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INTRODUCTION

9.1 This chapter of the Environmental Impact Statement (EIS), prepared by SLR Consulting Ireland, provides supporting information to accompany a Planning Application to Fingal County Council by Roadstone Limited. It primarily addresses potential noise related impacts from the proposed increase in the rate of inert soil and stone waste intake at the existing waste recovery facility at the Huntstown Quarry complex, in Finglas, Dublin 11, from a maximum of 750,000 tonnes per annum at the present time to 1,500,000 tonnes per annum in future years.

9.2 The restoration of the entire quarry complex at Huntstown comprising backfilling of 4 separate quarry voids using imported soil and stone waste has previously been granted planning permission (Ref. FW12-0022 and An Bord Pleanála (ABP) Ref. 241693). An existing EPA waste licence (Ref. W0277-01) only applies in respect of ongoing backfilling and waste recovery activities at the North Quarry. Waste recovery activity at this facility has been ongoing since October 2015.

9.3 The existing West Quarry was previously stripped of overburden soils to a depth of up to 3m in anticipation of its future development as a quarry. Having undertaken a detailed review of structural geology and extractable resources at the West Quarry in recent years however, Roadstone has decided not to proceed with further development of the planned West Quarry and to bring forward the backfilling and restoration of this area (which has been approved previously).

9.4 Over the short-to-medium term future, the proposed intensification of backfilling and waste recovery activities will be confined to the North Quarry and West Quarry at Huntstown. Further information on the site infrastructure, operations, environmental management systems and controls at the established facility is provided in the Chapter 2 of this EIS.

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 existing 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 adverse impacts, insofar as practical.

9.6 An operational vibration assessment has not been undertaken as previous SLR experience and that of the Applicant in operating the recovery facility to date indicates that little or no vibration arises form a development or activity of this nature and, as such, no vibration assessment is required.

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 9-A.

Scope of Work

9.8 The following sections of this Chapter describe the potential noise impacts associated with the proposed increase in waste intake. The following issues are addressed separately:

- methodology used to assess potential noise impacts from activities at properties (dwellings and farms) and sensitive ecological receptors
- 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

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 Fingal County Development Plan adopted in 2011 sets out the planned direction for growth and future development in the county. In this document, the flowing noise pollution objectives are identified:

- *Objective NP01*

Require all developments to be designed and operated in a manner that will minimise and contain noise levels. Where appropriate, the Council will apply conditions on new developments / uses that may restrict noise emissions and hours of operation such that the development does not cause any significant increase in the background noise level of nearby existing noise sensitive property. Noise sensitive developments in noisy areas should incorporate measures to reduce the exposure to acceptable levels.

As required by EU Directive 2002/49/EC Relating to the Assessment and Management of Environmental Noise, the four local authorities, within the agglomeration of Dublin (Dublin City Council, Dun Laoghaire-Rathdown, South Dublin County Council and Fingal) have produced Noise Maps and Action Plans to manage environmental noise.

- *Objective NP02*

Implement and comply with the recommendations of the Action Plan Relating to the Assessment and Management of Environmental Noise, Dublin Agglomeration 2008-2013.

- *Objective NP03*

Ensure planning applications identify and implement noise mitigation measures within the zone of influence of existing national roads where the proximity of the proposed development to the national road would result in the breach of the NRA's design goal for sensitive receptors exposed to road traffic noise.

- *Objective TO68*

Ensure that traffic noise levels are considered as part of all new developments along major roads / rail lines in accordance with best practice guidelines. In particular, ensure the set back of residential development from road / rail lines is such that amenity of residents is not unduly impacted upon by reason of noise, and ensure measures, including dense planting and mounding, are employed, where appropriate, between residential development and road / rail lines.

EPA Noise Guidance for 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 (ie. 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 highly sensitive noise receptor
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 highly sensitive noise receptor
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 4.9 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 their responses to noise. Guidance on assessment of the magnitude of noise impact and the 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		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

Design Manual for Roads and Bridges

9.27 The Design Manual for Roads and Bridges (DMRB) considers the following criterion to determine 'affected roads' which have the potential to impact at surrounding receptors:

- road alignment will change by 5m or more;
- daily traffic flows will change by 1,000 Annual Average Daily Traffic (AADT) or more;
- Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more;
- daily average speed will change by 10km/hour or more; or
- peak hour speed will change by 20km/hour or more.

