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INTRODUCTION

9.1 This chapter of the Environment Impact Statement (EIS) addresses potential noise impacts arising from the proposed development and operation of an inert waste recovery facility to restore an existing quarry void at Calary Quarry, Killough Upper, Kilmacanogue, Co. Wicklow by backfilling it to former ground level using imported soil and stone and re-establishing a heathland / grassland habitat similar to that which existed prior to quarrying.

9.2 SLR Consulting Ireland has been appointed to undertake baseline monitoring at the former quarry / application site and to prepare a noise impact assessment report to be included as part of the Environmental Impact Statement (EIS) to accompany a planning application by Roadstone Limited for the proposed waste recovery activities at Calary Quarry.

9.3 The proposed development, which comprises backfilling / infilling of the existing quarry void using imported inert soil and stone (and minor quantities of virgin aggregate) is technically classified by waste management legislation as 'recovery through deposition on land'. It is expected that soil and stone imported to this facility will largely be generated by construction and development activity within Counties Wicklow, South Dublin and Dun Laoghaire-Rathdown.

9.4 A detailed description of the proposed development, site based plant and waste recovery activities is presented in Chapter 2 of the EIS, accompanied by site layout plans and infrastructure drawings.

9.5 The noise impact assessment presented herein describes and assesses the existing noise baseline characteristics of the local area. The anticipated effects of the proposed waste recovery facility are then applied to these baseline conditions and the resulting noise impacts assessed. Mitigation measures are identified where necessary to eliminate or minimise these impacts insofar as practical.

9.6 An operational vibration assessment has not been undertaken as previous SLR experience has shown that vibration issues associated with a development of this nature are minimal and therefore do not require detailed assessment.

9.7 In order to assist the understanding of acoustic terminology and the relative change in noise, a glossary of terms and phrases, which specifically relate to this chapter, is provided in Appendix 9A.

Scope of Work

9.8 The following sections of this Chapter describe the potential noise impacts associated with the project. The following issues are addressed separately:

- methodology used to assess potential noise impacts at properties (dwellings and farms) and sensitive ecological receptors from proposed activities;
- baseline conditions pertaining to existing background and ambient noise levels around the project site;
- noise impact evaluation criteria;
- prediction of the noise levels and identification of potential impacts;
- assessment of severity of impacts, with reference to the evaluation criteria;
- description of mitigation measures that will be incorporated into the design and operation of the scheme to eliminate or minimise the potential for noise impact; and
- a summary of any residual impacts

LEGISLATIVE FRAMEWORK / PLANNING POLICY

National / Regional Legislation or Guidance

9.9 Currently, there is no national or regional legislation which specifically addresses the backfilling / infilling of existing quarry voids using imported inert soil and stone. However, there are a number of guidance documents that are relevant in the context of noise action planning.

Planning Guidelines

9.10 The National Spatial Strategy (NSS) is a 20-year planning framework designed to deliver a more balanced social, economic, physical development and population growth between the counties and regions. It sets out a vision and strategic framework for achieving sustainable and balanced development in Ireland.

9.11 The Wicklow County Development Plan 2010-2016 sets out the planned direction for growth and future development in the county. In this document, the flowing noise pollution objectives are identified:

- *NP1 : To enforce, where applicable, the provisions of the Environmental Protection Agency (EPA) Acts 1992 and 2003 and EPA Noise Regulations 1994 (now 2006);*
- *NP2 : To regulate and control activities likely to give rise to excessive noise (other than those activities which are regulation by the EPA);*
- *NP3 : To require proposals for new developments with the potential to create excessive noise to prepare a construction and/or operation management plans to control such emissions; and*
- *NP4 : To require activities likely to give rise to excessive noise to install noise mitigation measures.*

These are restated as objectives WE12 to WE15 in Section 9.3 of the Draft Wicklow County Development Plan 2016 to 2022, published in November 2015.

Guidance Note for Noise : Licence Applications, Surveys, and Assessments in Relation to Scheduled Activities (NG4)'.

9.12 The Environmental Protection Agency's (EPA) 2012 '*Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4*)' sets out scope, content, and methodology for scheduled / licensed industrial and waste activities in Ireland.

9.13 In accordance with the NG4 guidance, it is necessary to designate the noise environment at each sensitive receptor location as a '*Quiet Area'*, a '*Low Background Noise Area'* or '*Not an Area of Low Background Noise'*.

To be categorised as a '*Quiet Area'* the following criteria must be met:

- at least 3km from urban areas with a population > 1,000 people;
- at least 10km from any urban areas with a population >5,000 people;
- at least 15km from any urban areas with a population >10,000 people;
- at least 3km from any local industry;
- at least 10km from any major industry centre;
- at least 5km from any National Primary Route; and
- at least 7.5km from any motorway or dual carriageway.

9.14 If any of the above criteria are not met, then it is necessary to undertake a baseline noise survey of the existing daytime, evening, and night-time noise environments in order to establish whether the receptor is located in a '*Low Background Noise Area'* or '*Not an Area of Low Background Noise'*.

9.15 The noise criteria for these designations are shown in Table 9-1 below. For an area to be designated as an area of low background noise ($L_{AF\ 90}$), the daytime, evening, and night-time noise limits must all be met.

