NOISE IMPACT ASSESSMENT
SHARSTON RECYCLING

REC REFERENCE: AC104164-1R1

REPORT PREPARED FOR: OAKBAY DESIGN LIMITED

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National Consultancy, Locally Delivered

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EXECUTIVE SUMMARY

Resource and Environmental Consultants Limited was appointed by Oakbay Design Limited to complete a Noise Impact Assessment for a proposed Picking Station Facility at Sharston Recycling.

The Noise Impact Assessment has been informed by a Background Sound Survey conducted over noise sensitive time periods during proposed operational hours. The Background Sound survey was completed in a location considered representative of the noise climate at the closest residential receptors to the Facility.

The outcome of the Noise Impact Assessment indicates that, for the daytime period, the level of noise produced by the proposed development and associated operations will be below the measured background sound level and will not exceed the most robust rating level criteria specified in BS4142:2014. Additionally the noise levels produced by the development will not exceed the 50dB criteria given WHO Guidelines for external amenity Levels.

Given the favourable outcome of the assessment, noise should not be considered a determining factor in the granting of planning approval for this Development.

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1. INTRODUCTION

1.1 Background

Resource and Environmental Consultants (REC) Limited were appointed by Oakbay Design Limited to complete a Noise Impact Assessment for a proposed Picking Station at Sharston Industrial Estate.

The Noise Impact Assessment has been informed by a Background Sound Survey conducted over noise sensitive time periods during the proposed hours of operation. The Background Sound survey was completed in a location considered representative of the noise climate of the closest residential receptor to the proposed facility, located off Bronington Close to the north east.

All acronyms used within this report are defined in the Glossary presented in Appendix II.

1.2 Site Location & Proposed Development

The development will be located within Sharston Industrial Estate bordered by Longley Lane to the east, a railway line immediately to the south and Sharston Road to the west. A number of existing industrial units intervene the development site and the nearest sensitive receptors to the north east.

The Proposed Operating hours are:

- 08:00-18:00 Monday-Friday;
- 08:00-18:00 Saturdays; and
- No operations on Sundays and Bank Holidays.

"It is proposed to treat 500 tonnes of waste per day and will include approximately 74 HGV lorry Movements (in and out)."

As part of the development, the following noise sources have been identified:

- HGVs accessing the site from Sharston Road;
- Excavator use in input Storage Area;
- Feeder and Grab Loader;
- Trommel;
- Contained Picking Belt Facility; and
- Air Blower.

This assessment has been undertaken with due regard to the supplied Site plan shown on the following planning drawings:

- Site Layout Showing Waste Processing Facility (Drawing No. Z310.001) dated April 2017; and
- Site Section Showing Processing Plant Elevation and Plan (Drawing No. Z310.002) dated April 2017.

The Proposed Site Layout is shown in Figure I of Appendix III.

1.3 Limitations

The limitations of this report are presented in Appendix I.

1.4 Confidentiality

REC has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from REC; a charge may be levied against such approval.

2. ASSESSMENT CRITERIA

2.1 National Planning Practice Guidance

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Local planning authorities' plan-making and decision taking should take account of the acoustic environment and in doing so consider:

- 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.

In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

The Observed Effect Levels are as follows:

- Significant observed adverse effect level: This is the level of noise exposure above which significant adverse effects on health and quality of life occur;
- Lowest observed adverse effect level: this is the level of noise exposure above which adverse effects on health and quality of life can be detected; and
- No observed effect level: this is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 1 summarises the noise exposure hierarchy, based on the likely average response.

Table 1 Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not Noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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	Observed Adverse Effect	Mitigate and reduce to a minimum

	acoustic character of the area such that there is a perceived change in the quality of life.		
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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 Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation.

These factors include:

- The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day – this is because people tend to be more sensitive to noise at night as they are trying to sleep. The adverse effect can also be greater simply because there is less background noise at night;
- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise; and
- The spectral content of the noise and the general character of the noise. The local topology and topography should also be taken into account along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

- Where applicable, the cumulative impacts of more than one source should be taken into account along with the extent to which the source of noise is intermittent and of limited duration;
- Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases a suitable alternative means of ventilation is likely to be necessary. Further information on ventilation can be found in the Building Regulations; and
- If external amenity spaces are an intrinsic part of the overall design, the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.2 Local Authority Guidance and Criteria – Manchester City Council

REC contacted Rick Knightly, Environmental Protection Team Manager, at Manchester City Council via email, on the 26th September in order to agree on the noise survey methodology and the subsequent assessment methodology and criteria. The following was sent:

"REC have been appointed by a developer to complete a Noise Impact Assessment for an industrial development between Sharston Road and Longley Lane at Sharston Industrial Estate. The parcel of land is adjacent to a railway line with lies to the south.