AQTAG09 - Guidance on Effects of Industrial Noise on Wildlife

9.28 AQTAG09 (Air Quality Technical Advisory Group 09) guidance provides guidance to assist planning and/or licensing officials handling pollution prevention and control applications for industrial installations on relevant noise emissions and relates these to the requirements of the Habitats Regulations.

9.29 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

9.30 Environmental noise surveys were carried out to capture typical background noise levels at the noise-sensitive receptors closest to the existing recovery facility and 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.

9.31 The baseline noise measurements were taken 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.

9.32 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.

9.33 Environmental noise surveys were undertaken by SLR Consulting Ireland staff at the nearest noise sensitive receptors to the application site on 2nd and 3rd June 2016. Noise measurements were undertaken over three, 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.

9.34 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).

9.35 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.

9.36 BHP undertakes noise monitoring across the Huntstown Quarry complex on behalf of Roadstone Ltd. for planning compliance purposes. The most recent rounds of noise monitoring were undertaken by BHP on the 18th June 2015 and 22nd October 2015.

Existing Noise Conditions

9.37 The noise monitoring locations used for the purposes of the baseline noise survey, shown in Figure 9-1, comprise the following :

- N1 to the south east of the site;
- N2 to the south of the site;
- N6 to the east of the site;
- N7 to the east of the site;
- N8 to the north of the site;
- N9 to the north-west of the site;
- N10 to the south of the site.

9.38 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 N1 is considered representative of residential properties located to the east of application site, south of the site entrance.

[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.

- Location N2 is considered representative of the farm south of the application site.
- Location N6 is considered representative of the residential properties located to the east of the application site, north of the site entrance.
- Location N7 is considered representative of the residential properties located directly east of the application site.
- Location N8 is considered representative of the residential properties located to the north of the application site.
- Location N9 is considered representative of the residential properties located to the north west of the application site.
- Location N10 is considered representative of the commercial and residential property located to the south of the application site.

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

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

Location	Receptors	Period	Date	Time	$L_{Aeq,T}$	L_{A90}	L_{A10}
N1	R2, R3	Daytime	18/06/15	12:06-13:06	59	52	61
			22/10/15	12:07-13:07	60	54	62
N2	R1	Daytime	18/06/15	13:18-14:18	58	54	61
			22/10/15	13:13-14:13	62	58	65
N6	R4, R5, R6, R7	Daytime	2/06/16	11:58-12:13	72.9	57.6	76.2
			2/06/16	14:11-14:26	74.4	56.4	78.5
			2/06/16	15:57-16:12	71.1	59.1	75.4
N7	R9, R10, R11	Daytime	2/06/16	12:10-12:31	76.6	62.8	80.0
			2/06/16	14:28-14:43	76.3	59.9	79.0
			3/06/16	10:00-10:15	75.6	58.1	78.4
N8	R21, R22, R23, R24, R25	Daytime	2/06/16	13:10-13:25	70.7	57.2	74.3
			2/06/16	14:47-15:02	70.0	53.5	73.6
			3/06/16	10:19-10:34	68.0	50.9	71.9
N9	R30	Daytime	2/06/16	13:50-14:05	87.0	54.9	91.0
			2/06/16	15:05-15:20	84.8	53.8	89.4
			3/06/16	10:37-10:52	72.0	46.4	76.5
N10	R35, R46	Daytime	2/06/16	12:49 13:04	71.6	57.5	75.0
			2/06/16	15:37-15:52	71.2	57.2	73.5
			3/06/16	11:15-11:30	73.6	54.7	76.9

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

Location	Receptors	Period	$L_{AeqAVGE}$
N1	R2, R3	Daytime	59.5
N2	R1	Daytime	60.0
N6	R4, R5, R6, R7	Daytime	73.0
N7	R9, R10, R11	Daytime	76.1
N8	R21, R22, R23, R24, R25	Daytime	69.7
N9	R30	Daytime	84.3
N10	R35, R46	Daytime	72.2

