9 Noise

9.1 Introduction

This Chapter provides an assessment of the potential noise impacts arising from the proposed modifications to the West Offaly Power (WOP) Station and associated ash disposal facility (ADF) to facilitate the continued operation of these facilities and phased transition of that station to exclusive firing with biomass.

Electricity generation has taken place at the WOP location since 1963 with successive new generating stations (1977, 1982 and 2005) being developed on the site; the latest being the current WOP generating station which underwent environmental impact assessment as part of its planning process. Emissions from the WOP station, including noise, are controlled under the EPA IE Licence P0602-11. The existing noise environment of Shannonbridge reflects the presence of the station and the licenced noise emissions from it.

The existing development is subject to the condition that all existing activity ceases in December 2020. Whilst decommissioning the station will result in a positive effect, the potential noise impacts from the continued operation of WOP station and the ADF have been assessed both in relation to the no development scenario and the perceived change to the current noise environment currently experienced at the site.

Mitigation measures to eliminate or reduce the impacts to an acceptable level have also been proposed.

This chapter has been prepared by Hayes McKenzie Ltd, a professional noise assessment consultancy with inputs from ESB International.

9.2 Methodology

The impact of the proposed development has been assessed against the existing and the no development environment of discontinued operation of WOP which has been determined through assessment of noise when all significant items of plant were not in operation. The change to the current noise environment is of significant relevance when assessing the noise impact of the proposed continued operation. The impact has therefore been assessed both in terms of the predicted change in noise level and of the absolute level of noise in order to put the noise changes in context.

The assessment method presented in this chapter is split into two parts; firstly an evaluation of the change resulting from continued operation of the WOP station and ADF and a transition to Biomass operation and secondly an evaluation against appropriate noise limits defined in the EPA's NG4[1]. The first part is focussed on the

[1] EPA, NG4: 'Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities'

change between predicted existing and future (2020, assuming the continued operation of WOP) noise levels whilst the second part requires baseline noise data (obtained during shutdown of the power station) in order to assess the predicted future noise levels against appropriate noise limits. Predicted noise levels have been calculated for locations where baseline noise measurements have been carried out (whilst WOP station has been shut-down) allowing derivation of appropriate NG4 noise limits and assessment of total noise levels (including baseline noise levels).

The existing WOP station and ADF operate under an IE Licence P0611-02 issued by the EPA, which requires annual noise monitoring at specific noise sensitive locations to be undertaken and results reported to the Agency. Data from the most recent baseline noise survey (undertaken as part of the annual noise monitoring) has been used in the assessment of noise impact along with a baseline noise survey carried out by Hayes McKenzie (included at **Appendix 9.1**).

9.2.1 Guidance and Legislation

Various important documents relating to the appropriate noise prediction and assessment methodology have been referred to within this chapter and these are summarised in the following paragraphs.

9.2.1.1 Offaly Local Authorities Noise Action Plan 2013 – 2018

This document provides guidance on the way in which the local authorities within County Offaly operate in order meet the aims of the European Environmental Noise Directive (2002) and the requirements of the Irish Environmental Noise Regulations (2006). In relation to industrial noise sources there are some general principles set out and at paragraph 2.2.7 the following guidance is provided in terms of noise limits:

The following noise limits are generally stipulated for industrial and commercial developments close to residential areas:

L_{Aeq} (60 minutes) 55dB(A) 8.00 to 20.00.

L_{Aeq} (15 minutes) 45dB(A) 20.00 to 8.00.

9.2.1.2 BS5228, Code of practice for noise and vibration control on construction and open sites

It should be noted that ground-borne vibrations are not considered to be of relevance to activities associated with the construction or continued operation of WOP station, but the construction noise guidance is of relevance to this EIA. BS 5228[2] provides a number of different example criteria for the assessment of the significance of construction noise effects and a method for the prediction of noise levels from construction activities. The general methodology for predicting noise

[2] British Standard 5228: 2009, Code of Practice for Noise and Vibration Control on Construction and Open Sites, British Standards, 2009

levels broadly follows that presented in ISO9613, which is the standard that has been used for the noise model presented in this assessment.

In addition to the prediction method, a large part of BS5228 is taken up with tables of noise data for various items of construction plant. This body of noise data provides a useful basis on which to build a construction noise model since the actual equipment to be used is often unknown at the planning stage and it is useful to have indicative data.

9.2.1.3 ISO 9613 (parts 1 and 2)

The ISO 9613-2[3] standard is used for predicting sound pressure level for downwind propagation by taking the source sound power level for each turbine in separate octave bands and subtracting a number of attenuation factors. A detailed description of the ISO 9613 methodology presented in part 2 of the standard is provided at **Appendix 9.2**.

Part 1 of the standard provides a detailed model for how sound energy is absorbed by the atmosphere as sound waves propagate through it. There are a large number of variables which affect atmospheric absorption coefficient and the way in which these are included in the model is described in detail. The main factors affecting atmospheric absorption of the sound are temperature and relative humidity and tables of atmospheric absorption coefficient 'α' are provided for different combinations of temperature and relative humidity. The atmospheric absorption coefficient is an attenuation term and it is expressed as the reduction of sound level in dB/m.

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

NG4 is a document published by the Environmental Protection Agency (EPA) to provide guidance on appropriate methodology for noise assessments at IE licensed sites. Since WOP station requires an EPA license to continue operating, the guidance provided in NG4 is entirely appropriate and relevant to the noise assessment presented here.

The methodology presented in the document is focused around assessment of impacts at noise sensitive locations (NSLs). The impacts are assessed by determining appropriate noise criteria (noise limits) for NSLs surrounding the site where scheduled activities are to take place (only 'scheduled activities' require an EPA license for the site) and comparing these with rating levels for the noise sources. Rating levels are calculated by predicting noise levels (according to ISO 9613 which is detailed at **Appendix 9.2**) and then adding a penalty for any tonal or impulsive characteristics present in the noise.

In addition to the noise assessment methodology, NG4 also provides sections giving guidance on noise control, mitigation measures and complaint investigation.

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[3] ISO 9613-2, Acoustics - Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation, International Organization for Standardization, 1996

This provides a framework for addressing situations where noise sources are thought to be or are found to be exceeding noise limits at NSLs.

9.2.1.5 Requirements of the WOP IE Licence P611-02 with respect to noise

The current IE Licence (P0611-02), under Condition 4.5, requires that noise from the installation shall not give rise to sound pressure levels measured at noise sensitive locations which exceed the noise limit values.

Condition 6.15 of the Licence requires the station to undertake an annual operational noise survey and to submit the noise report as part of the stations Annual Environmental Report to the EPA. The condition also specifies that the survey programme shall be undertaken in accordance with the methodology specified in the 'Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)' as published by the Agency.

