 'whoomph' or 'thump'. In relation to large wind turbines it corresponds to the blade passing frequency of the wind turbine blades, typically around once per second.

Attenuation – The loss in energy level of the sound usually used in relation to the loss due to sound passing through a structure or enclosure.

Background sound level (LA90,T) – The A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest number of decibels. It is the underlying level of noise in the absence of the source and normally excludes most short duration noises (depending on time interval relative to the presence of source noise) (see Residual sound level). [ref BS4142 2014]

> **Note**: Many other guidelines and documents reference background noise level. There is a general move to sound level.

Background sound level ("influenced") - In many situations the background sound level can be measured either when the source or premises from which sound emanates, or is associated with, is not operating. Alternatively the intermittency of the source means that it does not have any appreciable effect on the background level, which is a statistical level based mainly on sound that continues with limited breaks. Where this is not the case the measured sound level will be increased and thus influenced.

Background sound level ("uninfluenced") - This refers to any measurement of the background sound level that has not been increased due to noise associated with the source.

Broadband Noise – This is noise covering the whole of the audible frequency range. Compare to narrow band noise which is noise made up of only a very narrow band of frequencies. It will normally exhibit tonality.

Character (of the noise) - Noise character refers to specific features of a noise or sound that render it more intrusive and / or more likely to attract a listeners attention. Noise character can refer to distinguishable or discrete continuous tones (for example hums, whines, hissing or screeching), distinct impulsivity (bangs, clatters, thumps, clicks, pulses) or any other irregularity that attracts attention or makes the noise readily distinctive in relation to the pre-existing acoustic environment.

Context - This includes the interrelationships between person and activity and place, in space and time. The context may influence the soundscape through auditory sensation, interpretation of auditory sensation and the responses to the acoustic environment (see Soundscape). Context is also objectively measured using weightings for character and emergence of the sound above the background sound environment (loudness and relative character).

C-Weighting – see A-Weighting above.

Decibel (dB) - A unit or level, derived from the logarithm of the ratio between the value of a noise energy quantity and a reference value. For sound pressure level the reference quantity is 20 Pa, the threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain / instantaneous damage. A change of 1 dB of the same sound is only perceptible under special conditions.

dB(A): (see A-Weighting) - This is decibels measured on a sound level meter weighted by a scale which is designed to reflect the weighting placed on noise by the human ear. A noise meter incorporates a frequency weighting device to create this differentiation. The dB(A) scale is now widely accepted. Measurements in dB(A) broadly agree with people's assessment of loudness for broadband noise. A change of 3 dB(A) of the same sound is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background sound level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).

dB(Z): The Z-weighting is a flat frequency response of 10Hz to 20kHz ±1.5dB. This response replaces the older "Linear" or "Unweighted" responses as these did not define the frequency range over which the meter would be linear.

DnT,w: See weighted level difference.

Equivalent continuous A-weighted sound pressure level (LAeq,T) - The sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period. LAeq is used to describe many types of noise and can be measured directly with an integrating sound level meter. It is obtained by continuously integrating ('adding up the energy of') a fluctuating sound signal and dividing by the elapsed time, to give the true mathematical average of any time varying signal. An LAeq reading must always be related to a measurement time interval and should not be read as an instantaneous value of sound pressure.

Façade level - Sound pressure level 1m in front of the façade. Façade level measurements are typically argued 1 to 2dB higher than corresponding free-field measurements because of the reflection from the façade in BS8233 2014 and 2-3dB in many other standards and guidance documents giving a range of 1-3dB.

FFT (Fast Fourier transform) Analysis – A method using digital signal processing to produce very rapid narrowband frequency analysis of acoustic signals. It can be used to equate audible sounds into decibel levels and / or enable a range of analysis of temporal sounds.

Filtering - Octaves & 1/3 Octaves - In general most noise is broad band i.e. it contains energy in virtually all the frequencies across the audio range in different combinations so that it has certain recognisable characteristics. To determine the frequencies at which most of the energy is concentrated, a sound signal is filtered into bands, commonly octave and 1/3 octave bands. Information from such filtering is widely used for diagnostic work and to determine noise control measures. (see Octave band 1/1 and Octave band 1/3)

Free-field level - Sound pressure level away from reflecting surfaces. These are typically measurements made between 1.2 to 1.5m above the ground and at least 3.5m away from other reflecting surfaces. To minimize the effect of reflections the measuring position has to be at least 3.5m to the side of the reflecting surface (not 3.5m from the reflecting surface in the direction of the source). [ref BS8233 2014]

Frequency – This is the number of air vibrations or pressure fluctuations per second. The unit is the hertz (Hz).

Hertz (Hz) – See Frequency above.

Impact Insulation class (IIC) - (American) a number rating (in decibels) indicating how well a structure attenuates impact sound.