9.40 The following observations are made in respect of the baseline noise monitoring undertaken around the Huntstown quarry complex and the application site:

- Measured baseline noise levels at monitoring point N1 were mainly dominated by road traffic noise on the adjoining R135 Regional Road, on the nearby N2 dual carriageway and M50 motorway;
- Measured baseline noise levels at N2 were mainly dominated by natural noises, aircraft flying overhead and quarry activities;
- Measured baseline noise levels at N6 were mainly dominated by road traffic noise along the R135 Regional Road, N2 and M50 and aircraft flying overhead;
- Measured baseline noise levels at N7 were mainly dominated by road traffic noise along the R135 Regional Road and N2 and aircraft flying overhead;
- Measured baseline noise levels at N8 were mainly dominated by road traffic noise along the local road network and aircraft flying overhead;
- Measured baseline noise levels at N9 were mainly dominated by road traffic noise along the local road network, dogs barking at the nearby property and aircraft flying overhead;
- Measured baseline noise levels at N10 were mainly dominated by road traffic noise along the local road network, work being undertaken on fencing along the local road and aircraft flying overhead;
- 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 ‘all other areas’ in accordance with standards set out in the EPA’s NG4 Guidance.

IMPACT ASSESSMENT

'Do Nothing'

9.41 At present the noise environment within the study area is dominated by road traffic noise emanating from the R135 Regional Road, N2, M50 and other local roads, industrial activities noise, airplanes. Locally, natural sounds such as farmyard animals or barking dogs are also audible.

9.42 Over time, it is anticipated that the volume of road traffic, industrial activities and airplane traffic in the area will increase as economic activity increases and that this in turn is likely to lead to an increase in ambient and background noise levels.

Operational Impacts

9.43 The noise emission limit for activities at quarries and most industrial facilities in areas which do not have low background noise levels (as at Huntstown) is conventionally taken to be 55LAeq, T dB(A) at site boundaries and/or sensitive noise receptors. At Huntstown however, given its proximity to key national road infrastructure and established industrial zones and its location beneath a flightpath in and out of Dublin Airport, ambient noise levels from road traffic and aircraft flying overhead are considerably in excess of the 55LAeq noise limit and tend to dominate all other noise sources, including those associated with ongoing quarrying and waste recovery activity at within the Huntstown quarry complex.

9.44 To determine the noise impact arising from increased waste intake at the application site, SLR Consulting Ireland carried out a noise prediction assessment, whereby the resultant increases in noise levels were calculated at the nearest noise sensitive receptors (residences) shown on Figure 9-1.

9.45 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'*. 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 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 quarry (as the attenuation path difference arising as a result of the screening barriers is greater than 1.5 m in height). 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.

9.47 For the purposes of this assessment, it is assumed that all of the noise sources are active and arise simultaneously at the distances indicated (to the edge of the quarry infill areas) in Figure 9-1 during the working hours of the development and the attenuation distance to the selected receptors is calculated from the application site boundary.

9.48 The following (additional) noise sources have been considered in the noise assessment for the soils deliveries and placement operation activities:

- 2 No. Bulldozers
- Excavator
- HGV trucks

9.49 The following noise sources have been considered in the noise assessment for the final restoration:

- Bulldozer
- Excavator

9.50 For the purposes of the noise assessment, it is assumed that the (additional) excavator and bulldozer(s) will be used continuously to spread the imported inert natural materials when backfilling and restoring the exiting quarry void as two (additional) HGV trucks are present on-site at all times transporting imported soil / stone onto or around the facility.

9.51 For the purposes of the noise assessment, it is assumed that an excavator and bulldozer will also be used continuously for the final restoration works.

9.52 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.

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

9.54 The noise prediction / assessment was undertaken to calculate the level of noise arising from the increased recovery activity at the nearest sensitive receptors shown on Figure 9-1. Detailed noise assessment calculations are provided in Appendix 9-B.

9.55 The operational $L_{Ar,\ 1hr}$ noise prediction for each receptor location (which includes an allowance for potential impulsive / tonal noise) is presented in Table 9-9 below. Table 9-9 also shows the comparison between the predicted operational $L_{Ar,\ 1hr}$ noise level and the prescribed noise limit (from the EPA's NG4 guidelines) for 'all other areas' at each receptor.

