Oakleaf Recycling Ltd, Cwmfelinfach

Noise Assessment for NRW Permit Compliance

19th April 2023

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Version	Comments	Date	Authored By	Checked By	Project Number
1	Noise Impact Assessment for NRW	10th March 2023	[redacted]	[redacted]	23-069
2	NRW Redaction Requests	19th April 2023	[redacted]	[redacted]	23-069

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1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned to prepare a Noise Assessment for the Waste Processing Operations at Oakleaf Recycling Limited's premises at Unit 23 Nine Mile Point Industrial Estate, Cwmfelinfach, Caerphilly, NP11 7HZ, for submission to Natural Resources Wales (NRW) as part of a Permit Compliance Review.

The purpose of the assessment is to determine whether the noise levels generated by the full operation of the site are within those presented within the noise assessment report, upon which the Environmental Permit was granted i.e. *Noise Impact Assessment – Land at Nine Mile Point Industrial Estate, Caerphilly, NP11 7HZ*, dated September 2015, ref: CRM.083.001.NO.R.001 and prepared by Enzygo.

The specific requirements are set out below:

Report to be carried out as per Natural Resource Wales (NRW) requirements: "within 3 months of commencement of normal operations, noise monitoring in accordance with BS4142:2014 shall be carried out to confirm the assumptions from the Noise Impact Assessment submitted as a part of the Application. A report shall be submitted to NRW at the reporting address, for approval, within 6 months of operations commencing".

This noise assessment is necessarily technical in nature; therefore a glossary of terms is included in Appendix A to assist the reader.

1.2. Scope and Objectives

The scope of the report is summarised as follows:

- Detailed sound measurements at the closest noise-sensitive receptors to the Site;
- Detailed sound source measurements at key locations within the Site;
- A detailed, supplementary 3-dimensional noise modelling exercise;
- A detailed assessment of the suitability of the Site, in accordance with the relevant policy; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the Noise and Vibration Management: Environmental Permits[1], and BS4142:2014+A1:2019[2].

[1] Environment Agency, Scottish Environment Protection Agency (SEPA), Natural Resources Wales and Northern Ireland Environment Agency, 2021. Noise and Vibration Management: Environmental Permits.
[2] British Standards Institution, 2019. BS4142:2014+A1:2019: Method for Rating and Assessing Industrial and Commercial Sound.

2. Assessment Framework

2.1. National Policy

2.1.1. Noise and Vibration Management: Environmental Permits

Environmental permits have conditions that require operators to control pollution; this includes controlling noise and vibration. The Environment Agency, Scottish Environment Protection Agency (SEPA), Natural Resources Wales and Northern Ireland Environment Agency have jointly released guidance to help holders and potential holders of permits apply for, vary, and comply with their permits. The guidance covers:

- how the respective environment agencies will assess noise from certain industrial processes;
- what the law says you must do to manage noise and vibration; and
- advice on how to manage noise – in particular, how to carry out a noise impact assessment and what operators should include in a noise management plan.

This guidance replaces these documents which have been withdrawn:

- Environment Agency Horizontal Guidance for Noise (H3) parts 1 and 2.

It involves determining the appropriate controls for industry to protect the environment through a single permitting process. To gain a Permit, Operators have to show that they have systematically developed proposals to apply the 'Best Available Techniques' (BAT) and meet certain other requirements, taking account of relevant local factors.

In terms of noise specifically, the use of BAT has to be considered and balanced within the wider context of other releases to different media (air, land and water) and taking issues such as usage of energy and raw materials into account. Noise cannot therefore be considered in isolation from other impacts on the environment.

The definition of pollution includes *"emissions which may be harmful to human health or the quality of the environment, cause offence to human senses or impair or interfere with amenities and other legitimate uses of the environment"*. BAT is therefore likely to be similar, in practice, to the requirements of the Statutory Nuisance legislation which requires the use of *"best practicable means"* to prevent or minimise noise nuisance. In the case of noise, *"offence to human senses"* may be judged by the likelihood of complaints. However, the lack of complaint should not necessarily imply the absence of a noise problem. In some cases, it may be possible, and desirable, to reduce noise emissions still further at reasonable costs and this may therefore be BAT for noise emissions.

Consequently, the aim of BAT should be to ensure that there is no reasonable cause for annoyance to persons beyond the installation boundary.

In summary, the aim of BAT should be to achieve the following:

- Underpinning of good practice, a basic level of which the operator should employ for the control of noise including adequate maintenance of any parts of plant or equipment whose deterioration may give rise to increases in noise. For example, this would include bearings, air handling plant, the building fabric as well as specific noise attenuation measures associated with plant, equipment or machinery;
- Noise levels should not be loud enough to give reasonable cause for annoyance for persons in the vicinity, which is a more appropriate environmental standard than that of Statutory

Nuisance and is normally the aim of most planning or other conditions applied by Local Authorities; and
- Prevention of 'creeping background' (creeping ambient), which is the gradual increase in sound levels as industry expands and areas develop.

The indicative requirements apply to both new and existing activities but it is more difficult to justify departures from them in the case of new activities.

Indeed, because the requirements for noise are likely to be strongly influenced by the local environmental conditions, new installations are expected to meet BAT from the outset and to demonstrate that noise reduction or prevention has been built into the process design. For most existing plant, especially where there are no existing noise limits, the focus is on good practice (BAT) and the need to ensure that there is no reasonable cause for annoyance. In assessing any noise impact, it is more normal to monitor existing levels and apply corrections and calculations, rather than rely on predictions.

The guidance refers to BS4142:2014+A1:2019 as the basis for the majority of noise impact assessments.

2.1.2. Planning Policy Wales

The Government's planning policies for Wales are contained in Planning Policy Wales (Edition 11, February 2021). The policy provides overarching requirements for developments to adequately control noise pollution, to provide appropriate soundscapes and to incorporate good acoustic design.

The policy is supplemented by the Noise and Soundscape Action Plan 2018-2023, which provides more detailed guidance on planning for a new development, but does not set out specific assessment methods or criteria. The guidance in this document has been used to inform a qualitative assessment of the effect the proposed development could have on the local soundscape.

2.1.3. Technical Advice Note (Wales) 11

This note provides advice on how the planning system in Wales can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business.

It outlines some of the main considerations which local planning authorities should consider in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

2.2. Assessment Criteria

2.2.1. BS4142:2014+A1:2019

BS4142:2014+A1:2019 sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014+A1:2019 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS4142:2014+A1:2019 states: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs"*. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- *"Typically, the greater this difference, the greater the magnitude of the 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."*
- *"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