Impulsivity - Used to describe an acoustic feature of single or repeated sound events of short duration such as a bang, shot or sudden impact of metal on metal etc. It is generally assessed subjectively as perceived by the listener and demonstrates rapid onset in the change in sound level and overall change in sound level. [ref BS4142 2014]

Lnight,outside - The long term equivalent outdoor A weighted sound pressure level established over a period of a year during night time hours (8 hours, typically 23:00 - 07:00). The Lnight,outside is a key parameter of the WHO 2009 Night Noise guidelines which was taken from the Environmental Noise Directive and is typically taken at the facade without reflections (free field level) rather than the facade level given for night time noise disturbance in the WHO 1999 guidelines. It is normally measured / calculated at a height of 4m.

Logarithmic – A scale where the exponent indicating the power to which a fixed number, the base, must be raised to produce a given number. The base used in acoustics is 10. Thus the logarithm of 10 = 1, the logarithm of 100 = 2 and the logarithm of 1000 = 3. In terms of sound energy, an increase of 10 decibels equates to a 10 fold increase. The human ear is sensitive to a very wide range of sound pressure levels (intensities). Measuring human response to sound with a linear scale would not be practical as the scale would be too large and so a logarithmic scale, in the form of decibels, is used.

Loudness – An observer's auditory impression of the strength of a sound. It is a subjective effect which is a function of the ear and brain as well as the amplitude and frequency of the sound. Whilst loudness is a subjective perception, a value can be attributed to loudness, which is typically measured in phons. Loudness is related to sound intensity and takes account of the sensitivity of the human to ear to certain frequencies.

Low frequency noise – This is normally considered to be noise ranging from 20 Hertz (pressure fluctuations per second) to 200-250 Hertz, depending on the reference. In music it is the bass region as opposed to alto and soprano.

Masking – The process by which the threshold of hearing of one sound is raised due to the presence of another.

Maximum (A weighted) sound level (LAmax) - The highest value A-weighted sound level with a specified time weighting that occurs during a given event. The time weighting (see below) used (F or S) should be stated. All measurements were 'fast' in this survey. [ref BS5228-1 2009+A1 2014]

Measurement time interval - Total time over which measurements are taken. [ref BS4142 2014]

Meter response and time weightings - Most practical sound sources cause fluctuating readings. If the level fluctuates too rapidly, an analogue pointer may move so erratically that it will not be possible to obtain a meaningful reading, or with impulsive sound the meter may not respond quickly enough to obtain an authentic reading. Sound level meters are therefore provided with a variable time response control with settings:-

> **'S' Slow** - Meter response is over damped with a time constant of approx 1 second or 1000ms**.** The setting tends to average out fluctuations in the readings.
>
> **'F' Fast** - Permits the instrument to follow and indicate levels that do not fluctuate too rapidly; the time constant response is 125ms.
>
> **'I' Impulse** - Uses a special electrical circuit with a time constant of about 35ms (of the same order as the response time of the human ear) to permit a very rapid response for investigating very sudden, short duration, impulsive sounds. This setting incorporates a detector which in effect stores the signal for sufficient time to allow it to be displayed. Also a slow decay rate is incorporated with time response of approx 1500ms to allow more easy reading of the maximum value as the indicator moves back relatively slowly.
>
> **'P' Peak** - Higher grade meters often incorporate this setting which enables the absolute peak (as opposed to the rms) value of an impulsive waveform to be measured. A time constant of the order of 20 - 50 micro seconds is now involved to permit the following of very sharp impulsive events. Evidently electrical signal storage is also required to permit the meter to register the peak of such very fast events.

Noise - Sound perceived by the receiver to be unwanted.

Octave band 1/1 (single) - Band of frequencies in which the upper limit of the band is twice the frequency of the lower limit. [ref BS4142 2014]

Octave band 1/3 (third)- Band of frequencies in which the upper limit of the band is 21/3 times the frequency of the lower limit. [ref BS4142 2014]

Percentile level (LAN,T) - A-weighted sound pressure level obtained using time-weighting "F" which is exceeded for N% of a specified time interval. Typically the percentile level can be changed on modern sound level meters e.g. LA90,T, LA10,T, LA50,T etc. [ref BS8233 2014].

> **LA90,T**: The A-weighted sound pressure level exceeded for 90% of the specified measurement time interval. It is a statistical measurement. In BS4142 2014 (and generally) it is used to describe the background sound level. Thus for a measurement time interval of 1 minute it would equate to the quietest 6 seconds of sound. For a measurement time interval of one hour it would be the quietest sound for 10% of the time (or 6 minutes). If a machine runs continuously without a reduction in sound for 54 minutes and then stops it would represent the quietest 6 minutes of sound but if run for 55 minutes it would represent the quietest period of machine sound.
>
> **LA10,T:** The A-weighted sound pressure level exceeded for 10% of the time. It represents the highest sound pressure levels within any measurement time interval. The LA10,18hour is typically used as a measure of road traffic noise.

Pitch – Frequency is an objective measure whereas the term pitch is subjective and although mainly dependent on frequency, is also affected by intensity. See also Tonality.

