# 8. NOISE AND VIBRATION

## 8.1 Introduction

This Chapter of the EIS assesses the likely effects/impacts of noise and vibration for the N9/N10 proposed road development. This section covers a length of approximately 70km (including a 6.2km stretch of single carriageway road along the Kilkenny link road) from a tie-in with the proposed N25 Waterford City Bypass Project, close to the River Blackwater in County Kilkenny to a tie-in with the existing N9 in Powerstown south of Carlow Town. This northern tie-in is also the terminus of the proposed N9/N10 Kilcullen to Powerstown Scheme.

The various noise and vibration issues associated with the overall road development will be addressed in three sections as follows:

- Section A – Waterford to King's River (Start of scheme to chainage 31+540m);
- Section B – King's River to Ballyquirke (Chainage 31+540m to 49+200m – including Kilkenny Link Road chainage 1+000m to 7+200m); and
- Section C – Ballyquirke to Powerstown (Chainage 60+000m to 76+400m)[1].

A link road to Kilkenny City is also included from Blanchfieldsland east of the city to a new junction with the proposed N9/N10 at Dunbell, a distance of approximately 6.2km.

This Chapter includes an assessment of the likely effects/impacts associated with both construction and operational phases of the proposed road development.

## 8.2 Design Goals for Specifying Mitigation Measures

For new roads in Ireland, it is standard practice to adopt traffic noise design goals contained within the NRA document *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*[2].

This document specifies that the Authority (i.e. NRA) considers it appropriate to set a design goal for Ireland as follows:

- day-evening-night 60dB $L_{den}$ (free field);

This design goal represents a more onerous limit value than that which has typically been employed in Ireland to date[3].

Noise mitigation measures are deemed necessary whenever the following three conditions are satisfied:

a) the combined expected maximum traffic noise level, i.e. the relevant noise level, from the proposed road development together with other traffic in the vicinity is greater than the design goal;

b) the relevant noise level is at least 1dB more than the expected traffic noise level without the proposed road development in place, and;

c) the contribution to the increase in the relevant noise level from the proposed road development is at least 1dB.

These conditions will ensure that mitigation measures envisaged are based upon the impact of the road development under consideration.

The Design Goal is applicable to new road developments only. In EIS terms, this means that it is to be applied to existing receptors in respect of both the year of opening and the design year (i.e. 15 years after projected year of opening).

It is stated that the Authority acknowledges that it may not always be sustainable to achieve this design goal. In such circumstances, nevertheless, a structured approach should be taken in order to ameliorate as far as practicable road traffic noise through the consideration of measures such as alignment changes and the use of various barrier types (e.g. earth bunds, fencing, or combinations, etc).

## 8.3 Noise Assessment Methodology

In order to assess the noise impact of any proposed road development, the following methodology is normally adopted.

1 Chainage between 49+200m and 60+000m are not used in the study.

2 *Guidelines for the Treatment of Noise and Vibration in National Road Schemes, 2004*, National Roads Authority.

3 To date, best practice in Ireland has involved a design goal of 68dB(A) $L_{10(18hour)}$ based on UK guidance, ref. *The Noise Insulation Regulations 1975*, UK Department of the Environment, S.I. No. 1763 of 1975.

The first stage is to assess and quantify the noise environment in the vicinity of sensitive receptors that may be affected by the proposed road development. In the case of a road scheme, the selected noise-sensitive locations are likely to be those in closest proximity. Both the construction and operational phases of the scheme should be reviewed when selecting appropriate measurement locations.

Where possible, the noise levels resulting from both the construction and operational phases are then calculated using established prediction techniques. Refer to section 8.7 for further discussion of construction noise.

Traffic noise levels are predicted in accordance with guidance set out in *Calculation of Road Traffic Noise (CRTN)*[4], giving results in the form of $L_{10(18hour)}$ values. These are then converted to $L_{den}$ values in accordance with the procedures detailed in the NRA guidance. The derived value for $L_{den}$ has been rounded to the nearest whole number, with 0.5 being rounded up.

The predicted values are then assessed against the three conditions set out in section 8.2 in order to assess the need for mitigation measures.

## 8.4 Description of Existing Noise Conditions

### 8.4.1 Environmental Noise Survey

A series of environmental noise surveys were conducted in order to quantify the existing noise environment in the vicinity of noise-sensitive locations that may be affected by the proposed road development.