We would like to agree on the methodology and assessment criteria prior to commencement.

REC will complete a series of noise surveys which will measure the impact of industrial activities upon the existing nearest sensitive residential receptors on Bronington Close.

We will undertake the following Assessment:

Commercial and Industrial Noise:

An assessment of the potential impact of associated industrial activities upon existing receptors will be undertaken in accordance with BS4142:2014. This is believed to include Heavy Goods Vehicles (HGV) movement, a 360 excavator and a picking station.

Commercial and Industrial will be assessed in accordance with BS4142:2014. We will look to compare the rating levels due to the additional operations with the existing typical background sound levels. Section 11 of BS4142 offers a range of 10dB from +10dB to 0dB (rating level equals the background sound level), with the advice for 0dB being 'where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact'. Please advise of your rating level criteria relative to the background sound level. If no criteria is provided, REC will aim to ensure that the rating level does not exceed the measured background sound level.

I trust that the above is satisfactory and would be grateful if you could confirm acceptance to the above. Please do not hesitate to get in touch if you would like to discuss this further."

A response was received from Rick Knightly via email on the 26th September who forwarded the correspondence to the district officer. At the time of submitting this report, no further response was received on the proposed methodology. However, the above methodology and assessment criteria is considered robust and in line with the guidance.

2.3 BS4142: 2014 '*Methods for rating and assessing industrial and commercial sound*'

This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and / or commercial premises; and

- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from processes or premises, such as that from forklift trucks, or that from train or ship movements on or around an industrial or commercial Site.

The procedure detailed in the standard compares the measured or predicted noise level '*the specific noise level*' from any of the above detailed noise sources with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is typical.

The specific noise level also acknowledges the following reference time intervals depending upon whether the noise source operates during daytime or night-time periods:

- Daytime (07:00 – 23:00): 1 hour; and
- Night-time (23:00 – 07:00): 15 minutes.

There are a number of 'penalties' which can be attributed to the specific sound level depending upon the 'acoustic features' of the sound level under investigation. These penalties vary in their weighting depending upon the severity of the acoustic feature, as follows:

Tonality

- +2dB: where the tonality is just perceptible;
- +4dB: where the tonality is clearly perceptible; and
- +6dB: where the tonality is highly perceptible.

Impulsivity

- +3dB: where the impulsivity is just perceptible;
- +6dB: where the impulsivity is clearly perceptible; and
- +9dB: where the impulsivity is highly perceptible.

Intermittency

- +3dB: where the intermittency is readily distinctive against the acoustic environment

In addition to the above acoustic features, there is a penalty for 'other sound characteristics' of +3dB where a sound exhibits characteristics that are neither tonal nor impulsive, though are readily distinctive against the acoustic environment.

BS4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.

Assessment of the rating level relative to the background sound level can yield the following commentary:

- Typically the greater this difference (between the rating level and the background sound level), the greater the magnitude of impact;
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context; and

- 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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

With the above in mind, it is common that a Local Planning Authority will specify their own criteria for the rating level relative to the background sound level and, where this is the case, this criterion usually takes precedence over a simple comparison of the rating level against the background sound level.

2.4 British Standard BS8233:2014: Guidance on Sound Insulation and Noise Reduction for Buildings

The scope of this standard is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including dwellings, as shown in Table 3:

Table 2 BS8233 Recommended Internal Noise Levels

Criterion	Typical Situation	Design $L_{Aeq,T}$ (dB)
Suitable resting/ sleeping conditions	Living Room	35
	Bedroom	30
For a Reasonable standard in bedrooms at night, individual noise evens (measured with fast time weighting) should not exceed 45dB L_{max}		

BS8233 goes on to recommend noise levels for gardens. According to BS8233;

"It is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors might be warranted".

BS8233 goes on to say:

"In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited".

3. NOISE SURVEYS

3.1 Noise Source Data

REC Ltd have been supplied with source noise measurement data of a similar Waste Management Site in Rotherham.