Table 9-1
Noise Criteria for Area Designation

Designation	Day $L_{AF\ 90}$ dB	Evening $L_{AF\ 90}$ dB	Night $L_{AF\ 90}$ dB
Low Background Noise Area	≤40	≤35	≤30
Not an Area of Low Background Noise	≥41	≥35	≥31

9.16 The procedure outlined in the NG4 Guidance document then sets out a methodology to determine an acceptable noise limit at a receptor location. This noise limit is termed the noise rating level (or $L_{Ar,T}$) and includes, if necessary, a plus 5dB tonal penalty, or a plus 5dB impulsive penalty. If a noise source is both tonal and impulsive however, only one adjustment should be made.

9.17 In order to determine whether or not a 5dB tonal penalty should be applied, it is necessary to obtain third octave frequency data of the noise source in question. The NG4 guidance states that

'... the time average sound pressure level in the one-third-octave band of interest should exceed the time-average sound pressure levels of both adjacent one-third-octave bands by some constant level difference'. 'The appropriate level differences vary with frequency. They should be greater than or equal to the following values in both adjacent one-third-octave bands:

- *15dB in low-frequency one-third-octave bands (25Hz to 125Hz);*
- *8dB in middle-frequency bands (160Hz to 400Hz); and*
- *5dB in high-frequency bands (500Hz to 10,000Hz).'*

9.18 In order to determine whether or not a 5dB impulsive penalty should be applied to a noise source, it is necessary to establish whether or not the noise in question may be '*described as something with a thumping, banging or impact noise that is clearly audible above everything else*.'

9.19 The permitted rating noise level in each designated area is shown in Table 9-2.

Table 9-2
Permitted Rating Noise Levels

Designation	Daytime Noise Criterion, dB $L_{Ar,T}$	Evening Noise Criterion, dB $L_{Ar,T}$	Night-Time Noise Criterion, dB $L_{Ar,T}$
Quiet Area	Noise from the licensed site to be at least 10dB below the average daytime background noise level measured during the baseline noise survey	Noise from the licensed site to be at least 10dB below the average evening background noise level measured during the baseline noise survey	Noise from the licensed site to be at least 10dB below the average night-time background noise level measured during the baseline noise survey
Areas of Low Background Noise	45.0	40.0	35.0
All Other Areas	55.0	50.0	45.0

British Standard 5228: 2009+A1:2014

9.20 British Standard 5228-1:2009+A:2014 *Noise and vibration control on construction and open sites, Part 1: Noise* (BS5228) sets out a methodology for predicting noise levels arising from a wide variety of construction and related activities. It can be used to predict noise levels arising from the operations of proposed minerals extraction sites. BS5228 also sets out tables of sound power levels generated by a wide variety of mobile equipment.

9.21 Noise levels generated by site operations and experienced at local receptors will depend upon a number of variables, the most significant of which are:

- the amount of noise generated by plant and equipment being used at the development site, generally expressed as a sound power level;
- the periods of operation of the plant at the development site, known as the "on-time";
- the distance between the noise source and the receptor, known as the "stand-off";
- the attenuation due to ground absorption or barrier screening effects; and
- any reflections of noise due to the presence of hard vertical faces such as walls.

Guidelines for Noise Impact Assessment (IEMA)

9.22 The *Guidelines for Noise Impact Assessment* produced by the Institute of Environmental Management and Assessment (IEMA) are generally recognised as established good practice standards for scope, content, and methodology of noise impact assessment.

9.23 These guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. These guidelines state that for any assessment, the noise level threshold and significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise. An example impact scale offered by the IEMA guidelines is shown in Table 9-3.

Table 9-3
Example Impact Scale from the Change in Sound Levels (IEMA)

Long-Term Impact Classification	Short-Term Impact Classification	Sound Level Change dB L_{pAeqT} (+ive or -ive) T = either 16hr day or 8hr night
Negligible	Negligible	≥ 0 dB and < 1 dB
	Minor	≥1 dB and < 3 dB
Minor	Moderate	≥3.0 dB and < 5 dB
Moderate	Major	≥5.0 dB and < 10 dB
Major		≥10.0

9.24 The criteria above reflect the key benchmarks that relate to human perception of sound. A change of 3dB is generally considered to be the smallest change in environmental noise that is perceptible to the human ear under most normal conditions. A 10dB change in noise represents a doubling or halving of the noise level. The difference between the minimum perceptible change and the doubling or halving of the noise level is split to provide greater definition to the assessment of changes in noise level.

9.25 To determine the overall noise impact, the magnitude and sensitivity Noise Effects Descriptors are presented in Table 9-4.

Table 9-4
Noise Effects Descriptors (IEMA)

Very Substantial	Greater than 10 dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than 5 dB L_{Aeq} change in sound level at a noise-sensitive receptor, or a 5 to 9.9 dB L_{Aeq} change in sound level at a receptor of great sensitivity to noise
Moderate	A 3 to 4.9 dB L_{Aeq} change in a sound level at a sensitive or highly sensitive noise receptor, or a greater than 5 dB L_{Aeq} change in sound level at a receptor of some sensitivity
Slight	A 3 to 2.9 dB L_{Aeq} change in a sound level at a receptor of some sensitivity
None/not significant	Less than 2.9 dB L_{Aeq} change in sound level and/or all receptors of negligible sensitivity to noise or marginal to the zone of the influence of the proposed development

9.26 As recognised in the IEMA guidance, there are however many factors which affect people's perception and responses to noise. Magnitude of the impact and significance of the effects are presented in Table 9-5.