### 8.4.2 Survey Methodology

**Unattended Measurement**

Unmanned continuous measurement was performed over a 24-hour period at fifteen locations. Attended measurements were also performed at the unattended locations and at five additional locations in the vicinity of each attended measurement location. $L_{A10(18hour)}$ values were derived from the results of the continuous monitoring by taking the arithmetic average of the eighteen hourly sample values between 06:00hrs and 24:00hrs.

$L_{day}$, $L_{evening}$, $L_{night}$ and $L_{den}$ values were derived directly from the measured data once appropriate corrections were made where necessary.

**Attended Measurement Procedure**

The bulk of the survey work was conducted generally in accordance with the Shortened Measurement Procedures laid down in CRTN.

When surveying traffic noise, the acoustical parameters of interest are $L_{A10(1hour)}$ and $L_{A10(18hour)}$, expressed in terms of decibels (dB) relative to $2x10^{-5}$Pa. The value of $L_{A10(1hour)}$ is the noise level exceeded for just 10% of the time over the period of one hour. $L_{A10(18hour)}$ is the arithmetic average of the values of $L_{A10(1hour)}$ for each of the one hour periods between 06:00 and 24:00hrs. $L_{A10(18hour)}$ is the parameter typically used in Ireland for the purposes of assessing traffic noise.

The Shortened Measurement Procedure presents a method whereby $L_{A10(18hour)}$ values are obtained through a combination of measurement and calculation as follows:

- noise level measurements are undertaken at the chosen location over three consecutive hours between 10:00 and 17:00hrs;
- the duration of the sample period during each hour is selected to encompass sufficient traffic flows to ensure reliable results; and
- the $L_{A10(18hour)}$ for the location is derived by subtracting 1dB from the arithmetic average of the three hourly sample values, i.e. $L_{A10(18hour)} = ((\sum L_{A10(1hour)}) \div 3) - 1$ dB.

The methodology referred to in section 8.3 may then be used to derive values for $L_{day}$, $L_{evening}$, $L_{night}$ and $L_{den}$.

### 8.4.3 Choice of Measurement Locations

Fifteen unattended and ninety attended measurement locations were selected in total, taking into account the existing noise climate and proximity to the proposed roads.

The survey locations are described in Table 8.1 and shown on Figures 8.2 to 8.11.

### 8.4.4 Survey Periods

Table A8.1 of Appendix 8.1 outlines the dates associated with the survey work carried out for this assessment.

[4] *Calculation of Road Traffic Noise*, Department of Transport Welsh Office, HMSO, 1988

### 8.4.5 Instrumentation

Noise level measurements conducted in accordance with the Shortened Measurement Procedure were performed using a Brüel & Kjær Type 2260 Sound Level Meter. The continuous measurements were performed using a Brüel & Kjær Type 3592 Environmental Kit and a Brüel & Kjær Type 2238 Sound Level Meter. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator.

### 8.4.6 Procedure

Shortened measurements were conducted at survey locations on a cyclical basis. Sample periods were 15 minutes. The results were noted onto a Survey Record Sheet immediately following each sample and were also saved to the instrument memory for later analysis where appropriate. Survey personnel noted all primary noise sources contributing to noise build-up.

For 24-hour monitoring, sample periods were 1-hour long. The results were saved to the instrument memory for later analysis.

### 8.4.7 Results

The survey results are presented in terms of the following three parameters.

**$L_{Aeq}$** is the A-weighted equivalent continuous steady sound level during the sample period and effectively represents an average value.

**$L_{A90}$** is the A-weighted sound level that is exceeded for 90% of the sample period; generally used to quantify background noise.

**$L_{A10}$** is the A-weighted sound level that is exceeded for 10% of the sample period; this parameter gives an indication of the upper limit of fluctuating noise such as that from road traffic.

The results for all ninety locations are presented in Tables A8.2 to A8.17 of Appendix 8.1. The derived $L_{A10(18hour)}$ and $L_{den}$ values, are presented in Tables 8.1 and 8.2, to the rear of this Chapter of the EIS.

<u>Section A – Waterford to King's River</u>

*S01*
A property just west of the proposed road was the position for a 24hour monitoring location and an associated attended measurement position.

Noise levels at the fixed unattended meter during day were in the range 59 to 66dB $L_{Aeq}$ and were influenced by traffic noise on the existing N9. Noise levels during the night were in range 49 to 58dB $L_{Aeq}$.

Noise levels during the day at the attended measurement location were in the range 60 to 69dB $L_{Aeq}$ and 65 to 66dB $L_{A10}$. As with the unattended measurements traffic noise was the dominant source. The derived $L_{A10(18hour)}$ is 64dB.