3. Site Description

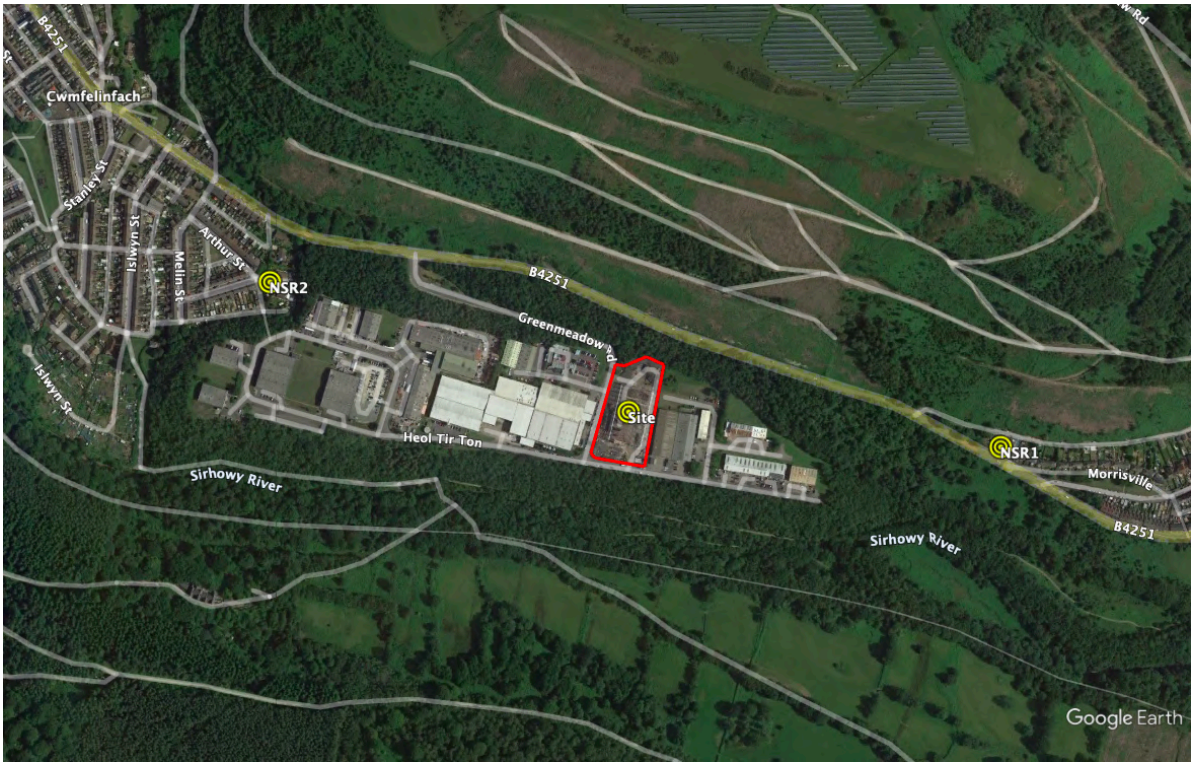
3.1. Site and Surrounding Area

The site is located at Unit 23 Nine Mile Point Industrial Estate, Cwmfelinfach, Caerphilly, NP11 7HZ, to the south of the B4251 road within the lower reaches of the Sirhowy Valley.

The soundscape of the area is largely dominated by road traffic using the B2451 road, with receptors to the north of the site also being acoustically influenced by daytime commercial activities within the Nine Mile Point Industrial Estate, unconnected to Unit 23. Activities associated with Unit 23 were inaudible at any identified receptor location.

The location of the site, relative to key local features, including the closest noise sensitive receptors (NSRs); being the residential properties on "Morrisville" at the northern edge of Wattsville, to the south of the site and residential properties off Arthur Street, at the southern end of the residential area of Cwmfelinfach are shown in Figure 1.

Figure 1: Location of Site and Surrounding Area



3.2. Operations Overview

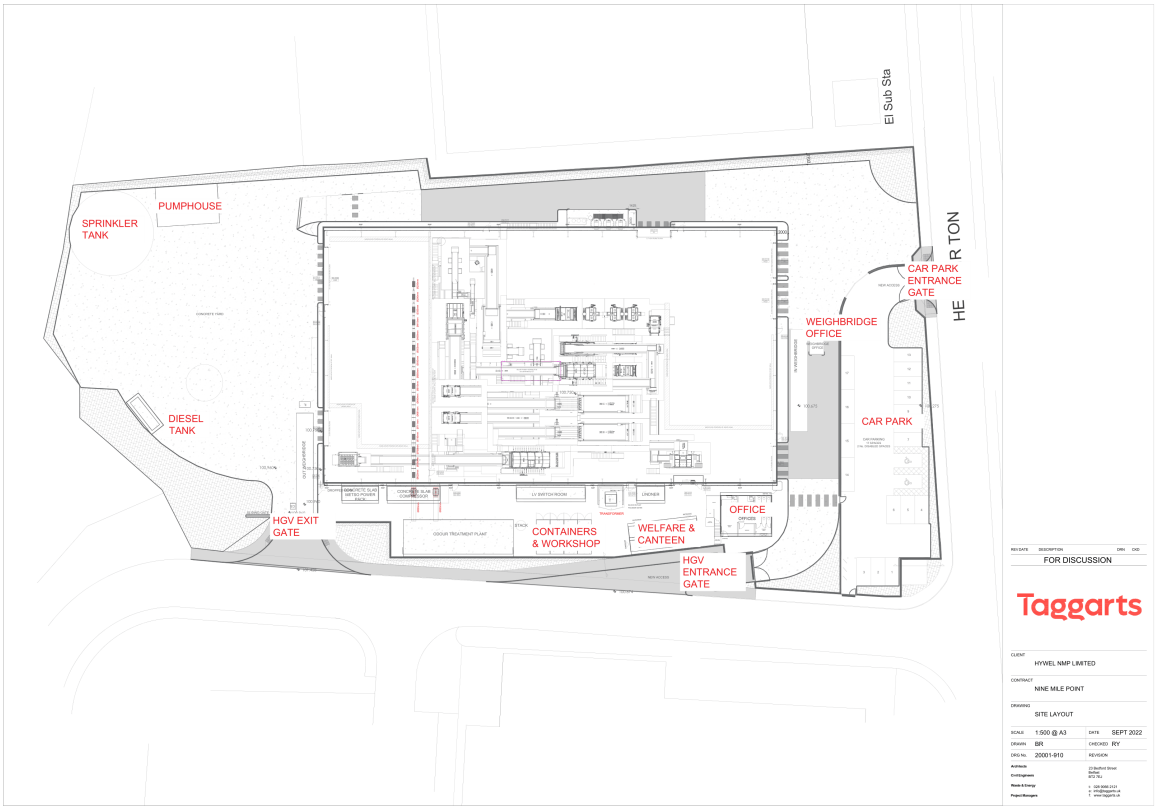
The Oakleaf Recycling Ltd facility at Unit 23 currently processes up to 100,000 tonnes of non-hazardous industrial, commercial, and household waste per annum. Recyclates are removed from the incoming waste during the production of Solid Recovered Fuel (SRF)/Refuse Derived Fuel (RDF).

The site operates on a 24-hour basis; however, the weighbridge only operates between 07:30 and 18:00, meaning that waste import and fuel export only occurs during the core daytime hours. Consequently, external activity is negligible outside of these hours, with no HGV manoeuvres.

As a result of shift changes, the site is shut down between the hours of 16:00 and 16:30, and 04:00 and 06:00.

The site layout is shown in Figure 2.

FIGURE 2: SITE LAYOUT



3.3. Noise Generating Elements

The operations comprise the receipt, storage, processing and export of various waste materials into usable fuel products, comprising the noise-generating elements summarised in Table 1.

TABLE 1: SUMMARY OF NOISE-GENERATING ELEMENTS

Description	Location	Operational Profile	Grid Coordinates	
			Easting	Northing
Internal Plant / Process Lines	Internal	Mostly Continuous	319233	191289
Material Receipt	Internal	On Demand – Frequent	319244	191331
Liebherr LH22 360 Grab	Internal (Tipping Hall)	On Demand – Frequent	319227	191338
Caterpillar 930M Loading Shovel	Internal (Tipping Hall)	On Demand – Occasional	319254	191338
Caterpillar 930M Loading Shovel	Internal (Processing Hall)	On Demand – Occasional	319219	191278
JCB Wastemaster Teletruck Diesel Forklift / Loading	External	On Demand – Frequent (Daytime)	319254	191360
HGV Arrival	External	On Demand – Infrequent (<4 per hour)	319196	191273
HGV Depart (via Weighbridge)	External	On Demand – Infrequent (<4 per hour)	319226	191348
HGV into Tipping Hall	External/Internal	On Demand – Infrequent (<4 per hour)	319257	191339
Stack and Odour Management Unit	External	Mostly Continuous	319211	191322
Metso Power Pack	External	On Demand – Frequent	319219	191324
Compressor	External	On Demand – Frequent	319216	191316
Lindner Louvre	External	On Demand – Frequent	319209	191292
Lindner AHU	External	On Demand – Frequent	319208	191295
Jet Bag Filter	External	On Demand – Frequent	319247	191276
HVAC	External	On Demand – Frequent	319248	191280

4. Measurement Methodology

4.1. General

The noise conditions in the area have been determined by an environmental noise survey conducted over Wednesday 1st to Thursday 2nd March 2023.

4.2. Measurement Details

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445[3].

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672[4]. A full inventory of this equipment is shown in Table 2 below.