Table 9-9
Operational Noise Levels – Soil Placement

Location	Receptors	Period	Noise Limit $L_{Aeq,\ 1hr}$ dB(A)	Operational* $L_{Aeq,\ 1hr}$ dB(A)	Difference
N2	R1	Daytime	55.0	31	−24
N1	R2	Daytime	55.0	30	−25
N1	R3	Daytime	55.0	30	−25
N6	R4	Daytime	55.0	31	−24
N6	R5	Daytime	55.0	31	−24
N6	R6	Daytime	55.0	31	−24
N6	R7	Daytime	55.0	33	−22
N7	R9	Daytime	55.0	34	−21
N7	R10	Daytime	55.0	34	−21
N7	R11	Daytime	55.0	34	−21
N8	R21	Daytime	55.0	34	−21

Location	Receptors	Period	Noise Limit $L_{Aeq, 1hr}$ dB(A)	Operational* $L_{Aeq, 1hr}$ dB(A)	Difference
N8	R22	Daytime	55.0	35	−20
N8	R23	Daytime	55.0	36	−19
N8	R24	Daytime	55.0	36	−19
N8	R25	Daytime	55.0	39	−16
N9	R30	Daytime	55.0	45	−10
N10	R35	Daytime	55.0	48	−7
N10	R46	Daytime	55.0	35	−20

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

9.56 It can be seen from the above figures that the NG4 noise criterion limits for daytime arising specifically from the increased waste activity are comfortably met at all noise sensitive locations during the active infilling period.

9.57 The predicted rating noise levels ($L_{Ar, 1hr}$) during the final restoration works at each receptor location are presented in Table 9-10 below. The table also shows the comparison between the predicted final restoration $L_{Ar, 1hr}$ noise level and the noise limit (from the EPA's NG4 guidelines) for 'all other areas' at each receptor during each time-period.

Table 9-10
Operational Noise Levels – Final Restoration

Location	Receptors	Period	Noise Limit $L_{Aeq, 1hr}$ dB(A)	Operational $L_{Aeq, 1hr}$ dB(A)*	Difference
N2	R1	Daytime	55.0	27	−28
N1	R2	Daytime	55.0	26	−29
N1	R3	Daytime	55.0	26	−29
N6	R4	Daytime	55.0	27	−28
N6	R5	Daytime	55.0	27	−28
N6	R6	Daytime	55.0	27	−28
N6	R7	Daytime	55.0	29	−26
N7	R9	Daytime	55.0	30	−25
N7	R10	Daytime	55.0	30	−25
N7	R11	Daytime	55.0	30	−25
N8	R21	Daytime	55.0	30	−25
N8	R22	Daytime	55.0	31	−24
N8	R23	Daytime	55.0	32	−23

Location	Receptors	Period	Noise Limit $L_{Aeq, 1hr}$ dB(A)	Operational $L_{Aeq, 1hr}$ dB(A)*	Difference
N8	R24	Daytime	55.0	32	−23
N8	R25	Daytime	55.0	35	−20
N9	R30	Daytime	55.0	41	−14
N10	R35	Daytime	55.0	44	−11
N10	R46	Daytime	55.0	31	−24

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

9.58 It can be seen from the above figures that the NG4 noise criterion limits for daytime arising specifically from the increased waste activity are comfortably met at all noise sensitive locations during the restoration works.

9.59 With regards to the potential impact of the proposed increased waste activity, 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 9-11 and Table 9-12 below.