"Measurements were undertaken on Wednesday 21st June 2017 using a Norsonic 131 Type Sound Level Meter, which was calibrated to a reference signal of 94dB prior to and after the survey and exhibited zero drift. Measurements positions comprised of 4 locations adjacent to each of the main section of plant (1-4) and a further 2 (5-6) at increased distances from each end of the process."

Table 2 tabulates the measured sound pressure levels and the distance measured from each source. The assumed On-time is also displayed.

Table 3 Measured Noise Levels and Assumed On-times for each Plant/Operation

Source	Distance to Source (m)	Measured Sound Pressure Level (dB) $L_{Aeq,T}$	Assumed On-time in 1-hour Period (mm:ss)
Feeder and Grab Loader	9	72.3	60:00
Trommel	6	81.7	60:00
Outside 'Picking Station'	7	74.0	60:00
End/Air Blower	9	82.2	60:00
Start/Mechanical Grab/Trommel	34	65.3	60:00
End/Air Blower	24	66.4	60:00

The following information was supplied relating to the source measurements:

"The main noise sources were the air blower at the end of the process line, the trommel screen and finally the feeder/conveyor/mechanical grab operating at the loading end of the process. Noise levels recorded adjacent to the picking station are primarily a combination of noises emanating from the adjacent processes, i.e. the air blower and the trommel."

As such, the measurement adjacent to the 'Picking Station' have been discounted due to the heavy contributions of other processes.

It is understood, that activities on site will also consist of approximately 74 HGV movements (in and out). REC has sourced these activities utilising archived source noise data. A worst-case On-time for a movement has also been assumed.

Table 4 Measured Noise levels and Assumed On-time for Operation.

Source	Distance to Source (m)	Measured Sound Pressure Level (dB) $L_{Aeq,T}$	Assumed On-time in 1-hour Period (mm:ss)
HGV Movement	5	60.9	02:00

3.2 Source Noise Survey

In order to inform the assessment, REC has conducted source noise measurements of an excavator which will operate on the Site. Measurements were taken on Thursday 28th September 2017.

The average measured sound pressure levels from the Source Measurements are presented in Table 5.

Table 5 Average Measured Source Noise Levels

Source	Average Measured Sound Pressure Level (dB) $L_{Aeq,T}$	Source On-time (seconds)	Highest Measured $L_{Amax,fast}$ (dB)	Distance to Source (m)
General Excavator Activity	65.7	300	78.5	12

3.3 Background Sound Survey

REC has conducted a Background Sound Survey at a location considered representative of the closest non-associated noise-sensitive residential receptor to the Facility over the following time period:

- 08:00 – 10:00 and 12:00 – 16:00 Thursday 28th September; and
- 06:30 – 08:00 Friday 29th September.

The following noise measurement position was chosen for the Background Sound Survey:

- Noise Measurement Position 1 (NMP1): Located at the nearest sensitive receptors on Bronington Close to the north east of the development Site. During the morning, distant road traffic, overhead aircraft and existing reversing alarms were perceptible from the monitoring location. During the afternoon, road traffic was mostly dominant.

The average measured sound pressure levels from the Background and Ambient Sound Survey are presented in Table 6.

Table 6 Range of Measured Background and Ambient Sound Pressure Levels

Date	Period	Range of Measured 1hr Sound Pressure Levels (dB) $L_{Aeq,1hr}$	Range of Measured Background Sound Pressure Levels (dB) $L_{A90,T}$
Thursday 28th September 2017	08:00 – 09:00	57.9	52.6
Thursday 28th September 2017	09:00 – 10:00	56.3	51.3
Thursday 28th September 2017	12:00 – 13:00	56.0	53.8
Thursday 28th September 2017	13:00 – 14:00	55.5	51.4

Date	Period	Range of Measured 1hr Sound Pressure Levels (dB) $L_{Aeq,1hr}$	Range of Measured Background Sound Pressure Levels (dB) $L_{A90,T}$
Thursday 28th September 2017	14:00 – 15:00	56.5	52.4
Thursday 28th September 2017	15:00 – 16:00	56.2	52.6
Friday 29th September 2017	06:00 – 07:00	56.6	52.9
Friday 29th September 2017	07:00 – 08:00	58.2	55.1

3.4 Meteorological Conditions

Table 7 details the recorded meteorological conditions at the start and end of the noise survey.