Table 2: Inventory of Sound Measurement Equipment

Position	Make, Model & Description	Serial Number	Calibration Certificate Number	Calibration Expiry Date
MP1	Rion NL-31 Sound Level Meter	00110040	1139896	09/02/2025
	Rion NH-21 Preamplifier	00142	1139896	09/02/2025
	Rion UC-53A Microphone	306449	1139896	09/02/2025
MP2 & Source	Rion NL-52 Sound Level Meter	00810638	CONF032203	11/03/2024
	Rion NH-25 Preamplifier	20046	CONF032203	11/03/2024
	Rion UC-59 Microphone	11181	CONF032203	11/03/2024
All	Cirrus CR:515 Acoustic Calibrator	82506	1131626	23/08/2023

The measurement equipment used during the survey was field calibrated at the start and end of the measurement period, with the following results:

- MP1 - Before: 94.0 dB After: 93.9 dB (@1kHz)
- MP2 - Before: 94.1 dB After: 94.0 dB (@1kHz)

A calibration laboratory has calibrated the field calibrator used within the twelve months preceding the measurements.

The weather conditions during the survey as follows:

- Wednesday 1st March – heavily overcast, but not raining, with little to no discernible wind, but measured at 0.1 to 0.3ms^{-1} from the north-east; and
- Thursday 2nd March – sunny and dry, with 40% cloud cover, light winds wind, measured at 0.3 to 0.5ms^{-1} from the north-east.

[3] British Standard 7445: 2003: *Description and measurement of environmental noise*. BSI.
[4] British Standard 61672: 2013: *Electroacoustics. Sound level meters*. Part 1 *Specifications*. BSI.

The microphones were fitted with protective windshields for the measurements, which are described in Table 3, with an aerial photograph indicating their locations shown in Figure 3. A plan of the source noise measurement positions is shown in Figure 4.

TABLE 3: MEASUREMENT POSITION DESCRIPTION

Position	Description
MP1	A partially attended measurement of sound under free-field conditions, at a height of 1.5m above ground, within the front garden of [redacted] on the boundary with [redacted], at the northern edge of Wattsville. The sound environment was entirely influenced by road traffic using the B4251. Nearby roadworks on the B4251 changed the traffic patterns during the morning of 2nd March, as vehicles platooned through the temporary traffic signals, rather than flow continuously.
MP2	A partially attended measurement of sound under free-field conditions, at a height of 1.5m above ground, within the rear garden of [redacted] Arthur Street, Cwmfelinfach. The sound environment was influenced by road traffic using the B4251 and daytime commercial activities (vehicle/plant movements and materials handling) within the closest units within Nine Mile Point Industrial Estate (unconnected to Oakleaf Recycling).
Source	Source measurements were undertaken around the site, as detailed in Figure 4 and Table 4.

FIGURE 3: MEASUREMENT POSITIONS

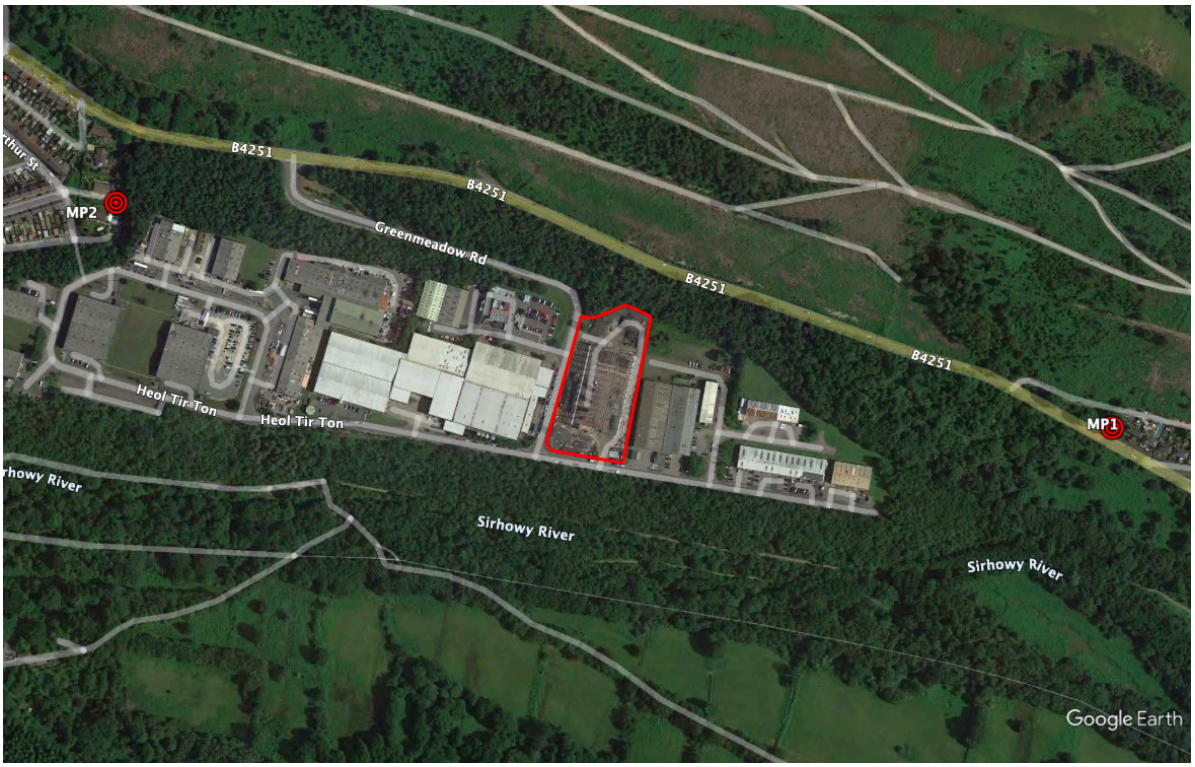
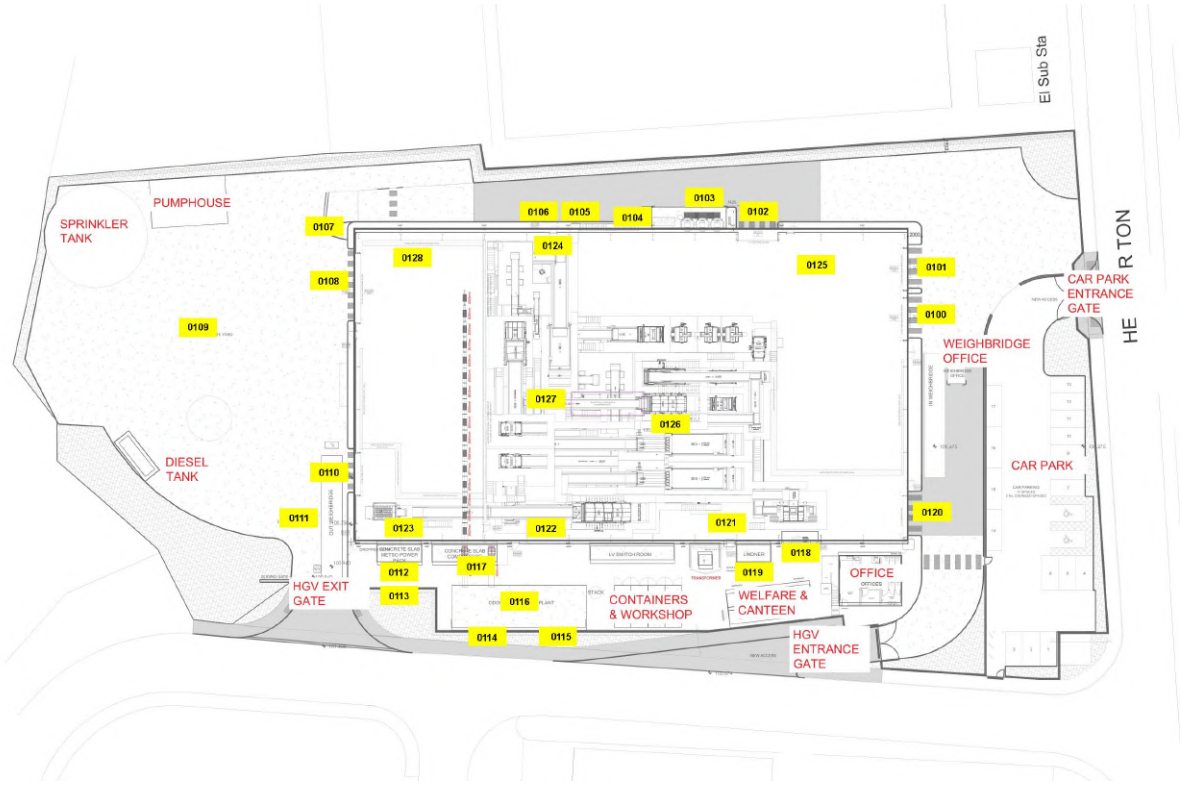


Figure 4: Source Noise Measurement Positions



4.3. Summary Results

The summarised results of the environmental noise measurements are presented in Table 4, with full time histories presented under Appendix B.