However, the current IE Licence does not specify noise limits for compliance purposes but the previous licence P0611-01 included noise limits under Condition 8.1 as follows:

Condition 8.1:

> "8.1 Activities on the Power Station site and on the Ash Disposal Facility site shall not give rise to noise levels at the boundary which exceed the following sound pressure limits (Leq,15 minutes) subject to Condition 3 of this licence:
>
> 8.1.1 Daytime: 55 dB(A),
>
> 8.1.2 Night-time: 45 dB(A)."

These are relevant as they are also the current noise limits applicable to Lough Ree Power Station (IE Licence P0610-02) and Edenderry Power Limited (IE P0482-04) for noise compliance assessment purposes.

Annual noise monitoring undertaken in compliance with the requirements of the current IE licence (P0611-02) is undertaken in accordance with NG4 and references the noise limits for 'all other areas'[4] set out in that guidance document which are as follows:

- Daytime Noise Criterion, dB LAr,T (07:00 to 19:00hrs): 55dB
- Evening Noise Criterion, dB LAr,T (19:00 to 23:00hrs): 50dB
- Night-time Noise Criterion, dB LAeq,T (23:00 to 07:00hrs): 45dB

The annual noise monitoring indicate that the station operation is compliant with these noise limits for daytime, evening time and nighttime.

[4] ie. Not quiet areas or areas of low background noise areas

9.2.1.6 EPA Guidelines on the Information to be Contained in Environmental Impact Assessment Reports

Section 3.7.3 of the EPA guidelines covers the description of effects and details six categories for describing an effect. Table 3.3 of the document (within section 3.7.3) provides clear and concise terminology to be used when describing each of the six categories. These categories and terms are summarised in in Chapter 1 of this EIAR as reproduced in **Table 9-1**, and it should be noted that the detailed descriptions of the terminology provided in the EPA guidelines have been referred to when describing effects using this terminology in this chapter.

Table 9-1: EPA Guidelines Description of Effects

Category	Terminology
Quality of Effects	• Positive Effects • Neutral Effects • Negative/Adverse Effects
Describing the Significance of Effects	• Imperceptible • Not Significant • Slight Effects • Moderate Effects • Significant Effects • Very Significant • Profound Effects
Describing the Extent and Context of Effects	• Extent • Context
Describing the Probability of Effects	• Likely Effects • Unlikely Effects
Describing the Duration and Frequency of Effects	• Momentary Effects • Brief Effects • Temporary Effects • Short-term Effects • Medium-term Effects • Long-term Effects • Permanent Effects • Reversible Effects • Frequency of Effects
Describing the Types of Effects	• Indirect Effects • Cumulative Effects • Do-nothing Effects • Worst Case Effects • Indeterminable Effects • Irreversible Effects • Residual Effects • Synergistic Effects

9.2.2 Construction Noise

9.2.2.1 On Site Construction Activity

The main construction activities on the site will consist of excavating the ground for the biomass storage slabs, piling and laying the concrete. Details of the plant that will be used is given in the Construction Methodology in **Appendix 4.2** and this has been used to inform the construction noise predictions. Foundation design will

depend on the outcome of more detailed site investigation. A construction methodology for both a ground bearing storage slab and a piled storage slab design has been provided in **Appendix 4.2**.

The plant required for these activities has been assumed to comprise the equipment listed at **Table 9-2**. BS5228, *Code of practice for noise and vibration control on construction and open sites*, provides source noise levels for many items of plant and the relevant noise levels are also included in the Table along with the BS5228 reference.

Table 9-2: Assumed Construction Plant Details

Plant Item	BS5228 Reference (closest match)	Source Level (L_{WA} dB)
21 tonne excavator	Table C.6 #7 Tracked excavator 128kW	76.0
6 tonne dumper	Table C.4 #4 Dumper 75kW	75.5
9 tonne dumper	Table C.4 #3 Dumper 81kW	76.3
28 tonne dumper	Table C.6 #16 Articulated dump truck (empty) 287kW	88.0
Telehandler	Table C.4 #54 Telescopic handler 76kW	78.5
CFA piling rig	Table C.3 #16 Crane mounted auger	79.4
Concrete Pump	Table C.3 #26 Concrete pump 25kW	74.9
5 Tonne Roller	Table C.5 #25 Vibratory roller 32kW	75.3
Concrete poker/vibrator	Table C.4 #33 Poker vibrator	78.5

In addition to providing source noise levels for the various items of plant listed above, BS5228 provides a noise prediction methodology which has been used to predict noise at the same critical noise sensitive locations which have been identified for the assessment of changes in operational noise. Predictions have been carried out assuming 50% soft ground between the sources and receivers.

Appendix 9.3 details the exact locations of all the plant included in the construction noise predictions and the results of the calculations.

9.2.2.2 Construction Deliveries

Outside the site boundary, the change in noise due to construction traffic noise has been assessed on the basis of the assumptions at **Table 9-3**.

Table 9-3: **Assumed Construction and Other Traffic Movements**

Description	Development Scenario	
	Existing operations (Pre-development)	Construction Phase* (includes existing plus additional movements)
HGV Movements	74 per day	85 – 86 per day

*Note, estimate only based on Construction Methodology

9.2.3 Operational Noise

9.2.3.1 Noise from the Site

A number of site visits have been carried out in order to quantify the noise from WOP station itself (the base noise level) as far as it affects critical noise sensitive locations in the vicinity, and the source noise levels from individual road delivery vehicles, wheel loader and delivery trains. The measurements carried out are described in **Appendix 9.4**

The results of these measurements have enabled noise predictions to be carried out based on the calculated sound power levels in **Table 9-4** below. It should be noted that, due to the nature of the measurements on which the calculated sound power levels are based, it was not possible to determine sound power levels in all octave bands for some of the noise sources due to the influence of other ambient and background sounds. All sound power levels have been estimated from average L_{Aeq} measurements (taken at close range to ensure an adequate signal to noise ratio in the relative octave bands) considered to be representative of each noise source.

It should be noted that the HGV unloading building contains three bays each fitted with a large extraction fan to remove dust during unloading and that all three fans operate simultaneously. These extractor fans generate a considerable amount of noise by themselves and if there is only one HGV unloading, noise from the other two fans is noticeable, therefore, the fan noise from the HGV unloading building has been measured separately.