Table 9-11
Cumulative Operational Noise Levels

Location	Receptors	Period	Existing Baseline $L_{Aeq,T}$ dB(A)	Specific $L_{Ar, 1hr}$ dB(A)*	Cumulative $L_{Aeq, T}$ dB(A)*	Difference
N2	R1	Daytime	60.0	26	60.0	0
N1	R2	Daytime	59.5	25	59.5	0
N1	R3	Daytime	59.5	25	59.5	0
N6	R4	Daytime	73.0	26	73.0	0
N6	R5	Daytime	73.0	26	73.0	0
N6	R6	Daytime	73.0	26	73.0	0
N6	R7	Daytime	73.0	28	73.0	0
N7	R9	Daytime	76.1	29	76.1	0
N7	R10	Daytime	76.1	29	76.1	0
N7	R11	Daytime	76.1	29	76.1	0
N8	R21	Daytime	69.7	29	69.7	0
N8	R22	Daytime	69.7	30	69.7	0
N8	R23	Daytime	69.7	31	69.7	0

Location	Receptors	Period	Existing Baseline $L_{Aeq,T}$ dB(A)	Specific $L_{Ar,\ 1hr}$ dB(A)*	Cumulative $L_{Aeq,\ T}$ dB(A)*	Difference
N8	R24	Daytime	69.7	31	69.7	0
N8	R25	Daytime	69.7	34	69.7	0
N9	R30	Daytime	84.3	40	84.3	0
N10	R35	Daytime	72.2	43	72.2	0
N10	R46	Daytime	72.2	30	72.2	0

*Specific Noise Level = Predicted Noise Level without the 5 dB penalty

Table 9-12
Cumulative Final Restoration Noise Levels

Location	Receptors	Period	Existing Baseline $L_{Aeq,T}$ dB(A)	Specific $L_{Ar,\ 1hr}$ dB(A)*	Cumulative $L_{Aeq,\ T}$ dB(A)*	Difference
N2	R1	Daytime	60.0	22	60.0	0
N1	R2	Daytime	59.5	21	59.5	0
N1	R3	Daytime	59.5	21	59.5	0
N6	R4	Daytime	73.0	22	73.0	0
N6	R5	Daytime	73.0	22	73.0	0
N6	R6	Daytime	73.0	22	73.0	0
N6	R7	Daytime	73.0	24	73.0	0
N7	R9	Daytime	76.1	25	76.1	0
N7	R10	Daytime	76.1	25	76.1	0
N7	R11	Daytime	76.1	25	76.1	0
N8	R21	Daytime	69.7	25	69.7	0
N8	R22	Daytime	69.7	26	69.7	0
N8	R23	Daytime	69.7	27	69.7	0
N8	R24	Daytime	69.7	27	69.7	0
N8	R25	Daytime	69.7	30	69.7	0
N9	R30	Daytime	84.3	36	84.3	0
N10	R35	Daytime	72.2	39	72.2	0
N10	R46	Daytime	72.2	30	72.2	0

Specific Noise Level = Predicted Noise Level without the 5 dB penalty

9.60 With reference to the *Guidelines for Noise Impact Assessment* produced by the Institute of Environmental Management and Assessment (IEMA), the cumulative noise impact from additional plant associated with the development at all receptors is determined to be NEGLIGIBLE.

9.61 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.

Additional Traffic Noise

9.62 The existing development provides for additional waste intake of 750,000 tonne per annum and expedited restoration of the West quarry. An increase in the annual intake rate of 750,000 tonnes / year corresponds to an average increase of 12 trips per hour during a working day (equivalent to 24 additional movements in and out of the Huntstown facility per hour).

9.63 Based on hourly total traffic of 24 HGV vehicles as outlined above, CRTN (Calculation of Road Traffic Noise, 1988) methodology was used to produce $L_{A10\ (1hour)}$ value which was then converted to $L_{Aeq\ (1hour)}$ using methodology from NRA *Guidelines for the treatment of Noise and Vibrations in National Road Schemes* (2004). The noise levels derived from additional traffic for the application site was calculated to be $L_{Aeq(1hr)}$= 51.9 dB(A).

9.64 Given the already elevated ambient noise levels recorded along the existing R135 Regional Road and National Road network, the additional noise and cumulative impact generated by the proposed increase in waste recovery activities will be considerably less than 1 dB(A). As an increase or change in noise level of this order is below that which is perceptible to the human ear, the traffic noise impact arising from the proposed development is determined to be NEGLIGIBLE.

Impact on Designated Sites

9.65 Ecological receptors of concern are those areas designated under EU Habitats Directive (92/43/EEC).

9.66 The application site is not subject to any statutory nature conservation designation and there are no designated sites within 2km of the site.

