8.0 NOISE AND VIBRATION

8.1 Introduction

This remedial Noise & Vibration Impact Assessment has been prepared to accompany a substitute consent application for an existing sand and gravel quarry at Ballinabarny North and Bolagh Lower, Redcross, Co. Wicklow. Activities at the Ballinabarny Quarry site have included and include the extraction of sand and gravel, together with processing and temporary stockpiling areas where materials are stored prior to being sold to market. This remedial Noise & Vibration Impact Assessment forms part of the Remedial Environmental Impact Assessment Report. All details of the existing sand and gravel quarry at Ballinabarny North and Bolagh Lower, Redcross, Co. Wicklow and the development of the substitute consent site from the baseline (1990) to the current time (2022) are set out in detail in Chapter 2.0 Project Description.

This Noise Impact Assessment report has been prepared by Mervyn Keegan. Mervyn Keegan is a Director of the environmental consultancy, AONA Environmental Consulting Ltd. Mervyn Keegan's areas of professional expertise are in Noise Control & Acoustics and Air Quality & Odour consultancy, including impact assessment and mitigation design. Mervyn Keegan has over 23 years of environmental consultancy experience. Mervyn is a full member of the Institute of Acoustics, the Institute of Air Quality Management and the Institute of Environmental Sciences, with a Bachelor of Science Degree (Applied Sciences), a Master of Science Degree (Environmental Science) and a Diploma in Acoustics in Noise Control.

8.1.1 Scope

The Noise & Vibration Impact Assessment has considered all the winning and working of minerals, processing and associated transportation activities which have occurred within the applicant's lands during the period from the baseline (1990) to the current time (2022).

This has included an assessment of all operational noise sources that have operated during typical opening hours of the existing sand and gravel quarry at Ballinabarny North and Bolagh Lower, Redcross, Co. Wicklow. The Noise & Vibration Impact Assessment has included operational noise surveys and noise prediction modelling to determine the noise impact that has occurred due to the existing sand and gravel quarry at Ballinabarny North and Bolagh Lower, Redcross, Co. Wicklow.

8.1.2 Study Area

The Noise & Vibration Impact Assessment has considered the impact that has occurred on the nearest residential properties located at Ballinabarny North and Bolagh Lower, Redcross, Co. Wicklow and within approximately 500m of all the winning and working of minerals, processing and associated transportation activities which have occurred within the applicant's lands during the period from the baseline (1990) to the current time (2022).

8.2 Policy and Legislative Context

The noise and vibration impact assessment has been undertaken with regard to the relevant and established standards and guidelines to determine the impact of the quarry site activities on the surrounding noise environment and assess for the potential for noise disturbance at existing noise sensitive receivers in the locality, as follows:

- Quarries and Ancillary Activities, Guidelines for Planning Authorities, April 2004, Department of the Environment, Heritage and Local Government. (DoEHLG Guidance).
- Environmental Management Guidelines Environmental Management in the Extractive Industry (Non-Scheduled Minerals), Environmental Protection Agency (2006).

8.3 Assessment Methodology

8.3.1 Relevant Guidelines & Standards

The noise and vibration impact assessment has been undertaken with regard to the following established standards and guidelines to determine the impact of the existing Ballinabarny Quarry site activities on the surrounding noise environment and assess for the potential for noise disturbance at existing noise sensitive receivers in the locality:

- Quarries and Ancillary Activities, Guidelines for Planning Authorities, April 2004, Department of the Environment, Heritage and Local Government. (DoEHLG Guidance).
- Environmental Management Guidelines Environmental Management in the Extractive Industry (Non-Scheduled Minerals), Environmental Protection Agency (2006).