Table 9-4: **Sound Power Levels for Operational Noise Predictions**

	Octave Band Sound Power L_{WA} (dB)									Over-all L_{WA}
Octave Band Centre Frequency (Hz)	31	63	125	250	500	1k	2k	4k	8k	
Base Level	85.7	92.8	98.1	103.2	98.1	-	-	-	-	105.6
Wheeled Loader	90.2	106.7	105.7	106.6	105.7	114.5	125.1	-	-	125.7
Train Pass-by	89.6	109.1	111.1	116.0	118.9	119.1	115.5	109.7	100.1	124.2
Pellet delivery	91.1	99.6	101.6	105.8	110.8	112.6	113.9	114.0	108.6	119.7
HGV unloading: Lorry	70.3	75.6	86.4	93.4	101.6	102.9	100.1	94.2	82.9	107.0
HGV unloading: Fan	69.1	73.4	79.5	86.3	95.0	92.6	91.5	83.5	75.7	98.6

Worst-case downwind noise predictions have been carried out in octave bands according to ISO 9613 parts 1 and 2. Details of the prediction model and the inputs used for calculating attenuation are provided at **Appendix 9.2.**

Noise generated by delivery vehicles in transit has only been considered in terms of the percentage increase to existing traffic volumes and the resulting increase in noise levels. Once onsite, the noise due to deliveries is modelled based on the following numbers of:

- HGVs unloading at the existing HGV unloading building,

- HGV's at the two proposed biomass storage slabs and the proposed pellet silo,
- Associated wheeled loader movements; and
- Rail pass-bys at a northern and eastern location on the track.

The number of HGV and rail deliveries that arrive at WOP station during any given day can vary quite considerably, depending on demand and a long term average is therefore not representative of the busiest periods. It is therefore considered appropriate to model the noise based on a worst case hour where the station is operating at maximum capacity. The number of deliveries over a working day will be considered separately as part of the offsite noise allowing a calculation of the change in HGV traffic noise associated with the site. The numbers of deliveries will also be used to help interpret the number of worst-case hours that could reasonably be expected to occur over a 16-hour day (since there is a technical limit of 12 HGV unloading at the unloading building per hour), thereby allowing a daily noise level to be calculated for comparison with expected noise limits.

In order to arrive at suitable modelling assumptions for a worst-case hour, ESBI have provided information about the limitations of the site (expected maximum number of deliveries unloading per hour) and the expected operational procedures. The information has been interpreted and investigated to find the worst-case combination of operational procedures that will result in the highest noise levels. The predicted HGV operations presented in **Table 9-5** below have been used in calculating the operational noise levels. These are derived from the expected operational activities on site as per **Appendix 4.1** in **Chapter 4**. As shown in **Table 9.5** proposed activities at WOP station has been split into Peat and Biomass operations because it is understood that the plant will be capable of using either fuel but it should be noted that this would never occur at the same time. It is possible that over the course of a 16-hour period, Peat and Biomass could be used to fuel the station separately but the resultant noise level would be somewhere between that predicted for Peat and the slightly higher level predicted for Biomass (not higher than the levels already assessed).

It should be noted that the typical worst-case HGV deliveries is actually predicted to be 20 per hour but that there is currently a technical limitation of no more than 12 HGVs unloading per hour at the HGV unloading building.

In order to calculate an hourly LAeq value it is also necessary to look at the duration of each noise producing activity. It has been assumed that normal HGV deliveries take 20 minutes to unload and deliveries to the pellet silo take 15 minutes to unload. Measurement and observation of the rail tippler highlighted that the actual unloading process is relatively quiet but that the peat wagons make a considerable noise when a moving train is slowed down or stopped and all the wagon linkages interact. Train pass-bys in themselves are not particularly noisy as the engines do not generate a significant amount of noise but manoeuvring (including the noise of starting, slowing down or a stop) generates a significant level

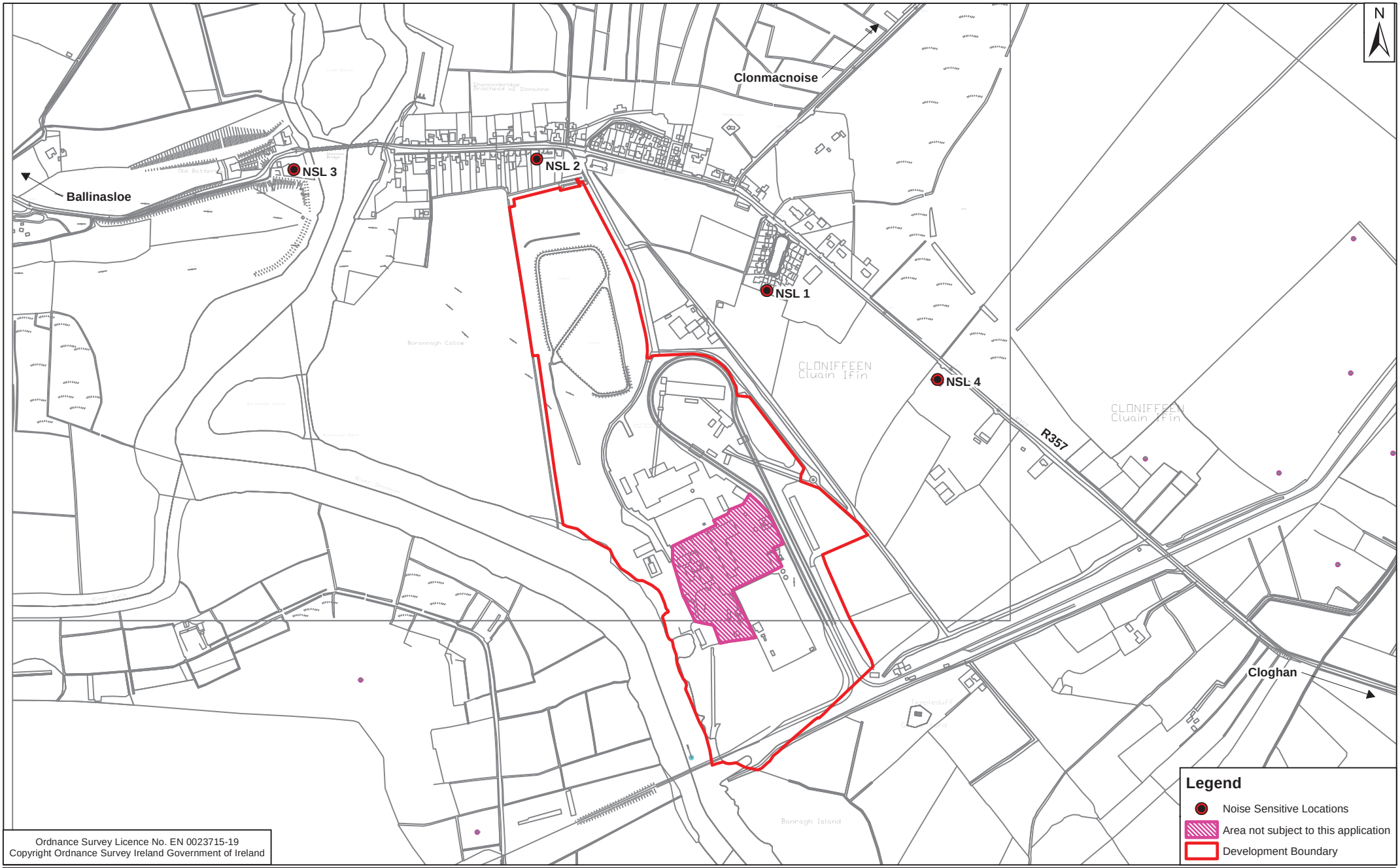
of noise. Train manoeuvres have therefore been modelled and are assumed to be 30 seconds in duration based on observation of the noise sources involved.