Table 7 Record of Meteorological Conditions at Start and End of Survey

Period	Measured Wind Speed (m/s)	Wind Direction	Precipitation Occurred?	Fog or Mist Evident?	Was the Ground Wet/Frozen/Snow Covered?	Measured Temperature (°C)	Cloud Cover (%)
28/09/17 08:00	1	Variable	No	No	No	14	75
28/09/17 09:00	1	South	No	No	Yes	15	25
28/09/17 12:00	3.1	SSW	No	No	No	17	40
28/09/17 13:00	3.1	SW	No	No	No	17	40
28/09/17 14:00	2.6	S	No	No	No	18	25
28/09/17 15:00	3.6	SW	No	No	No	18	40
29/09/17 06:00	1.5	Variable	Light Rain	No	Yes	15	100
29/09/17 07:00	2.1	South	Light Rain	No	Yes	15	100

Light rain was noted on Friday morning but this was not persistent and wind speeds stayed below 5.0m/s throughout the surveys.

Table 8 details the equipment used for the Source Noise Survey.

Table 8 Noise Measurement Equipment

Measurement Position	Equipment Description	Manufacturer & Type No.	Serial No.	Calibration Due Date
Source and Background	Sound Level Meter	01dB-Metravib Fusion	10819	24 November 2018
	Pre-amplifier	GRAS 40CE	10714	
	Microphone	01dB-Metravib	217637	
	Calibrator	01dB-Metravib CAL-21	34554787	04 July 2018

The sound level meter was field-calibrated on Site prior to and after noise measurements were taken. No significant drift was witnessed. Calibration certificates are available upon request.

4. NOISE IMPACT ASSESSMENT

For the purposes of this assessment, REC have used noise modelling software, CadnaA 4.2, to determine the potential impact of noise from the proposed development site. A noise model has therefore been constructed in order to predict the combined specific noise level at the nearest receptors on Bronington Close. The resultant values will be assessed against the existing ambient sound pressure levels.

The following inputs have been included in the model to generate the specific sound level at the receptor:

- Site Layout Showing Waste Processing Facility (Drawing No. Z310.001) dated April 2017;
- Proposed process heights have been estimated with due regard to Site Section Showing Elevation Processing Plant and Plan (Drawing No. Z310.002) dated April 2017;
- Site elevations have been taken as existing;
- Existing buildings that provided shielding from any of the noise sources have been included in the model;
- Barrier are inserted into the model to account for the 1.8m high close boarded fence at the receptor, and the 3.5m screening wall adjacent to the site;
- Noise sources associated with the Facility have been inputted as point sources using the calculated specific sound pressure levels and estimated height data;
- HGV movements have been inputted as a line source;
- It is assumed that approximately 60 HGV movements will take place during 1 working day;
- During any 1-hour period, the stipulated on-times are considered as a worst-case scenario;
- A reflection order of 2 has been used in all calculations;
- Noise levels generated using ISO 9613-1 and ISO 9613-2 “Acoustics – Attenuation of sound during propagation outdoors” as incorporated into CadnaA software.

4.1 BS4142 Assessment

The grid map determined that the highest predicted specific level due to the proposed picking station Facility is 40.6dB at the closest receptor on Bronington Close. Figure 2 of Appendix III shows the grid noise map.

For the BS4142: 2014 assessments, penalties are applied to the specific sound level in order to provide the rating level. These penalties relate to the acoustic features of the sound source. Accordingly, the following features have been accounted for in the assessment, in accordance with the subjective and objective methods detailed in BS4142: 2014, for the units as a whole operation.

Table 9 determines the applicable penalties for all fixed and mobile plant items.

Table 9 Identification of Acoustic Penalties

Source	Penalty	Applicable?	Attributable Penalty	Comment
All Fixed Plant/ Operations	Tonality	No	-	No Tones present
	Impulsivity	Yes	3dB	Impact noise may be just perceptible due to existing noise climate.
	Intermittency	Yes	3dB	Intermittent processes

Source	Penalty	Applicable?	Attributable Penalty	Comment
	Other Sound Characteristics	No	-	Not applicable as other penalties have been assigned.
HGV Movements	Tonality	No	-	Due to a number of sites intervening the receptors, it is expected that no additional tones will be perceptible.
	Impulsivity	No	-	If the HGVs follow the speed limit and all loads are secured, no impulses should exist.
	Intermittency	Yes	3dB	HGV movements are intermittent by nature.
	Other Sound Characteristics	No	-	Not applicable as other penalties have been assigned.
Excavator	Tonality	No	-	No Tones should be present.
	Impulsivity	Yes	3dB	Impact noise may be just perceptible due to existing noise climate.
	Intermittency	Yes	3dB	Excavator movements are intermittent by nature.
	Other Sound Characteristics	No	-	Not applicable as other penalties have been assigned.