Table 9-5
Relationship between Noise Impact, Effect and Significance (IEMA)

Magnitude (Nature of Impact)		Description of Effect (on a specific sensitive receptor)	Significance
Substantial	Beneficial	Receptor Perception = Marked Change Causes a material change in behaviour and/ or attitude, e.g. individuals begin to engage in activities previously avoided due to preceding environmental noise conditions. Quality of life enhanced due to change in character of the area.	More Likely to be Significant (Greater justification needed- based on impact magnitude and receptor sensitivities- to justify a non-significant effect)
Moderate	Beneficial	Receptor Perception = Noticeable Improvement Improved noise climate resulting in small change in behaviour and/or attitude, e.g. turning down volume of television; speaking more quietly; opening windows. Affects the character of the area such that there is a perceived change in the quality of life.	↕
Slight	Beneficial	Receptor Perception = Just Noticeable Improvement Noise impact can be heard, but does not result in any change in behaviour or attitude. Can slightly affect character of the area but not such that there is a perceived change in quality of life.	(Greater justification needed- based on impact magnitude and receptor sensitivities- to justify a significant effect) Less Likely to be Significant
Negligible		N/A = no discernible effect on receptor	Not Significant
Slight	Adverse	Receptor Perception = Non-intrusive Noise impact can be heard, but does not cause change in behaviour or attitude, e.g. turning up volume of television, speaking more loudly; closing windows. Can slightly affect the character of the area but not such that there is a perceived change in the quality of life.	Less Likely to be Significant Greater justification needed- based on impact magnitude and receptor sensitivities- to justify a significant effect)
Moderate	Adverse	Receptor Perception = Intrusive Noise impact can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows. Potential for non-awaking sleep disturbance. Affects the character of area such that there is a perceived change in the quality of life.	↕
Substantial	Adverse	Receptor perception = Disruptive Causes material change in behaviour and /or attitude, e.g. avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in getting to sleep, premature awakening, and difficulty in getting back to sleep. Quality of life diminished due to change in character of area.	Greater justification needed- based on impact magnitude and receptor sensitivities- to justify a non-significant effect) More Likely to be Significant
Severe	Adverse	Receptor Perception = Physically Harmful Significant Changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or psychological effects, e.g. regular sleep deprivation / awakening ; loss of appetite, significant , medically definable harm, e.g. auditory and non-auditory.	Significant

AQTAG09 - Guidance on Effects of Industrial Noise on Wildlife

9.27 AQTAG09 (Air Quality Technical Advisory Group 09) guidance provides guidance to assist planning officers involved with Pollution Prevention and Control applications for installations with relevant noise emissions and relate these to the requirements of the Habitats Regulations.

9.28 The Habitats Directive (92/43/EEC) specifies that, where specific noise from industry, measured at the habitat/nest site is below the levels in Table 9-6, it is considered unlikely that it will have an adverse impact on designated species. Where noise levels are exceeded further, more detailed assessment will be required.

Table 9-6
Specific Noise Levels at Habitat / Nest Site

Parameter	Noise Level, dB
$L_{Amax,F}$	80
$L_{Aeq,1hr}$	55

RECIEVING ENVIRONMENT

Baseline Noise Measurements Methodology

9.29 Environmental noise surveys were carried out to capture typical background noise levels at the noise-sensitive receptors closest to the application site. The methodology of the surveys and the results are set out below. The weather conditions during the survey periods were acceptable for noise monitoring, being generally dry with little or no wind.

9.30 The measurements were carried out using a Larson Davis 831 Type 1 sound level meter (serial number A0527). The sound level meter was calibrated before the measurements, and its calibration checked after, using a Larson Davis Cal200 field calibrator (serial number 6970). No calibration drifts were found to have occurred during surveys. All noise equipment had been calibrated to a traceable standard by UKAS (United Kingdom Accreditation Service) accredited laboratories within 12 months preceding the surveys.

9.31 At the measurement positions, the following noise level indices were recorded:

- $L_{Aeq,T}$ is the A-weighted equivalent continuous noise level over the measurement period, and effectively represents an “average” value.
- $L_{A90,T}$ is the A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe the background noise.
- $L_{A10,T}$ is the A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe traffic noise.
- 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 L_{eq} noise level, but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

9.32 Environmental noise surveys were undertaken by SLR Consulting Ireland staff at the nearest noise sensitive receptors to the application site on 16 March 2015. Noise measurements were undertaken over four, non-consecutive, 15-minute periods during the daytime (07:00 to 19:00). The monitoring periods chosen are considered to give representative daytime noise levels at each noise sensitive location.

9.33 During the surveys, the sound level meter was located in free-field conditions (i.e. at least 3.5m from the nearest vertical reflecting surface, with the microphone approximately 1.5m above ground level).

9.34 All noise levels are recorded in 'A-weighted' decibels, dB(A). A-weighting is the process by which noise levels are corrected to account for the non-linear frequency response of the human ear. All noise levels are quoted in dB(A) relative to a sound pressure of 20μPa.