MITIGATION MEASURES

9.67 Where necessary, 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 must be clearly described in accordance with the system for impact description set out in the EPA Guidelines. The adoption of Best Practicable Means is generally considered to be the most effective means of controlling noise emissions.

9.68 Notwithstanding the findings of the impact assessment presented above, which determined that the proposed increase in waste recovery activities at Huntstown will have negligible noise impact, in line with best practice implemented at other Roadstone facilities, the following measures will continue to be implemented wherever practicable at Huntstown to minimise 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 reduce or minimise potential 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.

9.69 Experience from other sites has shown that by implementing these measures, typical noise levels from construction works can bring about a reduction of 5dB(A) or more in ambient noise levels.

RESIDUAL IMPACT

9.70 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 all receptors is NEGLIGIBLE.

9.71 Table 9-13 summarise the impacts, mitigation measures and residual impact for operational plant noise at each of the noise sensitive receptor considered.

Table 9-13
Operational Noise Summary Table

Receptors	Increase in $L_{Aeq,\ 1hr}$ dB(A) Noise Level from Operations	Increase in $L_{Aeq,\ 1hr}$ dB(A) Noise Level from Final Restoration	Impact	Mitigation
R1	0	0	Negligible	Not Required
R2	0	0	Negligible	
R3	0	0	Negligible	
R4	0	0	Negligible	

Receptors	Increase in $L_{Aeq, 1hr}$ dB(A) Noise Level from Operations	Increase in $L_{Aeq, 1hr}$ dB(A) Noise Level from Final Restoration	Impact	Mitigation
R5	0	0	Negligible	Not Required
R6	0	0	Negligible	
R7	0	0	Negligible	
R9	0	0	Negligible	
R10	0	0	Negligible	
R11	0	0	Negligible	
R21	0	0	Negligible	
R22	0	0	Negligible	
R23	0	0	Negligible	
R24	0	0	Negligible	
R25	0	0	Negligible	
R30	0	0	Negligible	
R35	0	0	Negligible	
R46	0	0	Negligible	

INTERACTION WITH OTHER IMPACTS

9.72 The potential impact of noise generated by the increased waste intake and recovery activity on sensitive receptors including sensitive ecological receptors and people living in the area has been assessed in this Chapter. The impact of the proposed development activity on these receptors is further considered in Chapter 3 'Human Beings' and Chapter 4 'Ecology'.