*S02*
This position was near a barn and a ruined building some 150m east of the existing road, lying to the east of the proposed road. Noise levels were dominated by traffic on the road and the occasional passage of trains. Noise levels were in the range 53 to 55dB $L_{Aeq}$ and 56 to 58dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 56dB.

*S03*
This position was adjacent to a private house near the eastern side of the proposed road. Distant traffic was audible. A small number of vehicle movements were noted on the local road. A dog barking nearby was also noted occasionally. Noise levels were in the range 48 to 50dB $L_{Aeq}$ and 45 to 51dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 46dB.

*S04*
This position was adjacent to a private house near the western side of the proposed road. A small number of vehicle movements were noted on the local road. A dog barking nearby was also noted occasionally. Noise levels were in the range 43 to 47dB $L_{Aeq}$ and 45 to 47dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 45dB.

*S05*
This position was in a field next to a private house, to the east of the proposed road. Audible noise sources included birdsong and distant traffic. Isolated vehicles including tractors working in adjacent field and trucks on the nearby local road were also noticeable. Noise levels were in the range 41 to 60dB $L_{Aeq}$ and 44 to 62dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 50dB.

*S06*
This position was at the side of a local road, adjacent to a private house, to the west of the proposed road. The dominant source of noise was passage of occasional vehicles, including tractors and trucks along the local road. Distant traffic on the existing N9 was also audible. Noise levels were in the range 52 to 59dB $L_{Aeq}$ and 50 to 57dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 52dB.

*S07*
A residential house in Ballykillaboy, east of the proposed road, was the position for a 24hour monitoring location and an associated attended measurement position.

Noise levels at the fixed unattended meter during day were in the range 43 to 55dB $L_{Aeq}$ and were influenced by rural farming noise and distant traffic noise from the N9. Noise levels during the night were in the range 30 to 44dB $L_{Aeq}$.

Noise levels during the day at this attended measurement location were in the range 39 to 51dB $L_{Aeq}$ and 39 to 48dB $L_{A10}$. Children playing, local traffic, tractors and distant traffic noise were noted. The derived $L_{A10(18hour)}$ is 44dB.

*S08*
This position is west of the proposed alignment and close to the village of Kilmacow. Noise levels during the day at this measurement location were in the range 50 to 52dB $L_{Aeq}$ and 54 to 55dB $L_{A10}$. Traffic noise from the N9 was the primary contributor to these noise levels. The derived $L_{A10(18hour)}$ is 53dB.

*S09*
This position is west of the proposed alignment and close to the village of Kilmacow. Noise levels during the day at this measurement location were in the range 45 to 58dB $L_{Aeq}$ and 47 to 51dB $L_{A10}$. Traffic noise from the N9 was the dominant noise source although local traffic movements and dogs barking were also noted. The derived $L_{A10(18hour)}$ is 49dB.

*S10*
This position is west of the proposed alignment and close to the village of Kilmacow. Noise levels during the day at this measurement location were in the range 42 to 47dB $L_{Aeq}$ and 44 to 50dB $L_{A10}$. Traffic noise from N9 was the dominant contributor. Birds in trees, local traffic and dogs barking also contributed to the noise level at this location. The derived $L_{A10(18hour)}$ is 46dB.

*S11*
This position is east of the proposed alignment and close to the village of Kilmacow. Noise levels during the day at this measurement location were in the range 39 to 43dB $L_{Aeq}$ and 42 to 44dB LA10. Traffic noise from the N9 was only a distant noise source although constant in nature. A farmer ploughing nearby, birds in trees, local traffic and dogs barking also contributed to noise levels. The derived $L_{A10(18hour)}$ is 42dB.

*S12*
This position is east of the proposed alignment and close to the village of Kilmacow. Noise levels during the day at this measurement location were in the range 36 to 40dB $L_{Aeq}$ and 38 to 42dB $L_{A10}$. Traffic noise from the N9 was only a distant noise source although constant in nature. Local traffic and wildlife contributed were also noted as noise sources. The derived $L_{A10(18hour)}$ is 39dB.

*S13*
A private residence in the townland of Rahard east of the proposed road was the location for a fixed 24-hour noise survey. Noise levels at the unattended meter during day were in the range 47 to 58dB $L_{Aeq}$ and were influenced by local traffic, dogs barking, distant traffic noise from the N9 and train noise from the Waterford to Dublin Railway. Noise levels during the night were in range 24 to 39dB $L_{Aeq}$.