Existing Noise Conditions

9.35 The noise monitoring locations used for the purposes of the baseline noise survey on 16 March 2015, shown in Figure 9-1, comprise the following :

- N01 R755 Regional Road to the south of the site;
- N02 Foxborough Lane, to the west of the site;
- N03 Foxborough Lane, to the north-west of the site;

9.36 The noise monitoring locations listed above are considered representative of the nearest noise sensitive locations (receptors) to the application site, as described below[1] :

- Location N01 is considered representative of residential properties located to the south of the application site. During the survey, the noise meter was located approximately 2m from the road.
- Location N02 is considered representative of the residential properties located to the west of the application site. During the survey, the noise meter was approximately 2m from the lane.
- Location N03 is considered representative of the residential properties located to the north-west of the application site. During the survey, the noise meter was approximately 1.5m from the nearest road.

9.37 Noise monitoring results for the baseline survey on 16 March 2015 are provided in Table 9-7; logarithmic average L_{Aeq} values are provided in Table 9-8:

[1] Please note that noise levels were not taken at the exact locations of the noise sensitive properties as access could not be gained to privately owned land.

Table 9-7
Summary of Measured Noise Levels, Free Field dB

Location	Receptors	Period	$L_{Aeq,T}$	L_{A90}	L_{A10}	$L_{Amax,F}$
N01	R1,R2,R3, R4,R15, R16,R17, R18,R19	Daytime	62	31	65	84
			64	36	68	80
			63	32	67	82
			64	35	70	79
N02	R6, R7,R8,R9, R10,R11, R12	Daytime	48	33	49	70
			48	33	48	82
			45	33	46	73
			45	34	46	74
N03	R13,R14	Daytime	54	33	59	78
			53	36	56	83
			54	37	57	82
			55	39	57	84

Table 9-8
Summary of Measured Noise Levels, Free Field dB (Average Values)

Location	Receptors	Period	$L_{AeqAVGE}$
N01	R1,R2,R3,R4,R15, R16,R17,R18,R19	Daytime	63.3
N02	R6,R5,R7,R8,R9, R10,R11,R12	Daytime	46.7
N03	R13,R14	Daytime	54.0

9.38 Measured baseline noise levels at monitoring point N1 were mainly dominated by road traffic noise on the adjoining R755 Regional Road.

9.39 Measured baseline noise levels at N2 were mainly dominated by natural noises, including dog barking, but road traffic noise along the R755 Regional Road was also audible at this location.

9.40 Measured baseline noise levels at N3 were mainly dominated by natural noises, but road traffic noise along the R755 Regional Road was also audible at this location.

9.41 On the basis of the data presented in Table 9-7 and Table 9-8 above, it is concluded that all the locations may be designated as '*areas of low background noise*' in accordance with standards set out in the EPA's NG4 Guidance.

IMPACT ASSESSMENT

'Do Nothing'

9.42 At present the noise environment within the study area is dominated by road traffic noise emanating from the R755 Regional Road and other local roads. Locally, natural sounds such as farmyard animals and dogs barking are also audible.

9.43 Over time, it is anticipated that the volume of road traffic in the area will increase, which may lead to an increase in noise levels.

Operational Impacts

9.44 To determine the noise impact at the site, SLR Consulting Ireland carried out a noise prediction assessment, whereby the levels of noise were calculated at the nearest noise sensitive receptors (residences) shown on Figure 9-1. The operational $L_{Ar,\ 1hr}$ noise predictions at each receptor location are based on the prediction protocol for fixed plant contained within ISO 9613-2 *'Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation'*.

9.45 The noise assessment methodology used was based on BS5228: Part 1 (2009)+ A1:2014 "*Code of Practice for Noise and Vibration Control on Construction and Open Sites*"

9.46 On the basis of the available noise monitoring data, the area around the selected noise monitoring locations satisfies criteria for an area of low background noise levels and has a recommended daytime noise limit of $45L_{Aeq,\ T}$ dB(A).

9.47 For the purposes of this impact assessment, a reduction of -20 dB(A) has been adopted for full noise screening by existing perimeter berms around the former quarry. This reduction is based on field records and SLR experience of noise monitoring at extractive facilities across Ireland over the past 15 years. In all likelihood, the actual reduction will be greater for much of the life of the recovery facility as most activity will be undertaken below surrounding ground level and further noise attenuation will be provided by the high quarry faces.

9.48 For the purposes of this assessment, it is assumed that all of the noise sources are active for 100% of the time, at the distances stated during the working hours of the development and the attenuation distance to the selected receptors is calculated from the application site boundary.

9.49 The following noise sources have been considered in the noise assessment for the facility operation:

- Bulldozer
- HGV truck

9.50 For the purposes of the noise assessment, it is assumed that a bulldozer will be used continuously to spread the imported inert natural materials when backfilling and restoring the exiting quarry void as one HGV truck is present on-site at all time and is transporting imported soil / stone onto or around the facility.

9.51 Although SLR's experience at operational facilities is that these items of plant items are unlikely to generate impulsive or tonal noise, a 5dB penalty was nonetheless added to the predicted operational $L_{Ar,\ 1hr}$ noise level for presence of tonal or impulsive elements and the noise level at each receptor.

9.52 On this basis it is considered that the noise assessment presented herein is very conservative and represents a worst case scenario.