Table 9-5: Expected On-site Activity

Delivery Area	Operational Mode[5]	
	Existing operations (Peat only)	**Biomass only**
Road Peat	Maximum of 12 HGVs per hr unloading directly to the existing HGV unloading building or rail tippler	No peat deliveries
Rail Peat	6 trains per hour (3 per tippler)	No peat deliveries
Biomass Road	No Biomass	12 HGVs per hr unloading to the existing HGV unloading building or rail tippler building. Additional max of 3 HGVs per hour delivering to slab A and another 3 HGVs per hour to slab B.
Biomass - Slab A	No Biomass	1 Wheeled Loader filling 3 HGV's which are unloaded at the HGV unloading building
Biomass - Slab B	No Biomass	1 Wheeled Loader filling 3 HGV's which are unloaded at the HGV unloading building
Pellet Silo	No Biomass	4 HGV Deliveries per hour

Predictions have been carried out to determine the level of on-site operational noise (arriving) at four noise sensitive locations (NSLs), three of which are considered in a recent baseline noise survey (AWN Consulting ref. LW/16/8953NR01 dated 6th of June 2016). The fourth NSL is a new house which has recently been constructed to the east of the site (see **Figure 9.1**). It should be noted that, NSL 4 is not considered as part of the noise assessment for the current IEL at WOP station and is now included in this assessment due to the proposed development at Storage Slab B. The grid reference coordinates of the NSLs and the noise sources included in the predictions are presented at Figure 9-1 below. It should be noted that a receiver height of 4m has been used for the predictions at each NSL in order to be representative of a first floor window.

[5] During the co-firing phase, the station will be operating either on 100% biomass or 100% peat.



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PURPOSE OF ISSUE - PRELIMINARY UNLESS INDICATED

CLIENT APPROVAL ☐ PLANNING ☐ TENDER ☐ CONSTRUCTION ☐ AS-BUILT ☐

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CLIENT: ESB

PRODUCTION UNIT: Civil & Environmental Engineering

PROJECT: West Offaly Power, Transition to Biomass

DRAWING TITLE: Figure 9.1- WOP Station Noise Sensitive Locations (NSLs)

CONTRACT

DRAWN	PRODUCED	VERIFIED	APPROVED	APPROVAL DATE
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CLIENT REF.	NO. OF SHEETS	SIZE	SCALE
00-00	00-00	A3	1:7,000

DRAWING NUMBER: QS-000206-01-D460-158

Table 9-6: Locations Used in the Modelling

Description	Irish Grid Coordinates		Height above ground (m)
	Easting	Northing	
NSL 1	197512	225161	4
NSL 2	197051	225424	4
NSL 3	196564	225404	4
NSL 4	197854	224983	4
Chimney (taken as main source of noise for base level)	197362	224776	80
Easterly Train pass-by location	197451	224915	0.5
Northerly Train pass-by location	197364	225031	0.5
Pellet Silo	197309	224931	0.5
Lorry at HGV Unloading Building	197407	224837	0.5
Fan at HGV Unloading Building	197403	224832	3
Wheeled loader location 1 at Slab A	197331	224908	0.5
Wheeled loader location 1 at Slab B	197646	224680	0.5
Wheeled loader location 2 at Slab A	197359	224898	0.5
Wheeled loader location 2 at Slab B	197609	224728	0.5
HGV location at Slab A	197345	224903	0.5
HGV location at Slab B	197640	224687	0.5

Results of the operational noise predictions, including details of the calculations used to arrive at the hourly L_{Aeq} values are provided at **Appendix 9.5**. A Summary of the total predicted noise levels is provided at Section 9.5.

9.2.3.2 Offsite Noise

Outside the site boundary, the change in road vehicle movements has been assessed on the basis of the assumed changes in traffic flow in **Table 9-7**. It should be noted that due to potential scheduling difficulties with biomass deliveries, in periods of abnormal circumstances such as severe weather, there could be as many as 20 HGVs arriving in an hour period but these would then have to park in a holding area until unloading space becomes available according to the limitations set out in **Table 9-7**.

Table 9-7: Assumed Pre- and Post- Development Deliveries

Description	Development Scenario	
	Existing operations (Pre-development)	Peat and Biomass
95th Percentile HGV Movements	74 per day	129 per day
Mean HGV movements	52 per day	100 per day
Current assumed under existing EIS	74 per day	-

The change in rail movements outside the site boundary has not been specifically evaluated as the proposed development will not result in any increase to rail

deliveries and is actually likely to result in a reduction in rail traffic volumes, with no rail traffic movements occurring for the no development scenario. However, in order to enable an assessment of the noise impact related to the associated Ash Disposal Facility (ADF), it is assumed that there will be no reduction in rail movements to the ADF resulting in no change compared with the current operation and no movements for the no development scenario. The current number of trains making ash deliveries to the ADF is estimated to be 3 per day.

9.3 Study Area

9.3.1 West Offaly Power Station

The identified critical noise sensitive locations are identified on **Figure 9.1**. These are all residential in nature and are the nearest such properties to the power station and delivery routes. The study area is limited to the closest properties since any predicted change in noise level, resulting from the change to biomass and continued operation of WOP, will be greatest at these properties.

9.3.2 West Offaly Power Ash Disposal Facility

The ADF has also been considered since there are proposed changes to this facility as part of the development with no activity occurring for the no development scenario. There is ongoing construction work at the ADF in order to develop the landfill cells but these activities will not change as part of the development. Ash is delivered to the site via rail and the proposed changes primarily relate to extending the ADF boundary which is unlikely to change the noise impact of the site itself given its distance to the nearest residential receptors. Therefore, it is only the continued operation of the ADF and a change in the number of rail deliveries to the site which has the potential to affect the noise impact. Noise sensitive locations along the rail route to the ash disposal site have not been specifically identified but potential changes to the noise output along the route have been considered.