The Quarries and Ancillary Activities, Guidelines for Planning Authorities states that following with regard to the control of noise that is relevant to sand and gravel extraction. It is important to note that no blasting has taken place or is proposed to take place within the existing Ballinabarny Quarry site;

'Control of noise: Noise-sensitive uses in the vicinity of a quarry, such as dwellings, schools, hospitals, places of worship or areas of high amenity, require that the amount of noise be minimised. The sensitivity to noise is usually greater at night-time (20.00 to 08.00) than during the day, by about 10 dB(A). Many quarries are situated in areas of low background noise and it is appropriate to consider this when setting noise limits. In general, it can be expected that complaints will result where the noise from quarrying and associated activities are between 5 to 10 dB above the background noise levels. In areas of higher background noise levels, the EPA recommends that ideally, if the total noise level from all sources is taken into account, the noise level at sensitive locations should not exceed a L_{Aeq} (1 hour) of 55 dB(A) by daytime and a L_{Aeq} (15 minutes) of 45 dB(A) by night-time. Audible tonal or impulsive components in noise emissions (e.g. the reversing siren on a lorry, required for safety reasons) can be particularly intrusive, and such components should be minimised at any noise-sensitive location.

It may be necessary to raise the noise limits to allow temporary but exceptionally noisy phases in the extraction process, or for short-term construction activity which cannot meet the limits set for routine operations, e.g. the construction of baffle mounds, which bring long-term environmental benefits.
The developer may be required to carry out noise surveys to measure noise levels at the site boundary near sensitive locations, as agreed in advance with the planning authority. Surveys should be carried out in accordance with the EPA's "Environmental Noise Survey – Guidance Document" (2003). Noise monitoring should be carried out on a quarterly basis (or as otherwise agreed), and commenced prior to the commencement of development. The results should be reported to the planning authority within 3 weeks (or as agreed). 95% of all noise measured shall comply with the specified limit values. No individual noise measurement should exceed the limit values by more than 2 dB(A).

As outlined in the Environmental Management Guidelines Environmental Management in the Extractive Industry (Non-Scheduled Minerals), Environmental Protection Agency (2006), the Environmental Protection Agency (EPA) has produced a Guidance Note for Noise in Relation to Scheduled Activities (EPA, 1996). It deals in general terms with the approach to be taken in the measurement and control of noise, and provides advice in relation to the setting of noise Emission Limit Values (ELV) and compliance monitoring. In relation to sand and gravel quarry developments and ancillary activities, it is recommended that noise from the activities on site shall not exceed the following noise ELVs at the nearest noise-sensitive receptor:

- Daytime: 08:00–20:00 h $L_{Aeq\ (1\ h)}$ = 55 dB(A).
- Night-time: 20:00–08:00 h $L_{Aeq\ (1\ h)}$ = 45 dB(A).

Note:

- 95% of all noise levels shall comply with the specified limit value(s). No noise level shall exceed the limit value by more than 2 dB(A).
- On-site activities should be permitted during night-time hours where they comply with the noise ELVs (e.g. heating up of asphalt plants, loading of materials).
- Where existing background noise levels are very low, lower noise ELVs may be appropriate.
- Audible tones or impulsive noise should be avoided at night.
- It is also appropriate to permit higher noise ELVs for short-term temporary activities such as construction of screening bunds, etc., where these activities will result in a considerable environmental benefit.

On the basis of the above, the following noise limits are suggested as appropriate for the operation of the quarry and associated activities post 1990:

The equivalent sound levels attributable to all on-site operations associated with the development shall not exceed 55 dB(A) L_{eq} over a continuous one-hour period between 0700 hours and 1900 hours on Monday to Friday inclusive, and 0700 hours and 1400 hours on Saturday, when measured at any noise sensitive receptor. Sound levels shall not exceed 45 dB(A) at any other time.

8.3.2 CadnaA Noise Prediction Modelling Methodology

A CadnaA noise prediction model has been prepared to predict and assess a worst-case noise level that has occurred due to the specific operation of the quarry. This noise model is based on the scale of site operations and associated plant and equipment and lorry movements to and from the site as described in Chapter 2.0 Project Description. Thus, the noise prediction model provides an appropriate level of confidence when assessing specific noise impact from the quarry site.