9.53 A noise prediction assessment was undertaken to calculate the level of noise arising from the proposed recovery facility at the nearest sensitive receptors, identified as R1 to R19 and shown on Figure 9-1. Detailed noise assessment calculations are provided in Appendix 9-B.

9.54 The operational $L_{Ar,\ 1hr}$ noise prediction for each receptor location is presented in Table 9-9 below. The table also shows the comparison between the predicted operational $L_{Ar,\ 1hr}$ noise level and the noise limit for 'area of low background noise' at each receptor during each time-period.

Table 9-9
Operational Noise Levels

Location	Receptors	Period	Noise Limit $L_{Aeq,\ 1hr}$ dB(A)	Specific* $L_{Aeq,\ 1hr}$ dB(A)	Difference
N01	R1	Daytime	45.0	43	-2
N01	R2	Daytime	45.0	43	-2
N01	R3	Daytime	45.0	42	-3
N01	R4	Daytime	45.0	42	-3
N02	R5	Daytime	45.0	37	-8
N02	R6	Daytime	45.0	43	-2
N02	R7	Daytime	45.0	41	-4
N02	R8	Daytime	45.0	41	-4
N02	R9	Daytime	45.0	40	-5
N02	R10	Daytime	45.0	39	-6
N02	R11	Daytime	45.0	38	-7
N02	R12	Daytime	45.0	37	-8
N03	R13	Daytime	45.0	34	-11
N03	R14	Daytime	45.0	34	-11
N01	R15	Daytime	45.0	33	-12
N01	R16	Daytime	45.0	32	-13
N01	R17	Daytime	45.0	32	-13
N01	R18	Daytime	45.0	31	-14
N01	R19	Daytime	45.0	30	-15

*Specific Noise Level = Predicted Noise Level with a 5 dB penalty

9.55 It can be seen from the above figures that the NG4 noise criterion limits for daytime are met at all the noise sensitive locations.

9.56 With regards to the potential impact of the proposed development the predicted specific $L_{Aeq, 1hr}$ dB(A) noise levels have been logarithmically added to the existing ambient noise levels. The cumulative levels have been compared to the existing ambient noise levels at each of the noise sensitive locations for each time-period. The cumulative assessment is shown in Table 9-10 below.

Table 9-10
Cumulative Operational Noise Levels

Location	Receptors	Period	Existing Baseline $L_{Aeq, 1hr}$ dB(A)	Specific $L_{Ar, 1hr}$ dB(A)*	Cumulative $L_{Aeq, 1hr}$ dB(A)*	Difference
N01	R1	Daytime	63.3	43	63.3	0
N01	R2	Daytime	63.3	43	63.3	0
N01	R3	Daytime	63.3	42	63.3	0
N01	R4	Daytime	63.3	42	63.3	0
N02	R5	Daytime	46.7	37	47.7	+1
N02	R6	Daytime	46.7	43	48.7	+2
N02	R7	Daytime	46.7	41	47.7	+1
N02	R8	Daytime	46.7	41	47.7	+1
N02	R9	Daytime	46.7	40	47.7	+1
N02	R10	Daytime	46.7	39	47.7	+1
N02	R11	Daytime	46.7	38	47.7	+1
N02	R12	Daytime	46.7	37	47.7	+1
N03	R13	Daytime	54.0	34	54.0	0
N03	R14	Daytime	54.0	34	54.0	0
N01	R15	Daytime	63.3	33	63.3	0
N01	R16	Daytime	63.3	32	63.3	0
N01	R17	Daytime	63.3	32	63.3	0
N01	R18	Daytime	63.3	31	63.3	0
N01	R19	Daytime	63.3	30	63.3	0

*Specific Noise Level = Predicted Noise Level with the 5 dB penalty

9.57 With reference to the *Guidelines for Noise Impact Assessment* produced by the Institute of Environmental Management and Assessment (IEMA) the cumulative noise impact from plant associated with the development at receptors R1 to R19 is Negligible.

9.58 In view of the above findings, it is considered that mitigation measures to reduce the noise impacts of plant associated with the planned recovery facility are not strictly necessary.

Impact on Proposed Natural Heritage Area (pNHA)

9.59 Ecological receptors of concern are those areas designated under EU Habitats Directive (92/43/EEC). There is one ecological receptor of concern located east of the site R20, the proposed Natural Heritage Area. The noise criterion recommended by AQTAG09 has been adopted for the assessment and used to define two noise impact categories:

- 'negligible impact' is implied when average noise emission levels are below L_{Aeq} 55dB and maximum noise emission levels are below L_{Amax} 80dB.
- 'possible adverse impact' is implied when average noise emission levels are above L_{Aeq} 55dB or maximum noise emission levels are above L_{Amax} 80dB.

9.60 There is insufficient research available to reliably enable more detailed categorisation of noise impacts for ecological receptors.

9.61 An assessment has been carried out to determine whether the noise generated by operations would have an impact on the adjacent, proposed Natural Heritage Area receptor R20.

9.62 Table 9-11 below shows the predicted daytime noise levels produced by operations at the boundary of the pNHA compared to the guidance noise levels contained in AQTAG09.