Table 10 details the penalties which will be added to the specific noise source.

Table 10 Calculation of Total Penalties to Apply

Plant	Tonality Penalty (dB)	Impulsivity Penalty (dB)	Intermittency Penalty (dB)	Other Sound Characteristics Penalty (dB)	Total Penalty (dB)
All Fixed Plant/ Operations	0	3	3	0	6
HGV Movements	0	0	3	0	3
Excavator	0	3	3	0	6
Highest Penalty Applicable	0	3	3	0	6
Total Value of Penalties to Apply*	6				

*Summation of row 'Highest Penalty Applicable'

Note: BS4142 (Section 9.1) states; "*Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level*." It goes on to state "*Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion*."

Table 11 calculates the Rating Level at the closest proposed garden area for the daytime period. The lowest average background sound level has been used.

Table 11 Calculation of Rating Level and Comparison with Background Sound Level – Daytime

Receptors	Specific Sound Level, $L_{Aeq,1hr}$ (dB)	Total Penalty (dB)	Total Rating Level $L_{A,r}$ (dB)	Typical Measured Background Sound Level $L_{A90,1hr}$ (dB)	Criteria, $L_{A,r} = L_{A90}$ (dB)	Difference +/- (dB)
Garden areas at the north east Receptors	41	+6	47	53	53	-6

Table 10 indicates that the rating level will fall below the existing measured background sound level by approximately -6dB for the daytime period and as such consideration of mitigation measures are not required.

BS4142:2014 provides the following advice:

"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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact."

Accordingly, the impact is considered negligible. Furthermore, the rating level achieves the 50dB criteria for garden areas given in the WHO Guidelines and BS8233:2014.

5. MITIGATION

The outcome of the Noise Impact Assessment indicates that the level of noise produced by the proposed extension during the daytime period will be below the measured background sound level and will not exceed the most robust rating level criteria specified in BS4142:2014. Additionally the noise levels produced by the extension will not exceed the 50dB criteria given WHO Guidelines for external amenity Levels.

As there are no proposed activities taking place between the hours of 23:00 and 07:00, an assessment of night-time levels is not required.

Accordingly, no mitigation measures are required.

6. CONCLUSION

Resource and Environmental Consultants Limited were appointed by Oakbay Design Limited to provide a Noise Impact Assessment for the proposed Picking Station Facility at Sharston Industrial Estate.

The Noise Impact Assessment has been informed by a background sound survey conducted during the hours deemed most sensitive during the proposed hours of operation. The background survey was completed in a location considered representative of the nearest sensitive receptor to the proposed facility.

The outcome of the Noise Impact Assessment indicates that, for the daytime period, the level of noise produced by the proposed extension and associated operations will be below the measured background sound level and will not exceed the most robust rating level criteria specified in BS4142:2014. Additionally the noise levels produced by the extension will not exceed the 50dB criteria given WHO Guidelines for external amenity Levels.

Given the favourable outcome of the assessment, noise should not be considered a determining factor in the granting of planning approval for this Extension.

APPENDIX I LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between REC Limited and the Client as indicated in Section 1.2.

2. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

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APPENDIX II GLOSSARY OF ACOUSTICAL TERMINOLOGY

Noise

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude, but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A1: Typical Sound Pressure Levels

Sound Pressure Level dB(A)	Location
0	Threshold of hearing
20 - 30	Quiet bedroom at night
30 - 40	Living room during the day
40 - 50	Typical office
50 - 60	Inside a car
60 - 70	Typical high street
70 - 90	Inside factory
100 - 110	Burglar alarm at 1m away
110 - 130	Jet aircraft on take off
140	Threshold of pain

Acoustic Terminology

Table A2: Terminology

Descriptor	Explanation
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2x10-5Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq, T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall Leq noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
L_{10} & L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The Ln indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.
Fast	A time weighting used in the root mean square section of a sound level meter with a 125millisecond time constant.
Slow	A time weighting used in the root mean square section of a sound level meter with a 1000millisecond time constant.