CadnaA has been developed to allow detailed noise predictions to be undertaken in accordance with:

- ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2 General methods of calculation.
- BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise.

The CadnaA noise prediction model allows for noise from all sources entered into the model to be undertaken simultaneously. The noise model can take topographical effects, ground absorption, screening effects, reflections and focusing effects, among others, into consideration. The modelling software calculates noise levels based on the emission parameters and spatial settings that are entered. The model calculates the propagation of the sound from each noise source and produces a noise level contour map and graphics in proximity to a facility with colour coded noise level contours. Model parameters, sources, and settings have been incorporated into the model as detailed in Table 8.1.

Table 8.1: Modelling Parameters, Sources and Assumptions

Parameter	Source	Details
Horizontal distances – Quarry and surrounding area	WSP Golder	Scaled drawings in AutoCAD format.
Quarry Dimensions	WSP Golder	Scaled drawings in AutoCAD format.
Receiver Locations	AONA Environmental	In outdoor amenity areas adjacent to nearest residential properties @ 1.5m height.
Plant types, location & Sound Power Level	Site operator	Source noise measurements were undertaken in close proximity to plant and equipment on site. This allowed for an accurate Sound Power Level Lw to be assigned to active plant.
Ground Absorbtion	AONA Environmental	A Ground Absorbtion Rate G = 0.5 has been used in the model, which is appropriate for the surrounding land type.

AONA Environmental has undertaken source specific noise level readings in close proximity to the main noise sources that operate on the site. This has allowed for the generation of accurate sound power levels for all main existing noise sources on the site. For the purposes of noise impact assessment, the Sound Power level (L_W) was determined by measuring the Sound Pressure Level (L_P) at a specific distance from the noise source and assuming a Directivity Index (Q) of 2, i.e. hemispherical propagation, using the following equation;

$$L_W = L_p + |10 \cdot \log\left(\frac{Q}{4\pi \cdot r^2}\right)|$$

AONA Environmental has assessed the specific noise sources that have operated on and currently operate at the site. Therefore, an accurate noise prediction model has been prepared based on accurate source sound level data.

The type of plant that have operated on and currently operate on the site includes the following (not all of which has been or is in use concurrently or continuously):

- Washing & Screening Plant (in situ since approx. 2000) includes 2 sand and 6 gravel conveyors [Model: Powerscreen & Finlay conveyors].
- 3 excavators, 3 dump trucks and 3 loading trucks that are used to excavate sand and gravel at quarry face, load and transport sand and gravel and to feed the Washing & Screening Plant. The plant is occasionally used for tasks such as overburden clearance and haul road construction.
- Truck movements off site – the average number of truck movements is up to 20 two-way movements per day. Truck loading and export off site between 07.30 – 17.30 Monday to Friday and 07.30 – 1400 Saturday. (based on Chapter 2.0 Project Description - *"The annual volume of extraction from the sand and gravel pit during the period of the Development was on average 50,000 tonnes per annum. It is estimated that approximately 20 truck movements per day out and 20 truck movements per day in, with approximately 8 No. staff/visitor cars movements in and out occurred over the period of the Development, on average")*

- Other noise sources – personnel vehicle movements and workshop noise sources.
- Operating Hours – 07.30 – 17.30 Monday to Friday and 07.30 – 1400 Saturday. No operation on Sunday or Bank Holidays.

The following noise sensitive receiver locations (Figure 8.1) have been included in the CadnaA noise prediction model.

Table 8.2 provides the co-ordinates and address of the NSR's included in the model.