Table 9-11
AQTAG09 Noise Assessment

Location	Period	Predicted Noise Level $L_{Aeq,1hr}$	AQTAG09 Noise Limit	Difference
R20	Daytime	48	55.0	-7

9.63 It can be seen from Table 9-11 that predicted noise levels during the site activities do not exceed the AQTAG09 noise guidance limits and there will be a negligible noise impact on the pNHA.

MITIGATION MEASURES

9.64 The three established strategies for impact mitigation are avoidance, reduction and remedy. Where it is not possible or practical to mitigate all impacts, then the residual impacts should be clearly described in accordance with the system for impact description set out in the EPA Guidelines.

9.65 The adoption of Best Practicable Means is usually the most effective means of controlling noise. In addition, in line with best practice implemented at other Roadstone facilities, the following measures should be implemented wherever practicable to further mitigate the potential noise impact of on-site activities:

Screening

- existing screening berms and screen planting around the planned facility should be retained to act as acoustic barriers. Berms should be inspected on a regular basis and maintained as necessary.

Plant

- all mobile plant used at the development should have noise emission levels that comply with the limiting levels defined in EC Directive 86/662/EEC and any subsequent amendments;

- all plant items should be properly maintained and operated according the manufacturers' recommendations, in such a manner as to avoid causing excessive noise (*i.e.* all moving parts are kept well lubricated, all cutting edges are kept sharpened, the integrity of silencers and acoustic hoods are maintained);
- all plant should be is subject to regular maintenance, *i.e.* all moving parts are kept well lubricated, all cutting edges are kept sharpened, the integrity of silencers and acoustic hoods are maintained;
- all plant should be fitted with effective exhaust silencers which are maintained in good working order to meet manufacturers' noise rating levels. Any defective silencers should be replaced immediately.

Traffic

- any deliveries should be programmed to arrive during daytime hours only. Care should be taken when unloading vehicles to minimise disturbance to local residents.
- access / internal haul roads should be kept clean and maintained in a good state of repair, *i.e.* any potholes are filled and large bumps removed, to avoid unwanted rattle and "body-slap" from heavy goods vehicles;
- delivery vehicles waiting within the facility should be prohibited from leaving their engines running and there should be no unnecessary revving of engines.

9.66 Experience from other sites has shown that by implementing these measures, typical noise levels from construction works can be reduced by 5 dB(A) or more.

9.67 An assessment of operational noise from plant associated with the development has shown that the adopted criterion is unlikely to be exceeded at nearby noise-sensitive receptors.

RESIDUAL IMPACT

9.68 The worst-case noise assessment has shown that in accordance with the scale in the *Guidelines for Noise Impact Assessment* produced by the Institute of Environmental Management and Assessment (IEMA) the cumulative noise impact from plant associated with the development at receptors R1 to R19 is Negligible.

9.69 Table 9-12 summarise the impacts, mitigation measures and residual impact for operational plant noise at each of the noise sensitive receptor considered.

Table 9-12
Operational Noise Summary Table

Receptors	Increase in $L_{Aeq, 1hr}$ dB(A) Noise Level from Operations	Impact	Duration	Mitigation
R1	0	Negligible	Negligible	
R2	0	Negligible	Negligible	
R3	0	Negligible	Negligible	
R4	0	Negligible	Negligible	
R5	+1	Negligible	Negligible	
R6	+2	Negligible	Negligible	
R7	+1	Negligible	Negligible	
R8	+1	Negligible	Negligible	
R9	+1	Negligible	Negligible	
R10	+1	Negligible	Negligible	Not Required
R11	+1	Negligible	Negligible	
R12	+1	Negligible	Negligible	
R13	0	Negligible	Negligible	
R14	0	Negligible	Negligible	
R15	0	Negligible	Negligible	
R16	0	Negligible	Negligible	
R17	0	Negligible	Negligible	
R18	0	Negligible	Negligible	
R19	0	Negligible	Negligible	

INTERACTION WITH OTHER IMPACTS

9.70 The potential impact of noise generated by the project on sensitive receptors including sensitive ecological receptors and people living in the area has been assessed in this chapter. The impact of the project on these receptors has also been addressed in Chapter 3 'Human Beings' and Chapter 4 'Ecology.

CUMULATIVE IMPACTS

9.71 There are no cumulative noise impacts arising from the proposed recovery facility.

MONITORING

9.72 Noise monitoring will be undertaken at the application site. Noise monitoring locations shall be reviewed and revised where and as/when necessary. The results of the noise monitoring shall be submitted to the EPA and Wicklow County Council on a regular basis for review and record purposes.