9.3.3 Peat and Biomass Supply to West Offaly Power Station

Critical noise sensitive locations relating to off-site delivery on the road network are those on the roadside of the delivery routes. It has been identified that the proposed development will not generate any increase in rail deliveries, with none occurring for the no development scenario, and therefore no critical noise sensitive locations have been identified along the route of rail deliveries.

9.4 Receiving Environment

A recent noise survey, conducted during a shutdown of the WOP station, provides measured noise levels for two out of the four identified Noise sensitive locations (NSL 1 and NSL 2 listed at **Table 9-6**). The AWN consulting report (ref.

LW/16/8953NR01) explains that an equipment failure at NSL 3 meant that data was lost for this location but onsite observations indicated that the noise environment was similar to NSL 2. In order to obtain noise data at this location and NSL4, a similar noise survey has been carried out by Hayes McKenzie which is detailed in a report supplied at **Appendix 9.1**. A summary of the results of the AWN and Hayes Mckenzie baseline noise surveys is presented below at

. In this table the $L_{Aeq,\ 15min}$ represents the average noise level over each 15-minute measurement interval (which is further averaged to give the average for each period of the day) whilst the $L_{A90,\ 15min}$ represents the noise level exceeded for 90% of each interval (the 'background' noise).

Table 9-8: **Baseline Noise Survey Results**

Noise Index		NSL 1	NSL 2	NSL 3	NSL 4
Average $L_{Aeq,\ 15min}$	Day (0700-1900)	49	53	46	43
	Evening (1900-2300)	44	48	44	43
	Night (2300-0700)	46	48	37	35
Average $L_{A90,\ 15min}$	Day (0700-1900)	37	40	36	32
	Evening (1900-2300)	32	35	33	29
	Night (2300-0700)	30	28	22	20

The results of the two noise surveys, undertaken while WOP station was not in operation, indicate that the noise environment at the measurement locations is quite variable in nature. There is a 10-20 dB difference between the L_{A90} and the L_{Aeq} at all times of the day indicating that the noise environment consists mainly of loud transitory events which are most likely to be individual vehicles passing on the main road.

The majority of residential receptors along the rail route to the ADF are relatively close to WOP station and subject to a very similar receiving noise environment. One or two residential receptors are positioned further from WOP station in more rural locations and these are likely to have lower baseline noise levels.

9.5 Impacts of the Development

9.5.1 West Offaly Power Station

9.5.1.1 Construction Noise

On Site Construction Activity

Predicted construction noise levels at the NSLs are all very low due to the large distances involved. In order to provide an absolute worst-case, it has been assumed that construction work continues (using all plant) at all three locations simultaneously (Storage Slab A, Storage Slab B and the Pellet Silo). Even with this assumption the predicted noise levels are 19 dB, 11 dB, 8 dB and 23 dB (L_{Aeq}) at NSL 1, NSL 2, NSL 3 and NSL 4 respectively. These predicted levels are very low and are considered to generate **a neutral imperceptible temporary effect** that is unlikely to cause any noticeable impact at any of the NSLs around the site.

Construction Deliveries

The construction phase of the project is predicted to last for a duration of six to nine months over which time a total of approximately 2138 and 1974 HGV deliveries for ground bearing or piled construction respectively are expected, as detailed in the Construction Methodology (**Appendix 4.2**). This equates to 16 and 15 daily deliveries[6] for the two options respectively. At this stage, it is unclear whether ground bearing or piled construction[7] will be required but there is relatively little difference between either of these options and both have been assessed.

Comparing the predicted numbers of daily construction deliveries with the current number of deliveries associated with operation of the plant (74 HGVs per day), it can be seen that construction deliveries represent an increase of 15-16%. This increase in HGV traffic could generate an increase in noise associated with HGV deliveries of 0.6 dB. This change in noise level is very small and the noise from construction deliveries is considered to generate **a neutral imperceptible temporary effect** that is unlikely to cause any noticeable impact at any of the NSLs around the site.

9.5.1.2 Operational Noise

Operational noise has been modelled based on the proposed continued operation of WOP station. Predicted typical worst-case hourly operational noise levels for both Peat and Biomass operational scenarios are shown at **Table 9-9** below for day, evening and night hours operation. No deliveries are anticipated at night during normal operations which means that only the base level of noise from the plant requires consideration for this period. Should deliveries be required for operational purposes during the nighttime hours these will occur in compliance with the conditions of the IE Licence for the site. It can be seen that the proposed

[6] Assuming 26 weeks in 6 months and a 5 day working week.
[7] Piling may not be required but cannot be ruled out until further investigations have been conducted.

development generates an increase of 7 – 14 dB under Biomass operation compared with the existing operational noise generated through Peat operation. The difference in operational noise between peat and biomass arises due to the delivery, unloading and loading of biomass to the biomass storage slab areas and pellet silos.

Table 9-9: **Predicted Operational Noise**

Location and Scenario		Overall Level $L_{Aeq\ 1hr}$	Level Increase dB
NSL 1	Peat	46.6	0
	Biomass	54.1	7.6
	Night Hours	40.7	0
NSL 2	Peat	35.7	0
	Biomass	43.2	7.5
	Night Hours	35.0	0
NSL 3	Peat	33.4	0
	Biomass	41.4	8.1
	Night Hours	31.3	0
NSL 4	Peat	43.3	0
	Biomass	57.7	14.2
	Night Hours	38.2	0

It is understood that there is currently (and will continue to be) typically up to 12 deliveries unloading per hour at the HGV unloading building[8] and this assumption has been used in deriving the typical worst-case predicted hourly noise levels above. It should be noted that an additional 3 HGVs per hour for each of the biomass storage slabs and 4 HGVs per hour for the pellet silo have also been allowed for in the modelling and that this gives an additional capacity of 10 more HGVs per hour when delivering biomass. The numbers of deliveries described at **Table 9-7** (129 typical worst case – i.e. 95% of absolute maximum possible) indicate that these worst-case hourly noise levels for either Peat (12 HGVs ph) or Biomass (20 HGVs ph) operation could continue (if no mitigation is put in place) for up to 10.75 or 5.86 hours respectively across a 16-hour working day (0700-2300). It is noted that the proposed operation is predicted to have a typical worst case of less than 20 offsite deliveries arriving per hour and that this is therefore likely to limit the biomass operation meaning that the predicted worst-case hourly noise level is most likely to be lower in practice. Based on the worst-case hourly levels continuing for 10.75 and 5.86 out of 16 hours, the equivalent continuous 16 hour noise level ($L_{Aeq,\ 16hr}$) would be 1.7 dB and 4.4 dB lower for Peat and Biomass respectively than the numbers presented at **Table 9-9** above. The existing number of HGV deliveries is a little lower (74) and the predicted, existing, worst-case, hourly noise level could only continue for a little over 6 hours. The resulting equivalent

[8] It should be noted that the actual number of HGV deliveries arriving at WOP station could be up to 20 in a one hour period but these would then need to park up and wait for unloading space to become available.

continuous 16-hour noise level for the existing scenario (peat operation) would therefore be 4.1 dB lower than the hourly predicted level at **Table 9-9**.