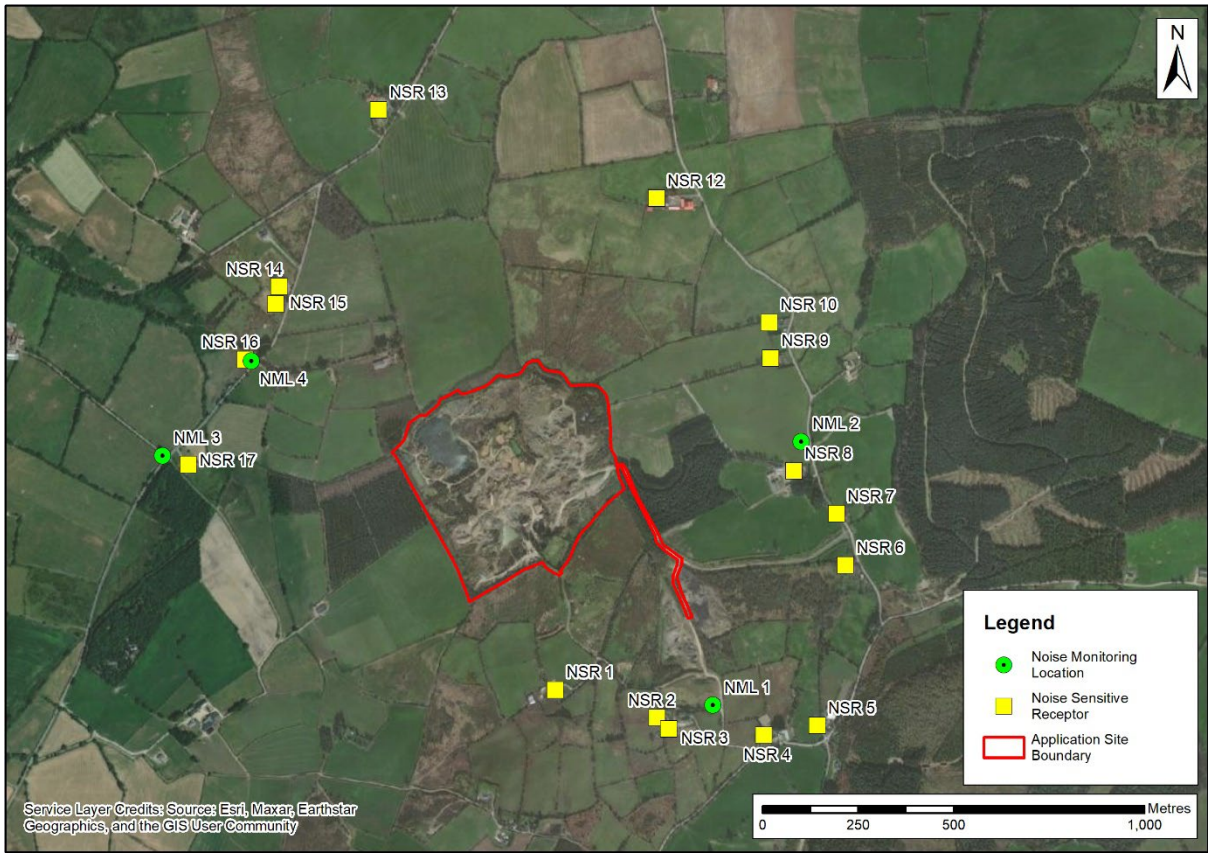

Figure 8.1: Noise Monitoring Locations (NML) and Noise Sensitive Receiver (NSR) locations included in the noise prediction model

Table 8.2 Noise Sensitive Receiver Locations included in the Noise Prediction Model.

Description	Irish Grid Coordinates		Address (near)
NSR 1	322335	185814	Cronebane ED, County Wicklow, A67 RY68
NSR 2	322602	185741	Cronebane ED, County Wicklow, A67 RY68
NSR 3	322632	185712	Cronebane ED, County Wicklow, A67 RY68
NSR 4	322881	185696	Cronebane ED, County Wicklow, A67 RY68
NSR 5	323021	185721	Cronebane ED, County Wicklow, A67 RY68
NSR 6	323095	186140	Dunganstown West ED, County Wicklow, A67 YR12
NSR 7	323072	186275	Dunganstown West ED, County Wicklow, A67 YR12