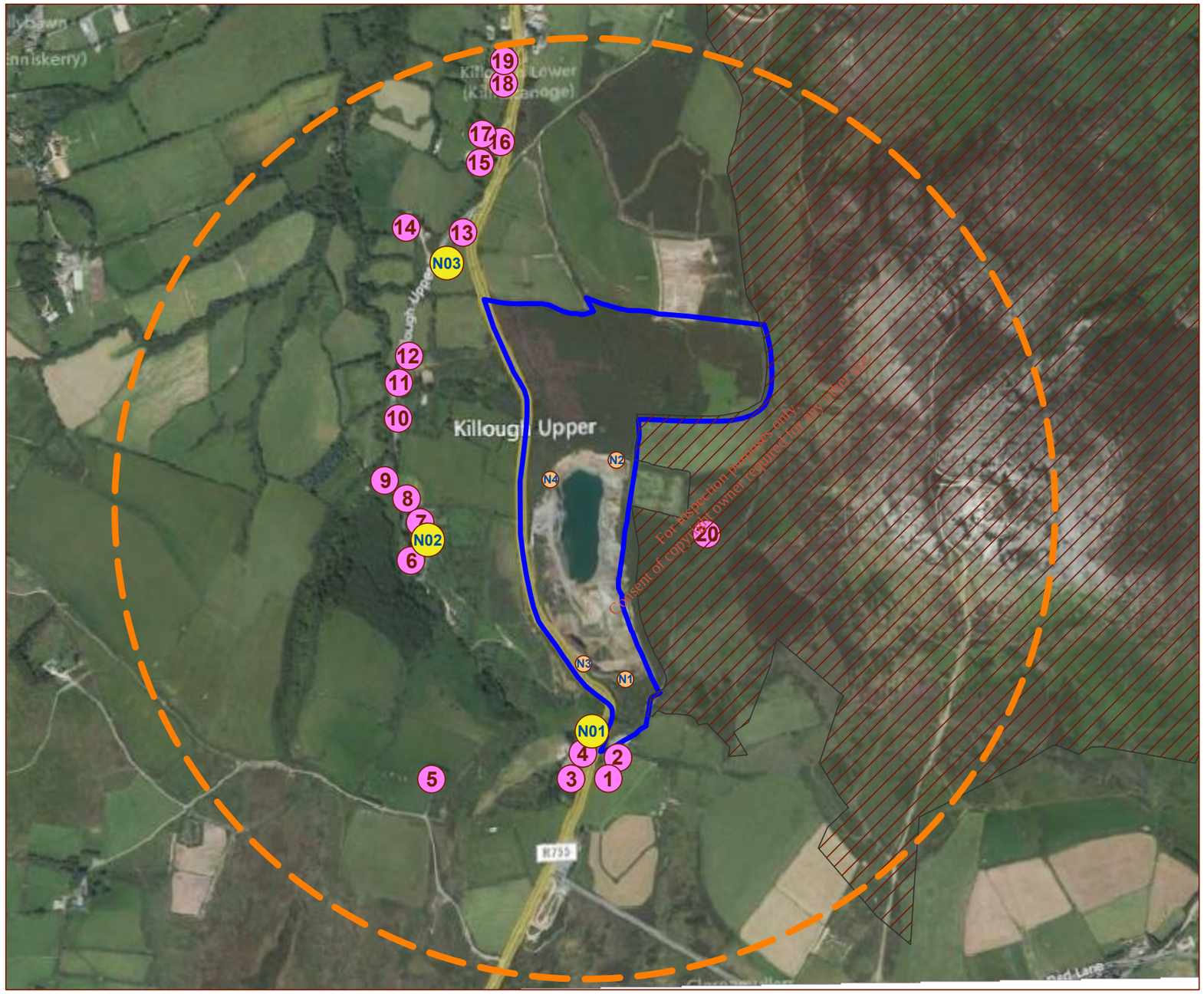
FIGURES

Figure 9-1
Noise Assessment

N

W E

S



0 100 200 300 400m 600 800 1000

Metres 1:10,000

NOTES

1. ORDNANCE SURVEY IRELAND LICENCE NO. **SU 0000716 (C)** ORDNANCE SURVEY IRELAND & GOVERNMENT OF IRELAND

2. AERIAL IMAGE EXTRACT FROM www.bing.com

LEGEND

- ROADSTONE LIMITED LAND INTEREST (c.25.45 Hectares)
- N01 - N03 NOISE MONITORING LOCATIONS (BASELINE SURVEY)
- PROPOSED OPERATIONAL MONITORING LOCATIONS
- NOISE RECEPTOR LOCATIONS
- 1KM RADIUS FROM SITE
- NPWS pNHA - GREAT SUGAR LOAF (001769)

SLR CONSULTING IRELAND
7 DUNDRUM BUSINESS PARK
WINDY ARBOUR
DUBLIN 14
T: +353-1-2964667
F: +353-1-2964676
www.slrconsulting.com

ROADSTONE LIMITED

ENVIRONMENTAL IMPACT STATEMENT

INERT SOIL WASTE RECOVERY FACILITY

CALARY QUARRY,
KILMACANOGE, CO. WICKLOW

NOISE MONITORING / RECEPTOR LOCATIONS

FIGURE 9-1

Scale	Date
1:10,000 @ A3	MAY 2016

00180.00109.0.FIG_9.1.Noise Monitoring_Recptor Locations.dwg

APPENDIX 9-A
GLOSSARY OF TERMINOLOGY

Appendix 9-A
Glossary of Terminology

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 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table 9.A
Noise Levels Commonly 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 one metre away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

Acoustic Terminology

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 ($2x10^{-5}$ Pa).

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} — L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

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 L_n 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.