Table 4: Summary of Noise Measurement Results

Description	Period	Noise Level, dB		
		$L_{Aeq,T}$	Modal L_{A90}	L_{AFmax}
MP1 - Wattsville				
Site fully operational	*01/03/23 13:40-18:00	67.0	49.0	79.9
Site operational – no deliveries	01/03/23 18:00-23:00	63.4	37.0	80.3
Site operational – no deliveries	**01-02/03/23 23:00-07:00	59.6	36.0	79.3
Site operational – no deliveries	02/03/23 07:00-07:30	66.4	49.0	79.1
Site fully operational	02/03/23 07:30-11:30	63.0	46.0	79.2
***Site not operational	**01/03/23 16:00-16:30**	67.1	**48.0**	78.5
***Site not operational	**02/03/23 04:00-06:00**	62.4	**35.0**	80.0

MP2 – Arthur Street				
Site fully operational	*01/03/23 14:05-18:00	45.7	39.0	70.8
Site operational – no deliveries	01/03/23 18:00-23:00	46.7	32.0	63.2
Site operational – no deliveries	**01-02/03/23 23:00-07:00	39.8	27.0	60.5
Site operational – no deliveries	02/03/23 07:00-07:30	45.2	38.0	59.9
Site fully operational	02/03/23 07:30-11:00	48.2	38.0	72.8
***Site not operational	**01/03/23 16:00-16:30**	44.1	**39.0**	59.4
***Site not operational	**02/03/23 04:00-06:00**	39.9	**28.0**	58.2

*denotes that sample excludes 16:00-16:30 shutdown period
**denotes that sample excludes 04:00-06:00 shutdown period
***denotes data used for background sound level

Measurement Address	Source Description	Distance to Source	Noise Level, dB $L_{Aeq,T}$
0100	Roller Shutter Door	1m	69.5
0101	Roller Shutter Door	1m	76.9
0102	Roller Shutter Door	1m	69.8
0103	Jet Bag Filter	1m	70.4
0104	HVAC	0.5m	65.4
0105	Man Access Door (High Level)	1m	64.1
0106	Man Access Door (Low Level)	1m	62.4
0107	HGV Reversing into Tipping Hall	3m	75.5
0108	Roller Shutter Door	1m	70.2
0109	Forklift Loading HGV	7m	74.0
0110	Roller Shutter Door	1m	67.3
0111	HGV Over Weighbridge	2m	74.3
0112	Metso Power Pack	1m	85.0
0113	Metso Power Pack	4m	78.8
0114	Compressor (Acoustically Sheeted)	1m	81.4
0115	Compressor (Acoustically Sheeted)	1m	81.7
0116	Odour Treatment Plant	1m	84.1
0117	Compressor	0.5m	80.0
0118	Lindner Louvre	1m	73.2
0119	Lindner AHU	0.5m	70.9
0120	Roller Shutter Door	1m	74.8

0121	Internal Process Area – Ground Level	Internal Reverberant	93.6
0122	Internal Process Area – Ground Level	Internal Reverberant	91.3
0123	Tipping Hall - Conveyor	Internal Reverberant	87.3
0124	Internal Process Area – Ground Level	Internal Reverberant	88.0
0125	Vehicle Loading Area	Internal Reverberant	87.7
0126	Internal Process Area – High Level	Internal Reverberant	92.7
0127	Internal Process Area – High Level	Internal Reverberant	92.6
0128	Tipping Hall - Receipt	Internal Reverberant	78.1

Noise breakout through the building façade was immeasurable relative to the external sources of noise, so that element will be considered via computation of the internal reverberant sound level and the published sound reduction of the clad areas of the building envelope.

4.3.1. Discussion of Results

It can be seen from the results set out above, that the operation of the site did not audibly or quantifiably influence the sound environment at the receptor locations, with no correlation shown between the operation of the site and the ambient, residual or background sound levels. The sound environment was qualitatively noted to be entirely influenced by other sources, primarily road traffic.

Consequently, the site was not considered to give rise to any measurable or audible noise impact at the receptor location during the measurement exercise; however, NRW's requirements where ambient-residual differentials are less than 3 dB are noted (as per strict interpretation of BS4142 para: 7.3.5), so a supplementary noise modelling exercise has been undertaken.

5. Predictive Noise Assessment

5.1. Noise Modelling

5.1.1. Introduction

The site was not considered to give rise to any measurable or audible noise impact at the receptor locations during the measurement exercise; however, NRW's requirements where ambient-residual differentials are less than 3 dB are noted (as per strict interpretation of BS4142 para: 7.3.5), so a supplementary noise modelling exercise has been undertaken, to replicate the peak site activities occurring during that exercise.

5.1.2. Noise Source Data

The following sources of noise associated with the Proposed Development have been identified and are considered in this assessment:

- External Waste Handling Operations; and
- Internal Waste Handling/Processing Operations.

5.1.3. Source Data

The sound source data used in the assessment are as per the data set out within Table 4.

It should be noted that, as noise breakout through the cladding was immeasurable against the backdrop of other noise sources, that the computation of noise from this element considers the internal reverberant sound levels and the published acoustic performances of the cladding.

As noise breakout via the building apertures was immeasurable, doors and louvres have been considered on that basis.

No duty reductions have been accounted for during the night-time, with the only day/night source variations being attributable to the presence or otherwise of external plant and vehicular movements, hence giving rise to a worst-case prediction scenario.

5.1.4. Building Envelope

In terms of the acoustic performance of the building envelopes, the sound reduction statistics set out in Table 5 have been adopted.

Table 5: Sound Reduction Index of Building Components

Component	Type / Material	Airborne Sound Insulation – R_w-C_{tr} - dB
Roof	Trimotherm SNV Cladding	29
Walls	Trimotherm TNV Cladding	30

5.1.5. Calculation Process

Calculations were carried out using Cadna/A, which undertakes its calculations in accordance with guidance given in ISO9613-1:1993 and ISO9613-2:1996.

5.1.6. Sound Data Assumptions

Given that the land between Proposed Development and nearest receptors is mixed, the ground factor has been set to 0.8 for the surrounding area and 0.2 for the area of the industrial estate in the calculation software. That calculation process also considers two orders of reflection.

5.1.7. Specific Sound Level Map

The sound map showing the specific sound level emissions from the Proposed Development can be seen in Figure 5.