Description	Irish Grid Coordinates		Address (near)
NSR 8	322960	186387	Dunganstown West ED, County Wicklow, A67 YR12
NSR 9	322899	186682	Dunganstown West ED, County Wicklow, A67 YR12
NSR 10	322896	186775	Dunganstown West ED, County Wicklow, A67 YR12
NSR 12	322600	187100	Dunganstown West ED, County Wicklow, A67 YR12
NSR 13	321872	187331	Dunganstown West ED, County Wicklow, A67 YR12
NSR 14	321612	186869	Dunganstown West ED, County Wicklow, A67 YR12
NSR 15	321603	186823	Dunganstown West ED, County Wicklow, A67 YR12
NSR 16	321523	186678	Dunganstown West ED, County Wicklow, A67 YR12
NSR 17	321374	186403	Dunganstown West ED, County Wicklow, A67 YR12

8.3.3 Significance Criteria

In this remedial Noise & Vibration Impact Assessment, the quantification of impacts from the assessment of all operational noise sources that have operated within the applicant's lands during the period from the baseline (1990) to the current time (2022) during typical opening hours in the existing sand and gravel quarry at Ballinabarny North and Bolagh Lower, Redcross, Co. Wicklow has been determined whether to be 'significant' or 'not significant' in terms of the following noise Emission Limit Values (ELVs) at the nearest noise-sensitive receptor:

- Daytime: 08:00–20:00 h $L_{Aeq\ (1\ h)}$ = 55 dB(A)
- Night-time: 20:00–08:00 h $L_{Aeq\ (1\ h)}$ = 45 dB(A)

As stated, it is the Quarries and Ancillary Activities, Guidelines for Planning Authorities, April 2004, Department of the Environment, Heritage and Local Government. (DoEHLG Guidance) that outlines appropriate noise Emission Limit Values (ELVs) at the nearest noise-sensitive receptors. The operational noise sources that have operated within the applicant's lands during the period from the baseline (1990) to the current time (2022) have been assessed to determine if the relevant ELVs have been complied with or exceeded at the nearest noise-sensitive receptors. Compliance with the relevant ELVs suggests that the impact of operational noise sources that have operated within the applicant's lands during the period from the baseline (1990) to the current time (2022) have been 'not significant'.

8.4 Baseline Conditions

8.4.1 Noise Monitoring

AONA Environmental has undertaken baseline noise monitoring in proximity to the nearest noise sensitive properties to the site on Thursday 10th March 2022. The noise monitoring survey was conducted in accordance with *ISO 1996-2, 2017 Acoustics – Description, Measurement and Assessment of Environmental Noise.*

The site was in operation during the survey. The nearby recycling site was also to be operational. A Norsonic Nor 140 sound level meter was used during the survey, which was calibrated before and after the noise survey period. The weather conditions during the noise survey were noted to be dry, warm and with a south-easterly breeze.

The baseline noise monitoring locations are outlined in Table 8.3 and photos of the monitoring locations are presented in Table 8.4.

Table 8.3 Baseline Noise Monitoring Locations on 10th March 2022.

Description	Location	Irish Grid Coordinates	
NML 1	At road access junction to recycling plant to represent properties located to the south of the quarry (NSR 1 - 5)	322748	185774
NML 2	At roadside near properties in Bolagh to represent properties located to the east of the quarry (NSR 6 - 11)	322980	186464
NML 3	At roadside near properties in Rockstown to represent properties located to the east of the quarry (NSR 12 - 17)	321307	186427
NML 4	At roadside near properties in Rockstown to represent properties located to the east of the quarry (NSR 12 - 17)	321539	186674