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 L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

APPENDIX 9-B
NOISE ASSESSMENT

Appendix 9-C Noise Assessment
(Refer to Figure 9-1)

Table (i) *Soil placement*

Receptor	Plant type	Average L_{Aeq} at 10m (dB(A))	Screening (dB(A))	Reflection (dB(A))	Tone / Impulse Penalty (dB(A))	Activity Distance (m) Direction from Site Activities	Attenuation with Distance (dB(A))	Activity L_{Aeq} (dB(A))
R1	HGV/Dumper Truck	80	-20	+3	+5	210(S)	26	42
R2	HGV/Dumper Truck	80	-20	+3	+5	195(S)	26	42
R3	HGV/Dumper Truck	80	-20	+3	+5	240(S)	27	41
R4	HGV/Dumper Truck	80	-20	+3	+5	225(S)	27	41
R5	HGV/Dumper Truck	80	-20	+3	+5	400(SW)	32	36
R6	HGV/Dumper Truck	80	-20	+3	+5	195(W)	26	42
R7	HGV/Dumper Truck	80	-20	+3	+5	250(W)	28	40
R8	HGV/Dumper Truck	80	-20	+3	+5	260(W)	28	40
R9	HGV/Dumper Truck	80	-20	+3	+5	270(W)	29	39
R10	HGV/Dumper Truck	80	-20	+3	+5	340(W)	30	38
R11	HGV/Dumper Truck	80	-20	+3	+5	355(NW)	31	37
R12	HGV/Dumper Truck	80	-20	+3	+5	400(NW)	32	36
R13	HGV/Dumper Truck	80	-20	+3	+5	540(NW)	35	33
R14	HGV/Dumper Truck	80	-20	+3	+5	600(N)	35	33
R15	HGV/Dumper Truck	80	-20	+3	+5	670(N)	36	32
R16	HGV/Dumper Truck	80	-20	+3	+5	690(N)	37	31
R17	HGV/Dumper Truck	80	-20	+3	+5	725(N)	37	31
R18	HGV/Dumper Truck	80	-20	+3	+5	800(N)	38	30
R19	HGV/Dumper Truck	80	-20	+3	+5	890(N)	39	29
R20	HGV/Dumper Truck	80	-20	+3	+5	120(E)	21	47

Table (ii) *Soil compaction*

Receptor	Plant type	Average L_{Aeq} at 10m (dB(A))	Screening (dB(A))	Reflection (dB(A))	Tone / Impulse Penalty (dB(A))	Activity Distance (m)/ Direction from Site Activities	Attenuation with Distance (dB(A))	Activity L_{Aeq} (dB(A))
R1	**Bulldozer**	**73**	**-20**	**+3**	**+5**	210(S)	**26**	**35**
R2	**Bulldozer**	**73**	**-20**	**+3**	**+5**	195(S)	**26**	**35**
R3	**Bulldozer**	**73**	**-20**	**+3**	**+5**	240(S)	**27**	**34**
R4	**Bulldozer**	**73**	**-20**	**+3**	**+5**	225(S)	**27**	**34**
R5	**Bulldozer**	**73**	**-20**	**+3**	**+5**	400(SW)	**32**	**29**
R6	**Bulldozer**	**73**	**-20**	**+3**	**+5**	195(W)	**26**	**35**
R7	**Bulldozer**	**73**	**-20**	**+3**	**+5**	250(W)	**28**	**33**
R8	**Bulldozer**	**73**	**-20**	**+3**	**+5**	260(W)	**28**	**33**
R9	**Bulldozer**	**73**	**-20**	**+3**	**+5**	270(W)	**29**	**32**
R10	**Bulldozer**	**73**	**-20**	**+3**	**+5**	340(W)	**30**	**31**
R11	**Bulldozer**	**73**	**-20**	**+3**	**+5**	355(NW)	**31**	**30**
R12	**Bulldozer**	**73**	**-20**	**+3**	**+5**	400(NW)	**32**	**29**
R13	**Bulldozer**	**73**	**-20**	**+3**	**+5**	540(NW)	**35**	**26**
R14	**Bulldozer**	**73**	**-20**	**+3**	**+5**	600(N)	**35**	**26**
R15	**Bulldozer**	**73**	**-20**	**+3**	**+5**	670(N)	**36**	**25**
R16	**Bulldozer**	**73**	**-20**	**+3**	**+5**	690(N)	**37**	**24**
R17	**Bulldozer**	**73**	**-20**	**+3**	**+5**	725(N)	**37**	**24**
R18	**Bulldozer**	**73**	**-20**	**+3**	**+5**	800(N)	**38**	**23**
R19	**Bulldozer**	**73**	**-20**	**+3**	**+5**	890(N)	**39**	**22**
R20	**Bulldozer**	**73**	**-20**	**+3**	**+5**	120(E)*	**21**	**40**

Table (iii) *Combined Noise Levels*

Receptor	Plant type	Activity L_{Aeq} (dB(A))
R1	Combined Noise Level	**43**
R2	Combined Noise Level	**43**
R3	Combined Noise Level	**42**
R4	Combined Noise Level	**42**
R5	Combined Noise Level	**37**
R6	Combined Noise Level	**43**
R7	Combined Noise Level	**41**
R8	Combined Noise Level	**41**
R9	Combined Noise Level	**40**
R10	Combined Noise Level	**39**
R11	Combined Noise Level	**38**
R12	Combined Noise Level	**37**
R13	Combined Noise Level	**34**
R14	Combined Noise Level	**34**
R15	Combined Noise Level	**33**
R16	Combined Noise Level	**32**
R17	Combined Noise Level	**32**
R18	Combined Noise Level	**31**
R19	Combined Noise Level	**30**
R20	Combined Noise Level	**48**