FIGURE 5: SPECIFIC SOUND LEVEL MAP - DAYTIME

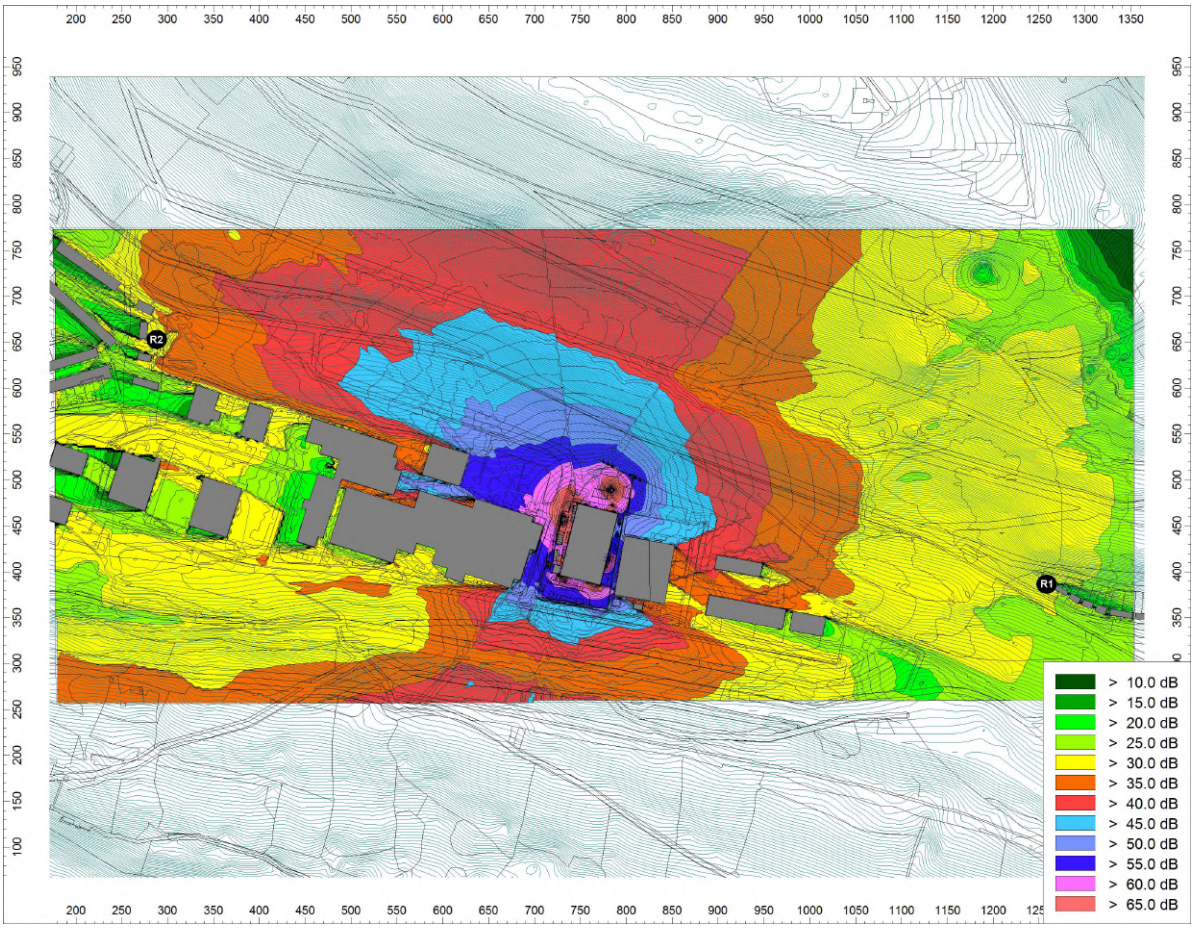
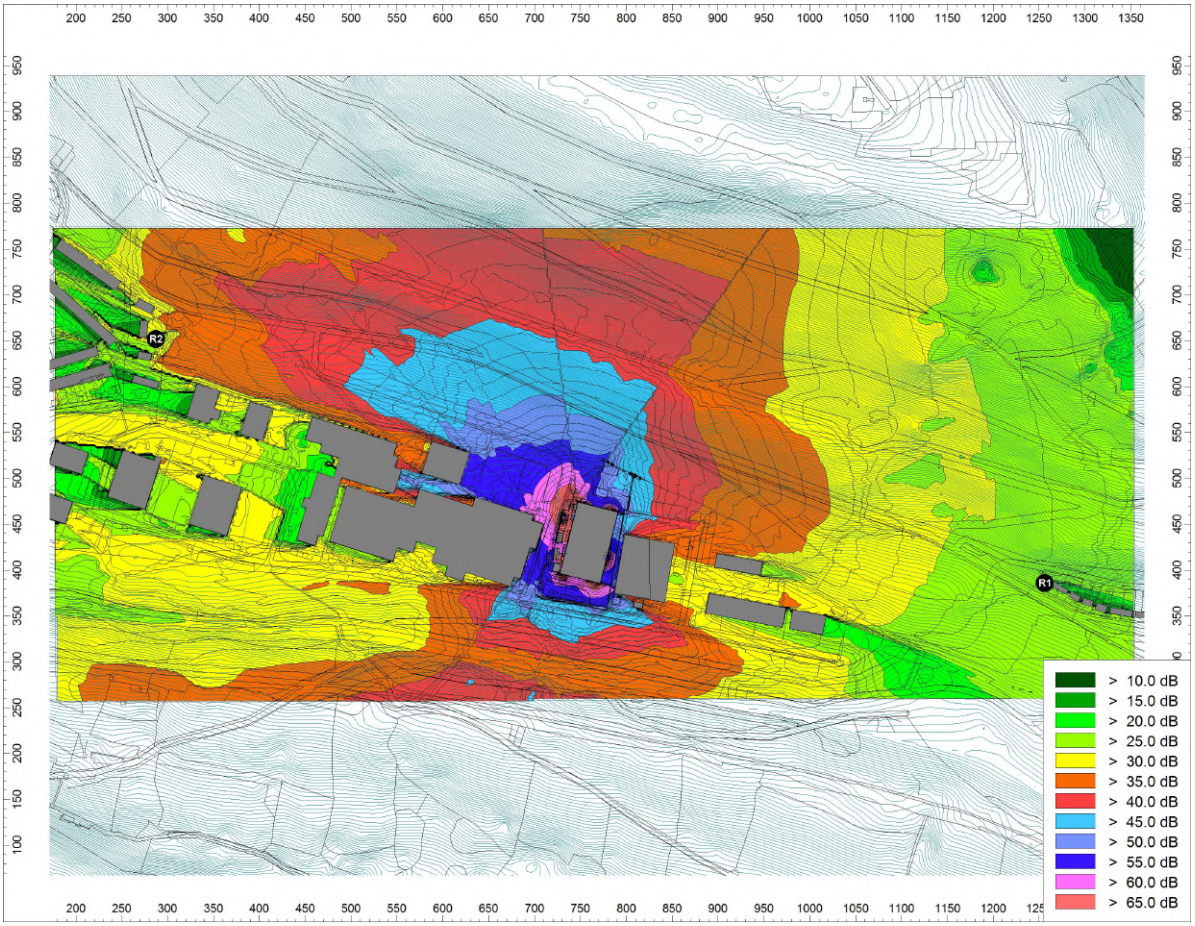


FIGURE 6: SPECIFIC SOUND LEVEL MAP – NIGHT-TIME



5.1.8. Specific Sound Level Summary

A summary of the predicted specific sound levels at the closest NSRs, based on the sound map shown in Figure 5 and Figure 6 can be seen in Table 6.

TABLE 6: PREDICTED SPECIFIC SOUND LEVEL SUMMARY

NSR	Specific Sound Level (dB)	
	Day	Night
1	30.5	27.9
2	30.7	30.2

5.2. Assessment

5.2.1. Rating Penalty Principle

Section 9 of BS4142:2014+A1:2019 describes how the rating sound level should be derived from the specific sound level, by determining a rating penalty. BS4142:2014+A1:2019 states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

a) subjective method;
b) objective method for tonality;
c) reference method."

Given that the Proposed Development was operational but immeasurable at the receptors, the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014+A1:2019, which states:

"Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed.

Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources."

BS4142:2014+A1:2019 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

Tonality

A rating penalty of +2 dB is applicable for a tone which is *"just perceptible"*, +4 dB where a tone is *"clearly perceptible"*, and +6 dB where a tone is *"highly perceptible"*.

Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is *"just perceptible"*, +6 dB where it is *"clearly perceptible"*, and +9 dB where it is *"highly perceptible"*.

Intermittency

BS4142:2014+A1:2019 states that when the *"specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time … if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied."*

Other Sound Characteristics

BS4142:2014+A1:2019 states that where *"the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied."*

5.2.2. Rating Penalty Assessment

Considering the content of Section 5.2.1, an assessment of the various sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, has been detailed in Table 7 below.

TABLE 7: RATING PENALTY ASSESSMENT

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
Mobile Plant	0 dB	0 dB	0 dB	0 dB	The area is generally industrial/commercial in character, with a heavy influence of road traffic noise sources. During the day, when vehicular movements occur at the site, the activities are entirely inaudible at the receptor locations, hence no feature correction being applied.
Static Operations	0 dB	0 dB	0 dB	0 dB	The predictions include for no duty reductions of the plant at night, so consider a worst case. The measurement data identifies that the static (continuous) operations do not govern the ambient (L_{Aeq}) or background (L_{A90}) sound levels at either receptor, which confirms the on-site observations of inaudibility and that the no duty reduction predictions have over-predicted the specific sound levels, particularly at night. Consequently, no feature corrections are considered necessary.

In summary, no rating penalty has been included in the assessment, due to the inaudibility of the site activities against the residual sound environment.

5.2.3. Uncertainty

BS4142:2014+A1:2019 requires that the level of uncertainty in the measured data and associated calculations is considered in the assessment. The Standard recommends that steps should be taken to reduce the level of uncertainty.