Table 8.4: Noise Monitoring Locations

NML 1	NML 2	NML 3	NML 4
			

Table 8.5 Noise Monitoring Survey Results at NML 1, 2, 3 & 4 on 10th March 2022

Location	Date	Time	Duration	LAeq (dB)	LAFMax (dB)	LAFMin (dB)	LAF10 (dB)	LAF90 (dB)	Notes
NML1	10/03/2022	10:52	00:59:59	43.7	67	30.3	45.3	43.7	Recycling Plant clearly audible, breezy, birdsong, quarry inaudible because of the recycling plant
NML2	10/03/2022	11:01	00:59:59	51.1	77.6	33.8	52.2	51.1	Recycling plant and quarry audible (recycling plant dominant), birdsong and sheep in field Occasional

Location	Date	Time	Duration	LAeq (dB)	LAFMax (dB)	LAFMin (dB)	LAF10 (dB)	LAF90 (dB)	Notes
									passing traffic on road (lorries & cars)
NML3	10/03/2022	13:15	00:59:59	48	72.1	32.4	49.1	48	Recycling plant/Quarry audible, dog barking, Occasional passing traffic on road, breezier than earlier
NML4	10/03/2022	13:19	00:59:59	50.8	77.8	36.8	51.6	50.8	Quarry/Recycling Plant audible, Occasional passing traffic on road, plane overhead, breezier than earlier.

The noise monitoring data presented in Table 8.5 indicates that while the quarry and the nearby recycling plant was in operation and audible during the noise surveys undertaken on 10th March 2022, the measured background noise level at each location of approximately 38 – 43 dB L_{A90} indicates that these sources are not having a significant noise impact in the wider area. Not all plant was operating on the Ballinabarney Quarry site when the AONA Environmental staff arrived at the site. AONA Environmental staff requested that all plant be operated concurrently so that a worst-case noise level could be assessed from the quarry operations.

Based on the noise survey data outlined in Tables 8.5, it can be deduced that the quarry noise received at the nearest residential properties was and is significantly below the 55 dB(A) noise limit that applies to the quarry.

Therefore, the specific quarry noise levels did not exceed the absolute limit that is applied to all extractive sites taken from the Guidelines Quarries and Ancillary Works, which states that *"site noise shall not exceed 55dB(A) $L_{Aeq,T}$ during 08:00hrs – 18:00 hrs Monday to Saturday and 45 dB(A) $L_{Aeq,T}$ at any other time when measured at any noise sensitive premises in the locality".*

8.5 Potential Effects

8.5.1 Operation Phase

Quarrying Noise Impacts that have Occurred

The results of the noise prediction model to address all the winning and working of minerals, processing and associated activities which have occurred within the applicant's lands during the period from the baseline (1990) to the current time (2022) are presented in Table 8.6. The sound power level (L_W) of the noise sources included in this noise prediction model are as follows:

Point Sources:

A series of source noise level measurements in proximity to the washing and screening plant has allowed for a sound power level to be determined for this main noise source on the site. This source does not operate all day every day but is frequently in operation on the site.

Table 8.6: Source Noise Level Measurements

Location	Notes	LAeq (dB)
1	~25m from Powerscreen box between 1st and 2nd sand mound	71.4
2	between sand mounds - noise of strange reverser on loading shovel	65.6
3	between gravel mounds	73.8
4	beside conveyor	76
5	beside conveyor	76.3
6	last gravel mound - machinery working adjacent - komatsu 240 and dumper	69.1
7	under conveyor	81.7
8	under loading area - squeaking. Man manually feeding in	73.8
9	back of powerscreen - shaking	84.4

Figure 8.2: Noise Source Level Measurement Locations

Table 8.7: Sound Power Levels

Name	LW dB(A)	Notes
Washing & Screening Plant	115.0	Assumed to be operational 100% of time
Excavator at working quarry faces	111.0	Assumed to be operational 100% of time

Moving Line Sources:

Table 8.8: Moving Line Noise Sources

Name	LW dB(A)		Moving Pt. Src		Notes
	Type	Value	Number per hour	Speed (km/h)	
Haul Truck Movements	PWL-Pt	105	5.0	10.0	

Table 8.9: Predicted Worst-case Noise Levels from the mineral extraction operations which have occurred within the applicant's lands during the period from the baseline (1990) to the current time (2022) (See Figure 8.3).