It should be noted that for the purposes of comparison between the proposed operation and noise limits derived according to guidance in NG4, the numbers in Table 9-9 for peat and biomass have been converted to a 16-hour L_{Aeq} by subtracting 1.7 dB and 4.4 dB for the two operational modes respectively, as described above. Night-time operation, with no deliveries, is unchanged. It can be seen that whilst converting the worst-case hourly noise levels to 16-hour L_{Aeq} values does reduce the overall predicted noise level at the NSLs, it also alters the difference between the existing and proposed development noise levels. Across a 16-hour day the difference between existing peat operations and the proposed increase in HGV deliveries results in a theoretical increase of 2.4 dB at all NSLs for Peat operation. Comparing the 16-hour Biomass and existing Peat predicted noise levels results in a very small reduction of 0.2 dB to the differences presented at Table 9-9.

There is a considerable change in predicted hourly and daily noise levels for the proposed development, when compared with the predicted existing noise levels. Comparing measured L_{Aeq} noise levels when the power station is not in operation, representing the no development scenario with predictions of existing noise levels, however, shows that they are not dissimilar to the existing level which implies that the full increase in predicted noise levels (for the proposed development) may well be perceptible at the nearest NSLs. It is therefore considered that the development has the potential to generate a **negative, long term significant** impact at the closest noise sensitive locations (houses in the vicinity of NSL1 and NSL4) in the absence of mitigation.

It should be noted that the highest sound power level out of any of the noise sources detailed at Table 9-4 is for a wheeled loader and that the overall level is mainly due to a peak in the 2 kHz octave band. This 2 kHz peak is due to reversing safety alarms on the plant which are a common source of noise complaints for construction sites. Furthermore, the noise from wheeled loaders operating on Storage Slab B is controlling the predicted noise level at the closest NSL (NSL 4) with all other noise sources contributing levels which are at least 18 dB lower.

Benchmark Assessment

This section provides a benchmarking assessment of the proposed development against the EPA Noise Guidance 4 noise criteria for industrial Emission Licenced sites. The proposed continued operation of WOP station has been assessed in terms of the change in predicted noise level but it is also important to look at the absolute predicted noise level in relation to national guidance. If the proposed development is granted a new IE license, the EPA are likely to set noise limits based on the guidance set out in NG4: '*Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities*'. Section 4.4 of NG4 (Setting Limits on Noise Emissions) sets out recommended noise limits for quiet areas, areas of low background noise and all other areas. The screening process to identify the appropriate noise criteria for the site indicates that

none of the NSLs are 'quiet areas' but the results of the baseline noise surveys indicate that all NSLs would be defined as 'areas of low background noise'. It is therefore appropriate to consider the noise criteria for areas of low background noise, as defined in NG4 and reproduced at **Table 9-10** below.

Table 9-10: **NG4 Noise Criteria**

Scenario	Daytime Noise Criterion, dB $L_{Ar,T}$ (07:00 to 19:00hrs)	Evening Noise Criterion, dB $L_{Ar,T}$ (19:00 to 23:00hrs)	Night-time Noise Criterion, dB $L_{Aeq,T}$ (23:00 to 07:00hrs)
Areas of Low Background Noise	45dB	40dB	35dB

It should be noted that during the daytime and evening, the noise criteria are defined as a rating level ($L_{Ar,T}$) which means that impulsive or tonal characteristics of the noise need to be taken into account. Section 5 of NG4 deals with assessing tonal and impulsive noise and whilst impulsive noise is not likely to be a significant issue, it is considered that the reversing alarms on the wheeled loaders would require assessment as a tonal noise source. According to the criteria set out in section 5 it is considered that the reversing alarms would incur a penalty of 5 dB to be added to measured daytime and evening $L_{Aeq,T}$ levels in order to arrive at the $L_{Ar,T}$ for comparison with the recommended noise limits. It should also be noted that NG4 recommends that tonal noise should not be audible at any NSL during the night-time.

Adjusting the predicted worst case hourly noise levels by 1.7 dB (as discussed above) provides worst-case (operating at maximum capacity) 16 hour daytime noise levels. Adding the 5 dB penalty for tonal noise associated with wheeled loaders (that are only required for Biomass operations) converts this average 16 hour daytime level into a rating level that can be compared with the recommended noise limits for both daytime and evening.

Table 9-12 below shows the rating levels and the margins between these and the NG4d limits. **Table 9.12** shows the predicted night hours noise levels and the margins between these and the NG4 limits.

Table 9-11 Compliance with NG4 Noise Criteria (Day & Evening)

	Rating level		Margin Day		Margin Evening	
	Peat	Biomass	Peat	Biomass	Peat	Biomass
NSL 1	45.4	55.1	-0.4	-10.1	-5.4	-15.1
NSL 2	35.5	44.8	9.5	0.2	4.5	-4.8
NSL 3	32.8	42.7	12.2	2.3	7.2	-2.7
NSL 4	42.2	58.4	2.8	-13.4	-2.2	-18.4

Table 9-12: **Compliance with NG4 Noise Criteria (Night)**

	Night Noise Level		Margin	
	Peat	Biomass	Peat	Biomass
NSL 1	40.7	40.7	-5.7	-5.7
NSL 2	35.0	35.0	0	0
NSL 3	31.3	31.3	3.7	3.7
NSL 4	38.2	38.2	-3.2	-3.2

A comparison against recommended limits in NG4 indicates that peat operations are within the acceptable criteria at all locations, except for NSL 1 and NSL 4 during the evening and night periods. For biomass operations it can be seen that rating levels exceed the criteria by around 10 – 13 dB during the day and 2 – 18 dB during the evening. Limits are exceeded by the greatest amount at NSL 1 and NSL 4, for biomass operation and due to the lower evening noise limits, the amount by which the limits are exceeded is greater during this time period. The exceedances of the night-time limit for biomass operation are the same as for peat.

It is clear that both Peat and Biomass operations have the potential to exceed benchmark criteria set out in NG4. Biomass operations are predicted to generate higher levels of noise and the amount by which the limits are exceeded for this new fuel type is considered to generate a **very significant, negative long term effect**. Proposed mitigation measures to reduce the predicted noise levels within the benchmark criteria are set out in section 9.6 below.