Measurement Uncertainty

BS4142:2014+A1:2019 states that measurement uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

"

...

b) the complexity and level of variability of the residual acoustic environment;

...

d) the location(s) selected for taking the measurements;

...

g) the measurement time intervals;

h) the range of times when the measurements have been taken;

i) the range of suitable weather conditions during which measurements have been taken;

...

k) the level of rounding of each measurement recorded; and

l) the instrumentation used."

Each of the measurement uncertainty factors outlined above have been considered and discussed in Table 8.

TABLE 8: MEASUREMENT UNCERTAINTY FACTORS

Measurement Uncertainty Factor Reference	Discussion
b)	Residual acoustic environment is relatively constant, hence no correction for a complex residual acoustic environment.
d)	Measuring at the closest affected receptors to the site has enabled the determination of robust background sound levels.
g)	Measurement time intervals were set in accordance with BS4142:2014+A1:2019, hence no further correction needs to be made.
h)	Measurements were undertaken during a representative daytime and night-time period.
i)	The weather conditions during the survey were anticyclonic, stable and locally observed to be suitable throughout the survey.
k)	Measured values were rounded to 0.1 dB, therefore rounding would not have had a significant impact on the overall typical background sound levels.
l)	The acoustic measurement equipment accorded with Type 1 specification of British Standard 61672, and were deployed with appropriate wind shields.

Calculation Uncertainty

BS4142:2014+A1:2019 states that calculation uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

"

...

b) uncertainty in the operation or sound emission characteristics of the specific sound source and any assumed sound power levels;

c) uncertainty in the calculation method;
d) simplifying the real situation to "fit" the model (user influence on modelling); and
e) error in the calculation process."

Each of the calculation uncertainty factors outlined above have been considered and discussed in Table 9.

TABLE 9: CALCULATION UNCERTAINTY FACTORS

Calculation Uncertainty Factor Reference	Discussion
b)	Sound source levels are based on robust on-site source measurements of existing activities. The predictions do identify an over-prediction of specific sound, particularly at night, when compared to the measurement results.
c)	Calculations were undertaken in accordance with ISO 9613-2, which is considered a *"validated method"* by BS4142:2014+A1:2019.
d)	The real situation has not been simplified for the purposes of this assessment.
e)	ISO 9613-2 indicates that there is a ±3 dB accuracy to the prediction method, therefore, an uncertainty factor of ±1 dB is considered appropriate and proportional, given the separation distances involved.

The overall uncertainty is considered to be small enough that it would not affect the conclusions of the assessment.

5.2.4. BS4142:2014+A1:2019 Assessment

The rating sound level, as calculated from the predicted specific sound level, has been assessed in accordance with BS4142:2014+A1:2019, at the closest NSRs.

The BS4142:2014+A1:2019 assessment at all NSRs, during the proposed operational period, can be seen in Table 10

TABLE 10: OPERATIONAL NOISE ASSESSMENT

Receptor	Sound Level – dB			
	Specific Sound Level: $L_{Aeq,T}$	Rating Level: L_{ArTr}	Background Sound Level: $L_{A90,T}$	Excess of L_{ArTr} above $L_{A90,T}$
Day				
1	31	31	48	-17
2	31	31	35	-4
Night				
1	28	28	39	-11
2	30	30	28	+2

Table 10 identifies that the predicted operation of the waste recycling facility gives rise to a *"Low Impact"* at the closest noise-sensitive receptors to the site, in the context of BS4142:2014+A1:2019 assessment criteria during the day and night, however, a 2 dB exceedence of the background sound

level has been predicted at NSR 2 at night, which is considered to be an over-prediction, when compared to the on-site observations and measured data.

5.2.5. Comparisons with Enzygo Report Predictions

The following is a comparison of the operational sound levels predicted at the key receptors in this assessment with those presented in the 2015 Enzygo report used at planning and presumably used to advise the permitting process.

TABLE 11: COMPARISON OF OPERATIONAL PREDICTED SOUND LEVELS

Receptor	Sound Level – dB		
	2015 Predicted Sound Level – dB(A)	2023 Predicted Sound Level – dB(A)	Difference 2023 – 2015 (dB)
Day			
1	28	31	**+3**
2	31	31	**0**
Night			
1	25	28	**+3**
2	30	30	**0**

It can be seen that the observation-based predictive exercise has replicated the 2015 results at R2, but has resulted in predicted operational sound levels that are 3 dB higher at R1.

The difference at R1 is inconsequential due to the level of the predicted operational sound level below the background sound level, thus not affecting the conclusions of the assessment, which robustly demonstrate a *Low Impact*.

Considering the above alongside the on-site observations, as discussed within this report, it is considered that the assessment has demonstrated compliance with the intended aims of the stated permitting requirements, which state:

Report to be carried out as per Natural Resource Wales (NRW) requirements: "within 3 months of commencement of normal operations, noise monitoring in accordance with BS4142:2014 shall be carried out to confirm the assumptions from the Noise Impact Assessment submitted as a part of the Application. A report shall be submitted to NRW at the reporting address, for approval, within 6 months of operations commencing".

In summary; while the input parameters may differ from those originally assessed, the assessment outcomes are similar.

6. MITIGATION

6.1. Best Available Technology

The operation of the site is considered to already adopt all reasonable BAT requirements, with the site being very closely and professionally managed, which gives rise to negligible levels of noise impact at off-site receptor locations.

The adopted systems at the site should continue for the life of the site, with regular maintenance undertaken to ensure that noise levels are maintained at the current low level.

7. CONCLUSION

inacoustic has been commissioned to prepare a Noise Assessment for the Waste Processing Operations at Oakleaf Recycling Limited's premises at Unit 23 Nine Mile Point Industrial Estate, Cwmfelinfach, Caerphilly, NP11 7HZ, for submission to Natural Resources Wales (NRW) as part of a Permit Compliance Review.

The purpose of the assessment is to determine whether the noise levels generated by the full operation of the site are within those presented within the noise assessment report, upon which the Environmental Permit was granted i.e. *Noise Impact Assessment – Land at Nine Mile Point Industrial Estate, Caerphilly, NP11 7HZ*, dated September 2015, ref: CRM.083.001.NO.R.001 and prepared by Enzygo.

The specific requirements are set out below:

Report to be carried out as per Natural Resource Wales (NRW) requirements: "within 3 months of commencement of normal operations, noise monitoring in accordance with BS4142:2014 shall be carried out to confirm the assumptions from the Noise Impact Assessment submitted as a part of the Application. A report shall be submitted to NRW at the reporting address, for approval, within 6 months of operations commencing".

The exercise has identified that a Low Impact is being generated in BS4142:2014+A1:2019 terms, meaning that no further mitigation measures are required beyond those already incorporated into the operation of the site. The assessment has also demonstrated that off-site noise effects are within the range set out within the original, prediction-based noise assessment report.

When operated in the manner considered in this report, the Site is considered to be operating in compliance with the requirements of the Noise and Vibration Management: Environmental Permits, demonstrating BAT where possible, as outlined in Section 6.

In light of the above, it is considered that this report provides sufficient information to satisfy the noise-related permitting requirements for the Site.