Noise levels during the day at the associated attended measurement location were in the range 46 to 50dB $L_{Aeq}$ and 47 to 52dB $L_{A10}$. Occasional local traffic movements and tractor noise also influenced these noise levels. The derived $L_{A10(18hour)}$ is 48dB.

*S14*
This position is just east of the proposed alignment and south of Mullinavat. Noise levels during the day at this attended measurement location were in the range 36 to 61dB $L_{Aeq}$ and 38 to 56dB $L_{A10}$. Traffic noise from the N9 was only a distant noise source although constant in nature. Local tractor activities contributed to the 61dB $L_{Aeq}$ level during the first measurement. For the remainder it was distant traffic and trains on the Waterford to Dublin line. The derived $L_{A10(18hour)}$ is 43dB.

*S15*
This position is just west of the proposed alignment and south of Mullinavat. Noise levels during the day at this attended measurement location were in the range 37 to 59dB $L_{Aeq}$ and 39 to 45dB $L_{A10}$. Traffic noise from the N9 was only a distant noise source although constant in nature. Trains on the Waterford to Dublin line were also noted as a noise source at this location. The derived $L_{A10(18hour)}$ is 41dB.

*S16*
This position is just west of the proposed alignment and south of Mullinavat. Noise levels

during the day at this attended measurement location were in the range 44 to 46dB $L_{Aeq}$ and 46 to 49dB $L_{A10}$. Distant traffic noise from the N9 and trains on the Waterford to Dublin line were the dominant noise sources noted. The derived $L_{A10(18hour)}$ is 46dB.

*S17*
This position is west of the proposed alignment and south of Mullinavat. Noise levels during the day at this attended measurement location were in the range 49 to 53dB $L_{Aeq}$ and 52 to 53dB $L_{A10}$. Traffic noise from N9 was the dominant noise source and was constant in nature. Trains on the Waterford to Dublin line also contributed to the noise climate. The derived $L_{A10(18hour)}$ is 52dB.

*S18*
This position is east of the proposed alignment and south of Mullinavat. The derived $L_{A10(18hour)}$ is 49dB.Noise levels during the day at this attended measurement location were in the range 47 to 49dB $L_{Aeq}$ and 49 to 51dB $L_{A10}$. Traffic noise from the N9 was the dominant noise source and constant in nature. Trains on the Waterford to Dublin line also contributed to the noise climate. The derived $L_{A10(18hour)}$ is 49dB.

*S19*
A private residence east of the proposed alignment and close to the village of Mullinavat was the location for this 24-hour survey.

Noise levels at the fixed unattended meter during day were in the range 46 to 52dB $L_{Aeq}$ and were influenced by local traffic, distant traffic noise from the N9 and train noise from Waterford to Dublin Railway. Noise levels during the night were in range 31 to 49dB $L_{Aeq}$.

Noise levels during the day at the associated attended measurement location were in the range 44 to 47dB $L_{Aeq}$ and 44 to 50dB $L_{A10}$. Local traffic, tractors and distant traffic noise generated these noise levels. The derived $L_{A10(18hour)}$ is 45dB.

*S20*
Noise levels during the day at this attended measurement location were in the range 51 to 57dB $L_{Aeq}$ and 49 to 53dB $L_{A10}$. Traffic noise from the N9 was the dominant noise source and was constant in nature. Trains on the Waterford to Dublin line also contributed to the noise climate at this location. The derived $L_{A10(18hour)}$ is 49dB.

*S21*
This position is west of the proposed alignment and in the centre of the village of Mullinavat on the N9. Noise levels during the survey periods were dominated by passing traffic on the N9 and were in the range 72 to 73dB $L_{Aeq}$ and 75 to 77dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 75dB.

*S22*
This position is west of the proposed alignment and just east of the village of Mullinavat close to the Catholic Church. Noise levels during the survey periods were dominated by passing traffic on the N9 and some local traffic. Levels were in the range 53 to 63dB $L_{Aeq}$ and 52 to 57dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 52dB.

*S23*
This position is west of the proposed alignment and just south of the village of Mullinavat. Noise levels during the survey periods were dominated by passing traffic on the N9 and were in the range 50 to 58dB $L_{Aeq}$ and 49 to 54dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 51dB.