CUMULATIVE IMPACTS

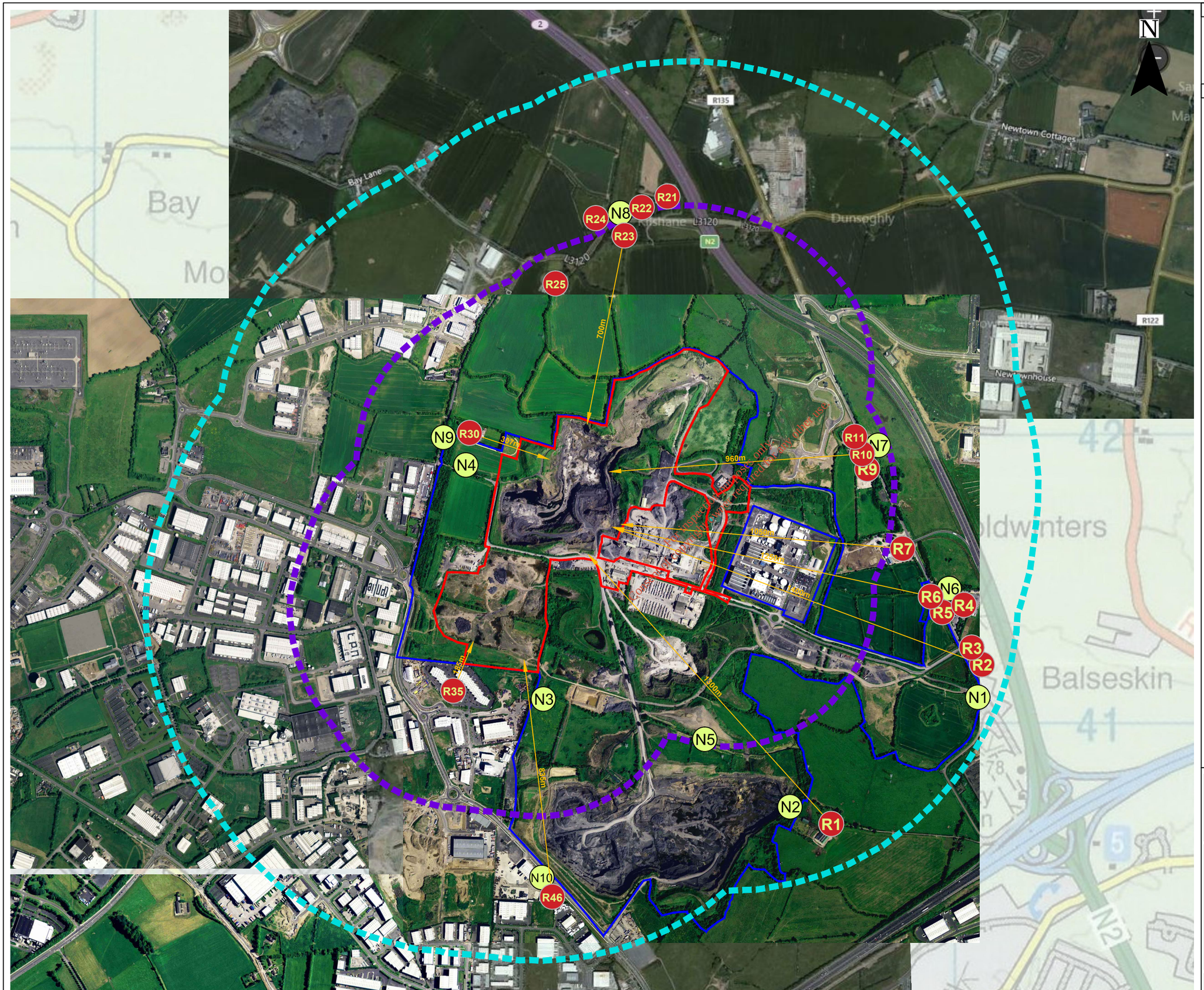
9.73 There are no cumulative noise impacts arising from the proposed increase in waste intake or waste recovery at the Huntstown facility.

MONITORING

9.74 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 Fingal County Council on a regular basis for review and record purposes.

FIGURES

Figure 9-1
Noise Assessment



NOTES

1. EXTRACT FROM 1:50,000 O.S DISCOVERY MAP **NO. 50**

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

LEGEND

- ROADSTONE LIMITED LAND INTEREST **(c. 200.3 ha)**
- APPLICATION AREA **(c. 48.65 ha)**
- N5 — NOISE MONITORING LOCATIONS
- R5 — NOISE RECEPTOR LOCATIONS
- 500m RADIUS
- 1000m RADIUS

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ROADSTONE LIMITED

ENVIRONMENTAL IMPACT STATEMENT

HUNTSTOWN WASTE RECOVERY FACILITY

NORTH ROAD, FINGLAS, DUBLIN 11

NOISE MONITORING LOCATIONS

FIGURE 9-1

Scale: 1:12,500 @ A3

Date: AUGUST 2016

0180.00152.0.FIG_9-1.Noise Monitoring Locations.dwg

APPENDICES

APPENDIX 9-A
GLOSSARY OF TERMINOLOGY

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

Noise Assessment
(Refer to Figure 9-1)