Name	Predicted Worst-case Noise Level	Receiver Height (m)	ITM Coordinates	
			X (m)	Y (m)
NSR 1	43.2	1.50	722258.82	685850.77
NSR 2	40.9	1.50	722525.76	685777.78
NSR 3	40.5	1.50	722555.76	685748.79
NSR 4	38.0	1.50	722804.70	685732.79
NSR 5	37.0	1.50	722944.67	685757.78
NSR 6	38.5	1.50	723018.66	686176.69
NSR 7	39.8	1.50	722995.66	686311.66
NSR 8	41.3	1.50	722883.69	686423.64
NSR 9	41.3	1.50	722822.70	686718.57
NSR 10	40.2	1.50	722819.71	686811.55
NSR 12	39.1	1.50	722523.77	687136.48
NSR 13	36.7	1.50	721795.93	687367.44
NSR 14	39.4	1.50	721535.99	686905.54
NSR 15	39.6	1.50	721526.99	686859.55
NSR 16	39.7	1.50	721447.01	686714.58
NSR 17	38.7	1.50	721298.04	686439.64
Limit	55 dB(A)			

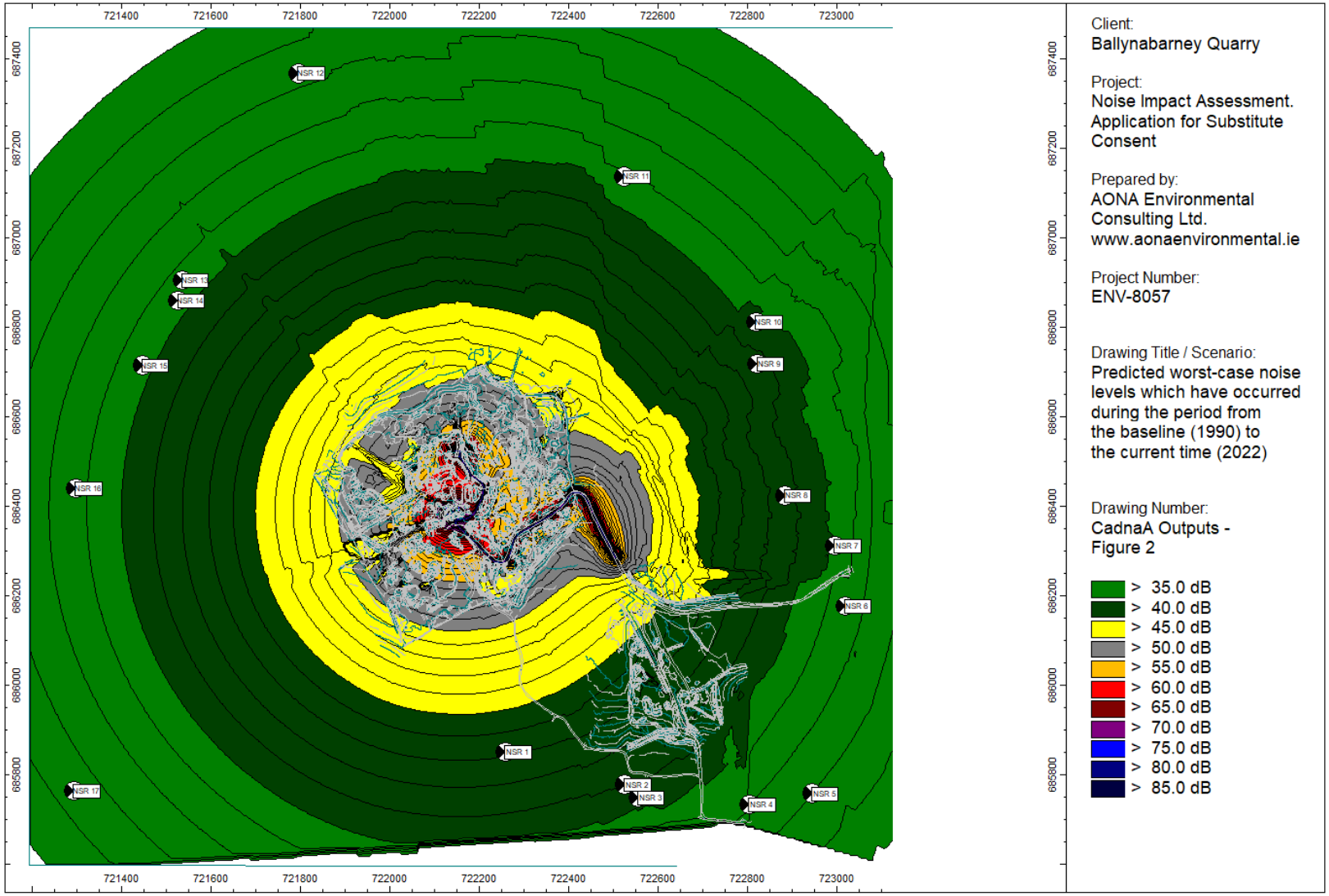

Figure 8.3: Predicted Worst-case Noise Levels

The highest predicted daytime noise level of 43.2 dB(A) at NSR 1 indicates that the quarrying noise sources did not have a significant noise impact at properties in proximity to the site relative to the quarry noise limits during daytime.

Quarrying Noise Impacts that are Occurring

Sand and gravel mineral extraction with associated excavation, washing & screening and lorry movements is currently operational within the application area. The predicted daytime noise levels presented in Table 8.5 indicate that the cumulative noise from quarrying and associated activities at the Site is not having a significant impact, relative to the quarry noise limits during daytime operation.

8.5.2 Decommissioning Phase

There is no scope in the existing Substitute Consent process to allow for future working and as such, the scope for noise generating activities is limited and future noise impacts from the quarry will be addressed separately under an application for continuation of extraction under 37L of the Planning and Development Act 2000 as amended. The Site will be restored in the future in accordance with the submitted restoration scheme. Activities associated with restoration works has the potential to result in potential noise impacts. Should quarrying and associated operations cease on the site, noise levels from de-commissioning of the structures on the quarry site and / or the regrading of the benches in the extraction area and any subsequent infill