*S24*
This position is west of the proposed alignment and adjacent to the Waterford – Dublin railway line. Noise levels during the survey periods were dominated by passing trains, traffic on the N9 and occasional local traffic movements. Noise levels were in the range 46 to 57dB $L_{Aeq}$ and 48 to 52dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 48dB.

*S25*
A private residence in Mullinavat, east of the proposed alignment and close to the village of Mullinavat was the location for this 24-hour survey.

Noise levels at the fixed unattended meter during day were in the range 47 to 51dB $L_{Aeq}$ and were influenced by local traffic, distant traffic noise from N9 and train noise from Waterford to Dublin Railway. Noise levels during the night were in range 34dB to 51dB $L_{Aeq}$.

Noise levels during the day at the associated attended measurement location were in the range 49 to 52dB $L_{Aeq}$ and 53 to 55dB $L_{A10}$. Local traffic and N9 traffic and train noise contributed to these levels. The derived $L_{A10(18hour)}$ is 53dB.

*S26*
This position was at the entrance to the grounds of a house at the north end of Ballylusky, to the west of the proposed road. The dominant noise source was birdsong. The existing N9 was audible in this distance. Noise levels were in the

range 44 to 50dB $L_{Aeq}$ and 47 to 53dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 49dB.

*S27*
This position was in a field adjacent to a house in Ballylusky, to the west of the proposed road. The existing N9 was audible in the distance. Noise levels were of the order of 51dB $L_{Aeq}$ and in the range 54 to 55dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 53dB.

*S28*
This position was in the grounds of a house in Ballylusky, to the west of the proposed road. The existing N9 was audible in the distance. Noise levels were in the range 49 to 50dB $L_{Aeq}$ and 52 to 53dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 52dB.

*S29*
This position was in a field adjacent to a house at the southern end of Ballylusky, west of the proposed road. The existing N9 was audible in the distance. Noise levels were in the range 49 to 60dB $L_{Aeq}$ and 50 to 55dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 51dB.

*S30*
This position was in the yard at the side of a private house, east of the proposed road, approximately 200m distant from the R704. The existing N9 was audible in the distance. Vehicles on the local road were also audible at this location. Noise levels were in the range 46 to 60dB $L_{Aeq}$ and 49 to 55dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 52dB.

*S31*
Knockmoylan west of the proposed alignment was the location for this 24-hour survey. Noise levels at the fixed unattended meter during day were in the range 40 to 54dB $L_{Aeq}$ and were influenced by machinery from a nearby farmyard and also neighbouring farms. Noise levels during the night were in range 31 to 48dB $L_{Aeq}$.

Noise levels during the day at the associated attended measurement location were in the range 40 to 48dB $L_{Aeq}$ and 42 to 52dB $L_{A10}$. Farm noise, dogs barking and occasional local traffic noise contributed to these levels. The derived $L_{A10(18hour)}$ is 47dB.

*S32*
This position is east of the proposed alignment on the roadside. Noise levels during the survey periods were dominated by occasional passing traffic, cattle and bird song. Noise levels were in the range 51 to 64dB $L_{Aeq}$ and 53 to 58dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 54dB.

*S33*
This position is just east of the proposed alignment in the farmyard of a residential property. Contributors to noise build up at this location during the survey periods included distant traffic noise, birdsong and a tractor operating in the distance. The levels were in the range 42 to 44dB $L_{Aeq}$ and 43 to 46dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 43dB.

*S34*
This position is just east of the proposed alignment in the garden of a residential property. Noise sources noted during the survey periods were very occasional passing traffic, birdsong and farm machinery operating in the distance. The levels were in the range 42 to 49dB $L_{Aeq}$ and 44 to 51dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 47dB.

*S35*
This position is east of the proposed alignment in the garden of a residential property and close to the existing N9. The noise climate during the survey periods was dominated by passing traffic along the N9 and occasional local traffic movements. Noise levels were in the range 52 to 53dB $L_{Aeq}$ and 56 to 57dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 55dB.

*S36*
This position is west of the proposed alignment in the farmyard of a nearby farm. Noise build up during the survey periods was dominated by farm machinery operating in the distance. Also noted was occasional dog barking. The noise levels were in the range 53 to 57dB $L_{Aeq}$ and 44 to 51dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 46dB.

*S37*
A private residence in Kyleva, west of the proposed alignment, was the location for a 24-hour survey. Noise levels at the fixed unattended meter during day were in the range 33 to 50dB $L_{Aeq}$ and were influenced by traffic noise. Levels during the night were in range 24dB to 48dB $L_{Aeq}$.