Table (i) Soil placement

Receptor	Average L_{Aeq} at 10m dB(A)					Reflection dB(A)	Screening dB(A)	Activity Distance (m)	Noise Attenuation with Distance dB(A)	Activity L_{Aeq} dB(A)					Specific Noise Levels dB(A)	Impulsive / tonal noise	Operational Noise Level **dB(A)**
	Bulldozer	Bulldozer	Excavator	HGV	HGV					Bulldozer	Bulldozer	Excavator	HGV	HGV			
R1	73	73	80	80	80	+3	−20	1300	42	14	14	21	21	21	26	+5	31
R2	73	73	80	80	80	+3	−20	1400	43	13	13	20	20	20	25	+5	30
R3	73	73	80	80	80	+3	−20	1400	43	13	13	20	20	20	25	+5	30
R4	73	73	80	80	80	+3	−20	1250	42	14	14	21	21	21	26	+5	31
R5	73	73	80	80	80	+3	−20	1250	42	14	14	21	21	21	26	+5	31
R6	73	73	80	80	80	+3	−20	1250	42	14	14	21	21	21	26	+5	31
R7	73	73	80	80	80	+3	−20	1050	40	16	16	23	23	23	28	+5	33
R9	73	73	80	80	80	+3	−20	960	39	17	17	24	24	24	29	+5	34
R10	73	73	80	80	80	+3	−20	960	39	17	17	24	24	24	29	+5	34
R11	73	73	80	80	80	+3	−20	960	39	17	17	24	24	24	29	+5	34
R21	73	73	80	80	80	+3	−20	880	39	17	17	24	24	24	29	+5	34
R22	73	73	80	80	80	+3	−20	825	38	18	18	25	25	25	30	+5	35

Receptor	Average L_{Aeq} at 10m dB(A)					Reflection dB(A)	Screening dB(A)	Activity Distance (m)	Noise Attenuation with Distance dB(A)	Activity L_{Aeq} dB(A)					Specific Noise Levels dB(A)	Impulsive / tonal noise	Operational Noise Level **dB(A)**
	Bulldozer	Bulldozer	Excavator	HGV	HGV					Bulldozer	Bulldozer	Excavator	HGV	HGV			
R23	73	73	80	80	80	+3	−20	700	37	19	19	26	26	26	31	+5	36
R24	73	73	80	80	80	+3	−20	740	37	19	19	26	26	26	31	+5	36
R25	73	73	80	80	80	+3	−20	490	34	22	22	29	29	29	34	+5	39
R30	73	73	80	80	80	+3	−20	307	28	28	28	35	35	35	40	+5	45
R35	73	73	80	80	80	+3	−20	185	25	31	31	38	38	38	43	+5	48
R46	73	73	80	80	80	+3	−20	835	38	18	18	25	25	25	30	+5	35

Table (ii) Final Restoration

Receptor	Average L_{Aeq} at 10m dB(A)		Reflection dB(A)	Screening dB(A)	Activity Distance (m)	Noise Attenuation with Distance dB(A)	Activity L_{Aeq} dB(A)		Specific Noise Level dB(A)	Impulsive/ tonal component	Operational Noise Level dB(A)
	Bulldozer	Excavator					Bulldozer	Excavator			
R1	73	80	+3	−20	1300	42	14	21	22	+5	27
R2	73	80	+3	−20	1400	43	13	20	21	+5	26
R3	73	80	+3	−20	1400	43	13	20	21	+5	26
R4	73	80	+3	−20	1250	42	14	21	22	+5	27
R5	73	80	+3	−20	1250	42	14	21	22	+5	27
R6	73	80	+3	−20	1250	42	14	21	22	+5	27
R7	73	80	+3	−20	1050	40	16	23	24	+5	29
R9	73	80	+3	−20	960	39	17	24	25	+5	30
R10	73	80	+3	−20	960	39	17	24	25	+5	30
R11	73	80	+3	−20	960	39	17	24	25	+5	30
R21	73	80	+3	−20	880	39	17	24	25	+5	30

Receptor	Average L_{Aeq} at 10m dB(A)		Reflection dB(A)	Screening dB(A)	Activity Distance (m)	Noise Attenuation with Distance dB(A)	Activity L_{Aeq} dB(A)		Specific Noise Level dB(A)	Impulsive/ tonal component	Operational Noise Level dB(A)
	Bulldozer	Excavator					Bulldozer	Excavator			
R22	73	80	+3	−20	825	38	18	25	26	+5	31
R23	73	80	+3	−20	700	37	19	26	27	+5	32
R24	73	80	+3	−20	740	37	19	26	27	+5	32
R25	73	80	+3	−20	490	34	22	29	30	+5	35
R30	73	80	+3	−20	307	28	28	35	36	+5	41
R35	73	80	+3	−20	185	25	31	38	39	+5	44
R46	73	80	+3	−20	835	38	18	25	30	+5	31