Rating level (LAr,Tr) – The specific sound level of a source plus any adjustment (penalty or weighting) for the characteristic features of the sound. It is used in BS4142 2014 for rating and assessing industrial and commercial sound. [ref BS4142 2014 and BS7445-1 2003 for tonal character and impulsiveness of sound]

Receiver - Person or group of persons who are or who are expected to be exposed to environmental noise.

Reference time interval (Tr) - Specific interval over which the specific sound is determined. For BS4142 2014 this is 1 hour during the day from 0700 to 2300hrs and a shorter period of 15 min at night from 2300 to 0700hrs. [ref BS4142 2014]

Residual sound level - Equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T. [ref BS4142 2014]

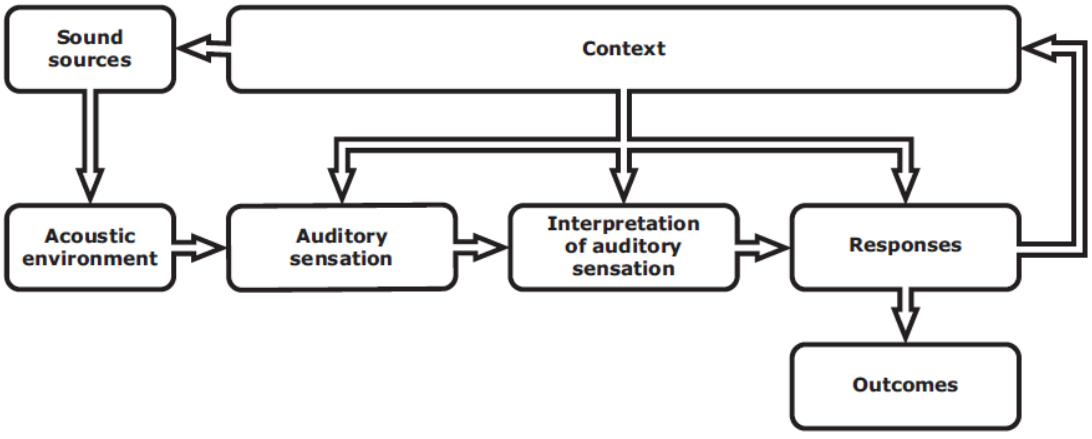
Rw - See sound reduction index.

Sound power level - Sound power is a measure of the flow of sound energy with reference to a unit of time measured in watts (W). The sound power level is an expression of this energy in a logarithmic scale. The sound power level, unlike the sound pressure level, is independent of room or environmental effects and distance.

Sound pressure level - Sound pressure is measured in pascals (Pa) and is created by fluctuations in air caused by sound. The sound pressure level is an expression of this pressure in decibels. The sound pressure level is variable depending on distance from the source and the interaction of the source with the environment (e.g. reflections).

Soundscape – The acoustic environment as perceived or experienced and/or understood by a person or people, in context (see 'acoustic environment' and 'context'). Figure 1 illustrates that soundscape is people's perceptions or experiences and/or understanding of an acoustic environment. The measurement, assessment or evaluation of soundscape is through the human perception of the acoustic environment.

Figure 1 - Elements in the perceptual construct of soundscape [ref BS ISO 12913-1 2014]



Sound reduction index, R, Rw, Rw + Ctr - a level that describes the sound reducing properties of a building element or partition. The weighted sound reduction index (Rw) is a laboratory measurement undertaken in accordance with ISO 717 and provides a standardised value, using a reference curve, which allows comparison between different building elements using the Rw value. The addition of the "Ctr" term, i.e. Rw + Ctr, provides an additional weighting which allows for sound sources with lower frequency spectral dominance.

Sounds Transmission Class - (American) a number rating indicating how well a structure attenuates airborne sound. It is roughly equivalent (in intent) to the sound reduction index.

Specific sound level (Ls = LAeq,Tr) - The equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T. [ref BS4142 2014]

Tonality – Tonal sound gives a definite pitch sensation. It usually occurs where the sound energy in a narrow range of frequencies is greater than those either side of that narrow range. It will appear as a peak on a graph of sound energy shown in decibels versus the audible spectrum. It can often be shown by comparing adjoining octave band (1/3) spectra. A formal definition of tonality varies between standards. Where one 1/3rd octave band is more than 5dB above those either side, the noise contains a tone or alternatively as assessed by narrow band analysis. [ref BS7445-2 1991 / ISO1996-2 1987]. In BS4142 2014 the level differences between adjacent 1/3rd octave bands that identify a tone are:

- 15dB in the lower frequencies (25Hz - 125Hz)
- 8dB in the mid frequencies (160Hz - 400Hz)
- 5dB in the higher frequencies (500Hz - 1000Hz)

Weighted level difference Dw, DnTw, DnTw + Ctr - The weighted level difference gives a single number value for the airborne sound insulation performance of building elements or partitions etc. As with the sound reduction index, the DnTw is a standardised weighted level difference, standardised to a reverberation time of 0.5 seconds, and allows comparison of different building elements. The addition of the "Ctr" term, i.e. DnT,w + Ctr, provides an additional weighting which allows for sound sources with lower frequency spectral dominance.

Appendix B - Photographs of equipment during survey