8. APPENDICES

8.1. Appendix A – Definition of Terms

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log10 (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE 12: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

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

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

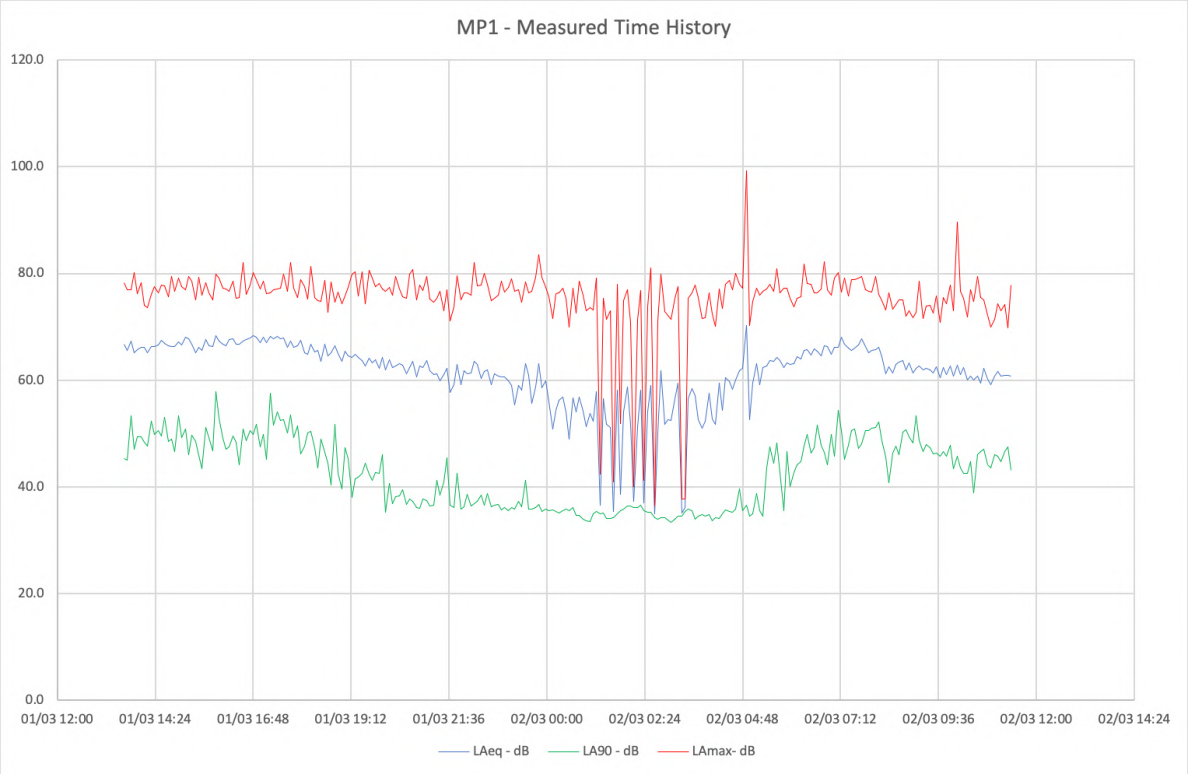
For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10}, the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq}.

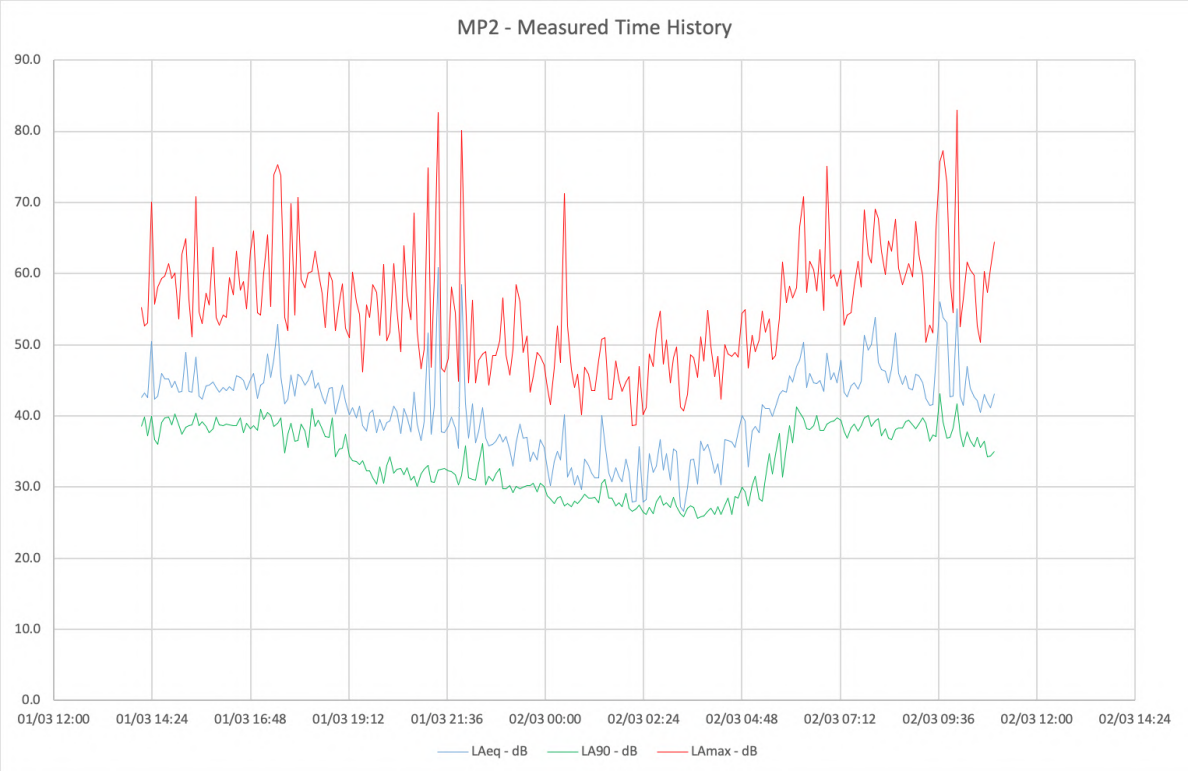
This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

8.2. Appendix B – Full Measurement Results





8.3. Appendix C – Qualifications etc

[redacted]

8.4. Appendix D – Calibration Certificates

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 9 February 2023 CERTIFICATE NUMBER: **1139896**

BS EN ISO 9001:2015 APPROVED BY **LRQA**

CERT No 10045223

11 Frensham Road
Norwich
Norfolk
NR3 2BT

Tel: +44 1603 279557

Approved Signatory

Electronically Authorised Document

[redacted]

Customer	**INACOUSTIC**
Order No	**CAL23-NL31**
Equipment Description	**SOUND LEVEL METER**
Manufacturer	**RION CO LTD**
Model	**NL-31**
Serial No	**00110040**
Ident No	**320/00354**
Date Of Calibration	**9 FEBRUARY 2023**

INSTRUMENT CONDITION

Adjustments Made	**NO**
Repairs Made	**NO**

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22 ºC ± 3 ºC and 45 %RH ± 15 %RH.

PROCEDURE

Measurements were performed in accordance with the in house laboratory procedure 5970
All equipment used has been calibrated/verified against measurement standards or reference equipment traceable to International or National Measurement Standards as specified in our control procedure WI64
The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
The attached results are a true record of the levels required to confirm the instrument meets the original stated manufacturer's specification and accuracy where shown.

MEASUREMENT SYSTEMS

CERTIFICATE OF CONFORMANCE

Date of Issue	**11 March 2022**
Customer	**Inacoustic**
Certificate Number	**CONF032203**

	Manufacturer	Type	Serial Number
Sound Level Meter	Rion	NL-52	00810638
Preamplifier	Rion	NH-25	11181
Microphone	Rion	UC-59	20046

This is to certify that the instrument was tested and calibrated at the Manufacturer's factory according to their specification and that the product satisfied all the relevant requirements of the following Standards:

IEC 61672-1:2013 Class 1.

The instrument also received a functional check by ANV Measurement Systems prior to despatch in the UK, in accordance with our standard procedures.

Signed. [redacted] .. Position. Calibration Technician Date. 11 March 2022

BEAUFORT COURT, 17 ROEBUCK WAY, MILTON KEYNES, MK5 8HL
☎ 01908 642846 🖷 01908 642814
✉ info@noise-and-vibration.co.uk 💻 www.noise-and-vibration.co.uk

CERTIFICATE OF CALIBRATION

ISSUED BY: **CALIBRATION MAINTENANCE & REPAIR LTD**

DATE OF ISSUE: 23 August 2022 CERTIFICATE NUMBER: **1131626**

BS EN ISO 9001:2015 APPROVED BY **LRQA**

CERT No 10045223

11 Frensham Road
Norwich
Norfolk
NR3 2BT

Tel: +44 1603 279557

Approved Signatory

Electronically Authorised Document

[redacted]

Customer	**INACOUSTIC**
Order No	**CAL22-LW-BRIS-82506**
Equipment Description	**ACOUSTIC CALIBRATOR**
Manufacturer	**CIRRUS RESEARCH PLC**
Model	**CR:515**
Serial No	**82506**
Ident No	**NOT KNOWN**
Date Of Calibration	**23 AUGUST 2022**

INSTRUMENT CONDITION

Adjustments Made	**NO**
Repairs Made	**NO**

ENVIRONMENT

The instrument was placed in the laboratory environment for a minimum period of 4 hours and was operated prior to calibration.