9.5.2 West Offaly Power Ash Disposal Facility

The number of rail movements to the ADF is not predicted to change (discussed at 9.2.3.2) and although there is potential for the number to reduce when operating using Biomass, the quantity of ash can vary considerably depending on the specific fuel that is used. Even if fewer rail movements did occur, given the small numbers of movements (3 per day) this would only ever be perceived as fewer trains rather than lower noise levels if indeed it was noticed at all. Given the remote location of the ADF (the nearest noise sensitive location being c.1.8 km distance from it) and the infrequent operation of the ash deliveries no significant noise impact from the continued operation of the ADF is expected.

In terms of road traffic noise generated through movements relating to workers, the ADF will only employ two full time workers and, as such, the volume of traffic will be very low. It should also be noted that there will be no change to the volume of road traffic when compared to the current operations at the ADF.

9.5.3 Decommissioning Phase

At the end of the life of WOP station, a decommissioning process would take place to restore the site to a similar state to that which it was in before the station was constructed. It is likely that demolition of the building would generate the most noise but given the careful deconstruction techniques that would be employed, it is most likely that vehicle movements removing material from the site would be the main noise source.

Assuming the use of one Lorry with lifting boom 50kW (as defined at table C.4 of BS5228) for collecting and removing material as part of the decommissioning process it is possible to calculate typical noise levels. Even with the lorry operating on Slab B at the closest location to NSL 4 (closest residential receptor to the site), the predicted noise level does not exceed 10 dB L_{Aeq} which is considered to be a **neutral, imperceptible temporary effect.**

The ADF would also go through a decommissioning process but this would not involve any additional work over and above the ongoing construction work at the site. The open cells would be capped once operation at WOP station had ceased and all buildings at the site would be removed. Any demolition noise associated with removing buildings from the ADF would be considerably further away from residential receptors than such activities at the main WOP site and the impact can therefore be considered to be lower and also **a neutral, imperceptible temporary effect.**

9.5.4 Peat and Biomass Supply to West Offaly Power Station

The change in traffic noise levels on nearby local roads, relating specifically to HGV deliveries at WOP Station, can be determined through analysing the change in traffic volume. The actual change in traffic noise levels would also depend upon the existing volume of non-WOP-station traffic but as a worst-case, analysing the change WOP station HGV deliveries gives a maximum percentage increase that will not be exceeded in practice. The change in HGV movements and the resulting increases in traffic noise are shown at Table 9-13 below. It can be seen that the increase in WOP Station related traffic noise is in the range of 2-3 dB but it should be noted that in the context of non-WOP-station traffic the actual increase would be much smaller than this.

Table 9-13: **Traffic Noise Increase**

Index	HGVs per day		Increase	
	Existing	Biomass and Peat	Percentage	Noise (dB)
95th percentile	74	129	74.3%	2.4
Mean	52	100	92.3%	2.8

It is commonly accepted that 3 dB is the minimum perceptible change in noise level and in this context the road traffic noise increase is likely to be imperceptible. The change in noise at the side of the rail delivery route is considered likely to decrease

rather than increase and has therefore not been considered. The change in traffic noise levels due to deliveries at WOP Station is considered to be a neutral, imperceptible long term effect.

9.5.5 Do-Nothing (No Development) Scenario Impact

In the do nothing scenario, WOP station will close by the end of 2020, with all rail and road deliveries ceasing. At a specific date in the future the plant would be decommissioned as per the requirements of the EPA Decommissioning Management Plan and Closure, Restoration and Aftercare Management Plan. This involves for the station, emptying and cleaning of all drainage, pipe work and storage tanks, removal of contaminated material to a licensed waste handling facility. Following decommissioning the site would then be demolished to ground level (in line with existing planning permission conditions) with all recyclable materials sent off site for recovery and other waste materials to a licensed waste handling facility. The operational noise would therefore cease but there would be noise associated with the decommissioning process as discussed at section 9.5.3 above.

Therefore, the do nothing scenario will result in no more operational noise output with the only residual effect being related to decommissioning noise which is considered to be **a neutral, imperceptible temporary effect**.

9.6 Mitigation

The predicted continued operation and change in operational noise levels have been shown to have the potential to generate a very significant negative long term impact at the nearest noise sensitive locations. This impact is considered to be mainly linked to the use of wheeled loaders with tonal reversing alarms on Storage Slab B as stated at section 9.5.1.1 above. The absolute predicted worst-case noise levels are also found to exceed recommended noise limits from NG4 and it is therefore considered that mitigation will be required to reduce the noise emissions to an acceptable level. It should be noted that predicted levels are based on the best available information including measured sound power levels of proposed plant but that in practice, alternative plant may be selected resulting in lower levels of noise emission. The proposed mitigation measures have therefore been provided to demonstrate that the NG4 day and evening hours limits can be met and that the impact can be reduced but, in practice, mitigation requirements may change and monitoring as required by the station's IE Licence will confirm operations within the limits and would identify any noise limit exceedance.

When the site is considered with no development (i.e. the existing station does not exist), the nearest noise sensitive locations could be described as being in a low noise environment albeit that this low noise environment has not existed for a very many years because of the existence of the current and previous operation at WOP. The predicted noise impact at these locations indicates an exceedance of

the NG4 Guidance night hours noise limit, despite the fact that the operational noise would be the same as for the current station which has been shown to comply with the ‘all other areas ’NG4’” limits. The predicted noise impact has, in effect, been in existence since commencement of the current operations in 2005, in compliance with its existing IE Licence, with the site being used for power generation since the 1960s.

Under the proposed development there will be no change to the current night-time operational noise levels currently experienced at the nearest noise sensitive locations, and hence no additional mitigation is currently proposed for the nighttime operational period.

The noise predictions have been based upon measurements of on-site use of a wheeled loader rather than typical sound power levels for a wheeled loader and this gives more accurate results. Since no measurements were obtained where the wheeled loader was not using the reversing alarm it is difficult to exactly quantify the effect this has on the predicted noise levels. However, removing the obvious peak in the sound power levels at 2 kHz is estimated to provide 3-4 dB of reduction at the nearest NSLs. Furthermore, removing the 2 kHz tone would also remove the 5 dB tonal penalty incurred by this noise source, reducing the rating level (for comparison with NG4 limits) by 8-9 dB in total. This is a well-known problem with tonal reversing alarms which can be solved by using an alternative alarm system and it is recommended that an alternative reversing alarm which uses a white noise signal be employed. For example the bbs-tek white sound reversing alarm from Brigade Electronics is a ‘white sound’ alarm which meets the challenge of providing safety whilst eliminating noise complaints by dissipating quickly outside of the hazard zone. This type of alarm does not contain the distinctive tonal element that would require a 5 dB penalty according to NG4, yet it would still provide the same alerting effect. The use of this type of alarm or its equivalent would provide appropriate mitigation and will be implemented on the wheeled loaders used onsite.