APPENDIX III FIGURES

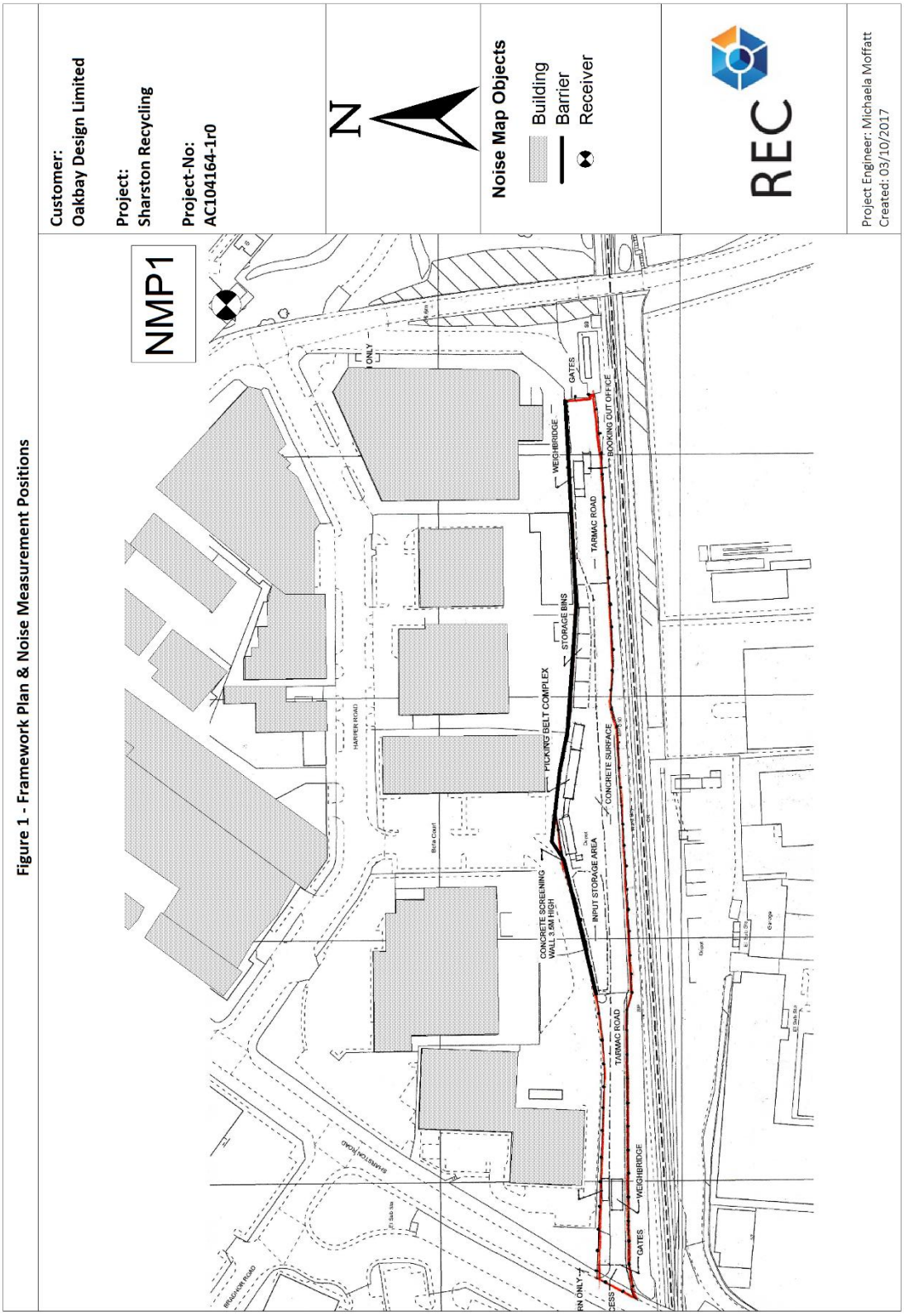


Figure 1 - Framework Plan & Noise Measurement Positions

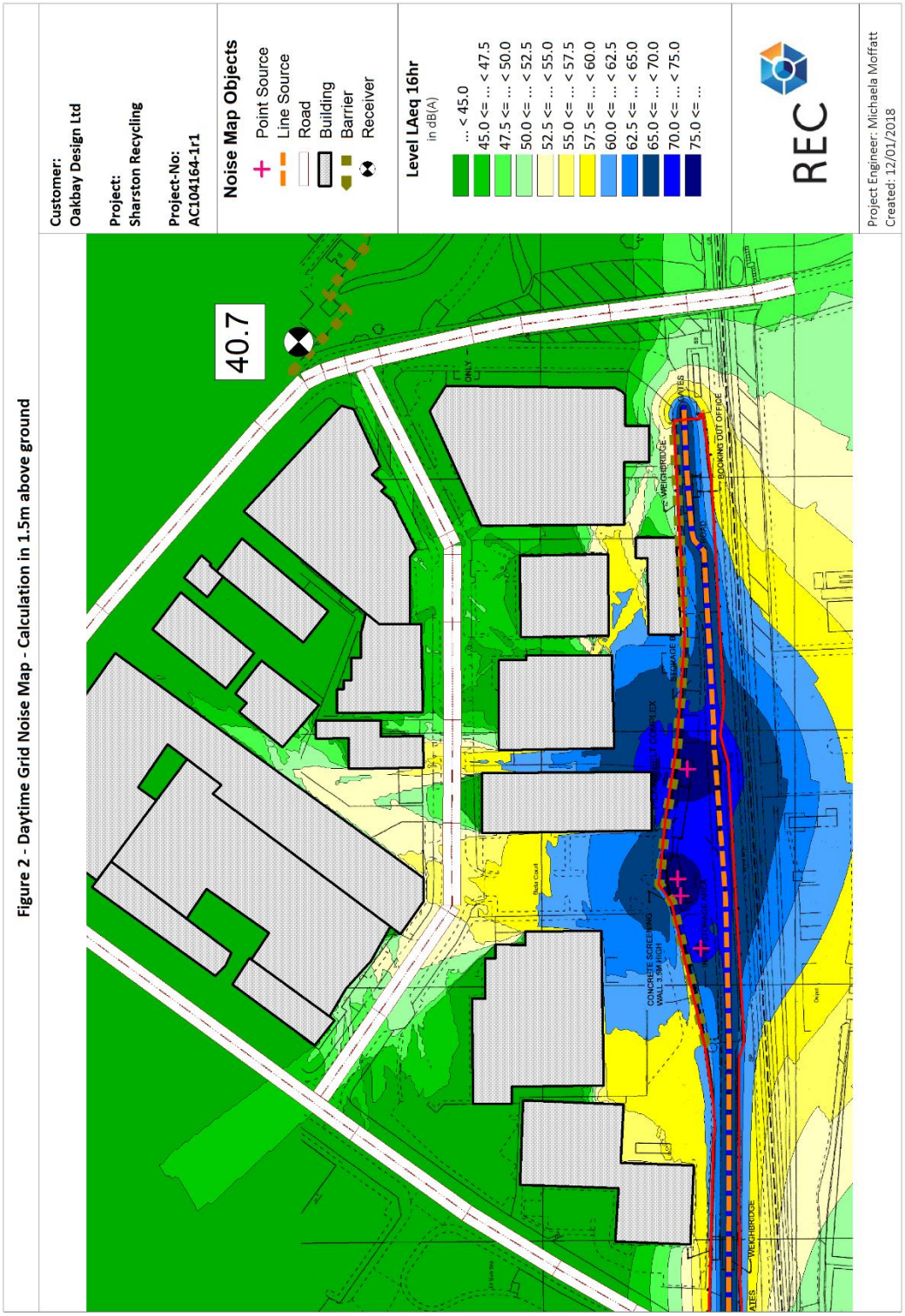


Figure 2 - Daytime Grid Noise Map - Calculation in 1.5m above ground

APPENDIX IV MEAURED AMBIENT & BACKGROUND SOUND DATA

Table A3: Measured Background Sound Pressure Level Data

Date and Start Time	Measured Sound Pressure Level (dB)	
	$L_{Aeq,t}$	$L_{A90,t}$
28/09/2017 08:00	57.9	52.6
28/09/2017 09:00	56.3	51.3
28/09/2017 12:00	56	53.8
28/09/2017 13:00	55.5	51.4
28/09/2017 14:00	56.5	52.4
28/09/2017 15:00	56.2	52.6
29/09/2017 06:00	56.6	52.9
29/09/2017 07:00	58.2	55.1