Measurements were made in ambient conditions of 22 ºC ± 3 ºC and 45 %RH ± 15 %RH.

PROCEDURE

Measurements were performed in accordance with the in house laboratory procedure 2124
All equipment used has been calibrated/verified against measurement standards or reference equipment traceable to International or National Measurement Standards as specified in our control procedure WI64
The results attached to this certificate refer to measurements made at the time of test and not to the instrument's ability to maintain calibration.
The attached results are a true record of the levels required to confirm the instrument meets the original stated manufacturer's specification and accuracy where shown.

8.5. Appendix E – Off-Site Noise Measurement Position Photographs

FIGURE 7: MEASUREMENT POSITION 1

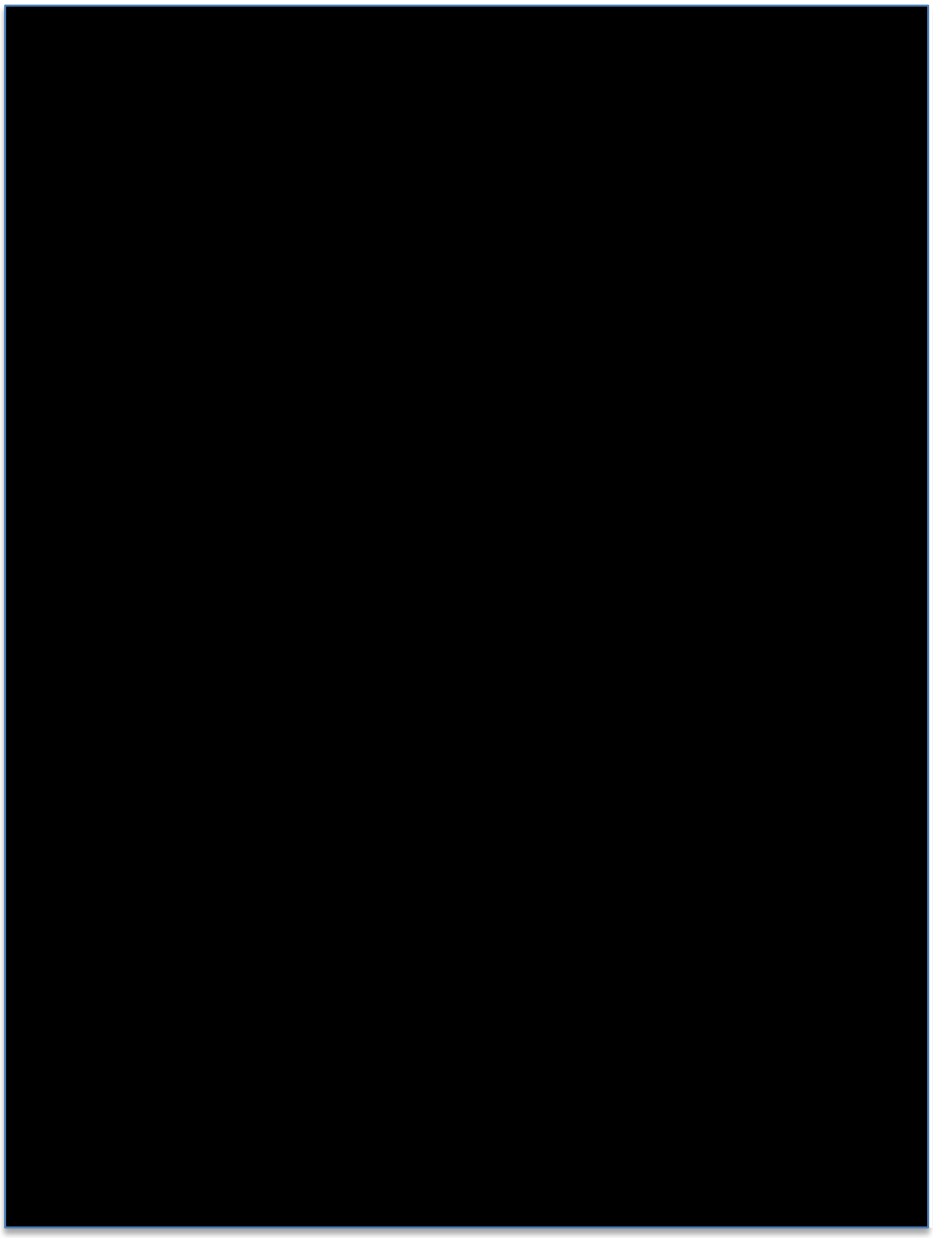
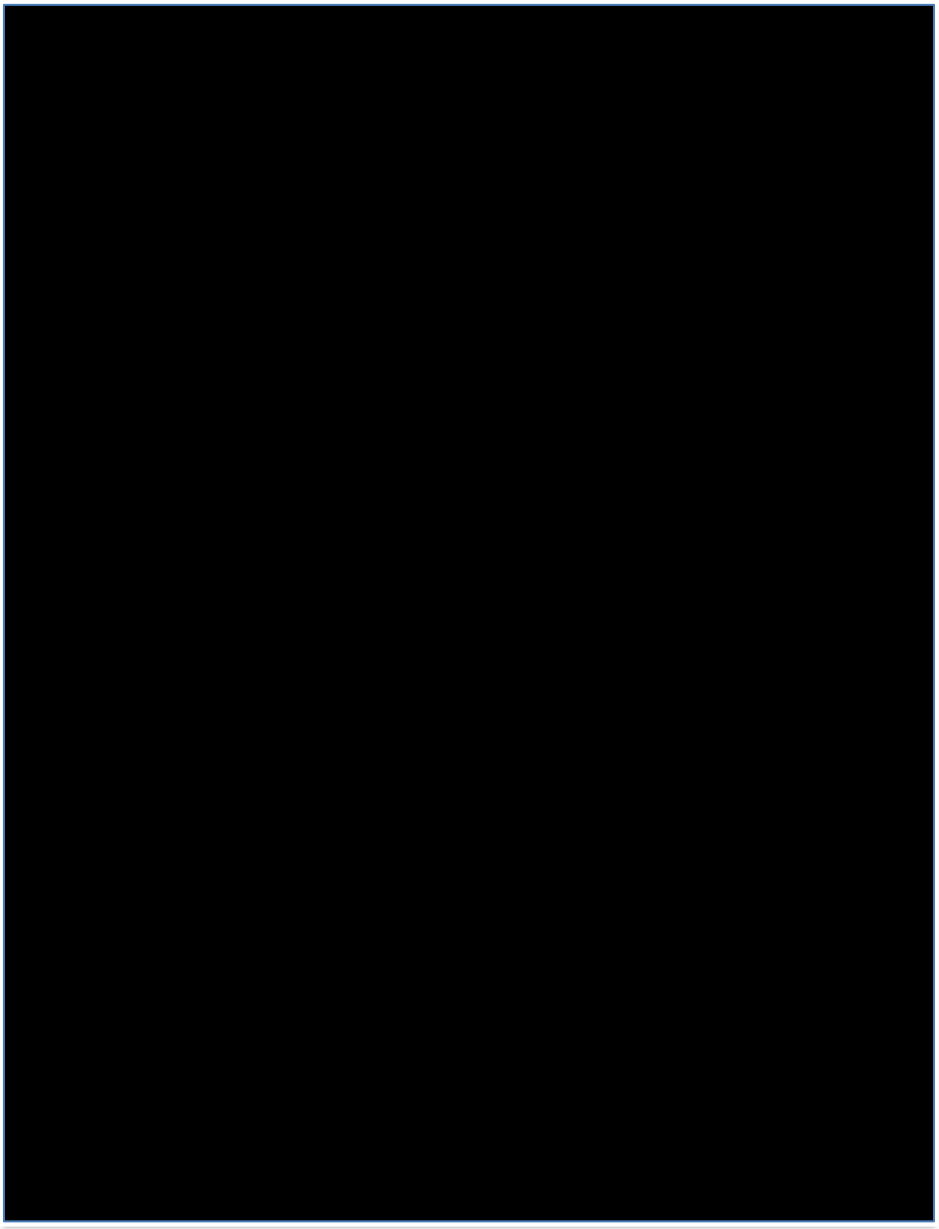


FIGURE 8: MEASUREMENT POSITION 2



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