For NSL 1, NSL 2 and NSL 3, removal of the tonal reversing alarm would be likely to reduce the predicted change in noise level (for biomass operations rather than peat) to 3 – 4 dB which is only of marginal significance. This would also reduce the rating level such that recommended noise limits could be met at NSL 2 and NSL 3. However, the predicted change in noise level and the amount by which the noise limits are exceeded are considerably greater at NSL 1 and NSL 4 indicating that additional mitigation will be required to further reduce the noise impact at these locations.

The location of Storage Slab B provides no acoustic shielding in the form of buildings between the wheeled loader operations and NSL 4 and in this respect there is scope to introduce an acoustic barrier at Storage Slab B to mitigate the noise of the wheeled loader operations. The effectiveness of an acoustic barrier would depend upon the relative location of a wheeled loader and generally speaking it would be more effective for operations closer to the barrier. However, it is considered that through careful planning of operations and use of an appropriate barrier it should be possible to provide sufficient mitigation. Predictions indicate that

a 3.6 m high barrier around the perimeter of Storage Slab B would offer 11 and 13 dB reduction to the level of noise arriving at NSL 1 and NSL 4 respectively, for a wheeled loader operating at the centre of the Slab.

In order to mitigate noise impacts and ensure compliance with the EPA NG4 Guidance noise limits for day and evening periods, the following will therefore be implemented as appropriate:

- A noise barrier such as the proposed 3.6m high 'Alphabloc' system detailed on the drawing entitled 'Biomass Storage Slab B Proposed Layout Plan' (QS-000206-01-D460-034) will be installed at Slab B and is considered appropriate for this purpose (providing the predicted reduction in noise levels discussed above)
- Limiting wheeled loader use on Storage Slab B to daytime hours only (as defined in NG4).
- Fitting all wheeled loaders with 'white sound' reversing alarms such as those supplied by Brigade Electronics or equivalent.
- It is expected that the noise limits set in any revised licence by the EPA will be in line with those specified in NG4 for the day and evening periods, against which this development has been assessed, and the station will comply with the IE Licence requirements with respect to noise. It is expected that noise limits will be set in any revised IE Licence by the EPA and as such all operations on site will be undertaken in a manner that ensures that the EPA IE Licence noise limits for daytime, evening time and night-time will not be exceeded. This will be achieved by:
    - Scheduling appropriate peat and biomass fuel deliveries and handling appropriately as demonstrated by appropriate noise monitoring as per the requirements of the IE Licence required to operate the facility.
    - Investigation of mitigation to overall operational noise from the plant, excluding deliveries, for the night hours period, as required by any new licence.

Through introducing the mitigation suggested above, the change in predicted worst-case hourly noise levels could be reduced to around 0 dB at NSL 1 and NSL 4 but would still be in the region of 2 – 3 dB for NSL 2 and NSL 3. This will result in a **slight negative impact** at these noise sensitive locations at the start of new operations but, through inclusion of the mitigation measures, the recommended IE Licence limits would be met during the daytime and evening hours for its continued operation. There may however, be a slight on-going negative impact at night but this will be no more than exists at present.

9.7 Difficulties Encountered in Compiling Information

There are a number of difficult aspects to preparing a noise assessment of this kind. The most difficult thing to take account of is the variability of the noise that is

produced on-site. When noise is produced by moving plant, assumptions have to be made about the worst-case location for that plant to ensure that the noise is not under-predicted. However, when there are a number of potential operational modes and variable traffic on-site it is necessary to first assess the worst-case mode of operation to ensure that noise is not under-predicted or misrepresented. The information compiled for the purposes of determining the worst-case operational modes has been part of a two way dialogue between ESB and Hayes McKenzie whereby the assumptions that have been arrived at have been agreed to ensure that they are realistic. This process is a necessary part of preparing the noise assessment but it should be noted that the assessment is based on information about operations and operational traffic (HGV deliveries) as provided in **Chapter 4**.

9.8 Residual Impacts

The proposed mitigation identified at section 9.6 reduces the predicted noise level below the recommended noise limits within NG4 which is considered to generate a **neutral not significant effect.** There are still some predicted increases in noise output for the site particularly related to increased HGV fuel deliveries when operating using biomass rather than peat. However, it has been estimated that a change in noise level of no more than 2 – 3 dB could be achieved through mitigation and this is considered to be a **negative, imperceptible long term effect**.

9.9 Cumulative Impact

In terms of cumulative noise impacts with the other large peat fired generating stations and their associated ash disposal facilities Lough Ree Power and Edenderry Power Limited, these are located circa 50 km and 60 km from WOP and as such cumulative noise impacts will not arise.

Other peat harvesting activities are carried out by Bord na Móna in relation to Lough Ree Power and Edenderry Power Limited and Bord na Móna also harvest peat for other end uses (e.g. horticulture). Third-party harvesting of peat also occurs on bogs throughout the Midlands both at commercial (horticulture) and small scale (domestic fuel) level. In terms of noise associated with these peat harvesting activities this would be cumulative in nature. These activities will not add to the noise impact considered here.

The nearest recent industrial development that was granted planning consent early this year (2018), is an energy storage (battery) facility operated by Lumcloon Energy (Offaly County Council ref: 17/278) which is adjacent to the WOP site. The ecological report submitted with the Lumcloon Energy planning application includes very little information on noise, simply stating that low levels of noise will be generated by HVAC units installed at the site. Given the lack of information about the noise output or the HVAC units, it is not possible to carry out direct prediction of cumulative noise levels. The battery units are described as Lithium ion which are normally air cooled and produce broadband noise which could have accumulative

effect. However, these will be housed within a single story metal clad building which will ensure no significant cumulative noise emission will occur. No specific noise reduction requirements were included in the Lumcloon planning permission. All other industrial developments are significantly more than 8 km away and are therefore considered to contribute even less than the ash disposal facility.

No other cumulative assessment is required as there are no other comparable industrial noise sources within 2 km of the WOP site or the associated ADF which could be incorporated into such an assessment. Noise sources more distant than 2 km are considered to be a sufficient distance away that cumulative noise impact would be negligible. In this regard cumulative consideration of WOP and the ADF is not required.

9.10 References

- ISO 9613-2 (1996) Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation
- ISO 9613-1 (1993), Acoustics - Attenuation of sound during propagation outdoors - Part 1: Calculation of the absorption of sound by the atmosphere
- BSI (2009) British Standard BS 5228:2009, Code of Practice for Noise and Vibration Control on Construction and Open Sites
- EPA (2016) Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4)