will be short-term noise impacts. Such activities will be subject to a higher noise limit of 70 dB(A) as distinct from normal site operations. Such activities may include overburden removal, bund de-construction, restoration works, de-commissioning of plant and equipment, etc. Typically, such works will be carried out during an 8-week window per annum.

In the event that the alternative scenario is adopted, and planning permission is sought under 37L of the Act for future quarrying, given that the noise modelling has predicted that operations at the quarry site have individually and cumulatively operated below the guideline figure provided for in the DOEHLG recommended noise levels, no significant effect is predicted as a result of future working at the quarry. In any event, this would be the subject of a separate environmental assessment in the future.

8.6 Cumulative Impacts

The measured daytime noise levels presented in Table 8.4 indicate that the cumulative noise from the Site and the occasional operation of the recycling plant on a site located to the south of the quarry site has not had a significant noise impact at properties in proximity to the quarry site relative to the quarry noise limits during daytime.

8.7 Summary and Conclusions

The noise monitoring surveys that have been undertaken previously in proximity to the existing quarry site at Ballinbarny report that the ‘quarry noise was audible’ at the residential properties i. However, the noise monitoring survey undertaken on 10th March 2022 in proximity to the Site indicates that the cumulative noise from the operation of the quarry and the adjacent recycling plant is not having a significant noise impact at the nearest residential properties. Therefore, it is concluded that operations during the Substitute Consent period at the Site, have not resulted, and are not resulting or unlikely to result in any a significant noise impact at the nearest residential properties.

The noise prediction modelling presented indicates that noise impacts that have occurred do not give rise to any significant environmental impact, and the existing quarry operations consistently have operated below the guideline figure provided for in the DOEHLG recommended noise levels.