Noise levels during the day at the associated attended measurement location were in the range 41 to 46dB $L_{Aeq}$ and 40 to 50dB $L_{A10}$. Farm noise, dogs barking and occasional local traffic noise contributed to these levels. The derived $L_{A10(18hour)}$ is 43dB.

*S38*
This position is west of the proposed alignment along a small country road. Noise levels during the survey periods were dominated by distant traffic noise and occasional dog barking in the area. The noise levels were in the range 40 to 49dB $L_{Aeq}$ and 39 to 43dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 40dB.

*S39*
This position is east of the proposed alignment outside a private residential property. Noise levels during the survey periods were dominated by passing traffic and other distant traffic noise. Noise levels were in the range 47 to 52dB $L_{Aeq}$ and 42 to 48dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 43dB.

*S40*
This position is west of the proposed alignment outside a residential property. Contributing to noise build up during the survey periods were cattle, occasional passing traffic and other distant traffic noise. The levels were in the range 35 to 50dB $L_{Aeq}$ and 37 to 44dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 40dB.

*S41*
This position is west of the proposed alignment to the rear of a residential property. Noise levels during the survey periods were dominated by passing traffic and tractor noise from a neighbouring field. The levels were in the range 37 to 40dB $L_{Aeq}$ and 41 to 44dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 41dB.

*S42*
This position is east of the proposed alignment along a country road. Noise levels during the survey periods were dominated by passing traffic and other distant traffic noise. The levels were in the range 44 to 50dB $L_{Aeq}$ and 47 to 53dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 48dB.

*S43*
A private residence in Stonecarthy was the location for a 24-hour fixed meter. This position was in front of a farmhouse, some 400m from the local road, lying to the east of the proposed road. Noise levels at the fixed unattended meter during day were in the range 32 to 52dB $L_{Aeq}$. Noise levels during the night were in the range 23dB to 47dB $L_{Aeq}$.

Noise levels during the day at the associated attended measurement location were in the range 33 to 36dB $L_{Aeq}$ and 35 to 39dB $L_{A10}$. The dominant sources of noise were sheep bleating, birdsong and occasional farm activity. The derived $L_{A10(18hour)}$ is 36dB.

*S044*
This position was in front of a private house, some 150m from the local road, lying to the west of the proposed road. The dominant sources of noise were cattle and crows. Some isolated vehicle movements on the local road and occasional dog barking were also heard. The levels were in the range 36 to 49dB $L_{Aeq}$ and 39 to 48dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 43dB.

*S45*
This position was in a field next to a farmstead, some 100m from the local road, lying to the east of the proposed road. The dominant sources of noise were cattle in the adjacent field and crows in high trees. Some isolated vehicle movements on the local road and occasional dog barking were also noted. The levels were in the range 47 to 51dB $L_{Aeq}$ and 50 to 52dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 50dB.

*S46*
This position was in front of a private house, approximately 30m from the local road, lying to the west of the proposed road. The dominant sources of noise were cattle and crows. Some isolated vehicle movements on the local road were also noted. The noise levels were in the range 42 to 57dB $L_{Aeq}$ and 39 to 50dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 42dB.

*S47*
This position was in a field adjacent to a farmstead, some 120m from the local road, lying to the west of the proposed road. The dominant sources of noise were birdsong and cattle lowing and moving around in a nearby shed. Isolated vehicles were occasionally heard on the local road. The noise levels were in the range 39 to 48dB $L_{Aeq}$ and 39 to 51dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 45dB.

*S48*
This position was in a field adjacent to a house, some 150m from the local road, lying to the west of the proposed road. The dominant sources of noise were birdsong and occasional wood-cutting in the distance. The levels were in the range 34 to 38dB $L_{Aeq}$ and 36 to 42dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 38dB.

<u>Section B – King's River to Ballyquirke</u>

*S49*
A private residence was the location for a 24-hour fixed meter. This position is west of the

proposed alignment and close to, but west of, the existing N9. Noise levels at the fixed unattended meter during day were in the range 53 to 60dB $L_{Aeq}$ and were influenced by traffic on the N9. Noise levels during the night were in the range 42 to 55dB $L_{Aeq}$.

Noise levels during the day at the associated attended measurement location were in the range 54 to 57dB $L_{Aeq}$ and 58 to 60dB $L_{A10}$. Tractors and traffic noise generated these levels. The derived $L_{A10(18hour)}$ is 57dB.

*S50*
This position is east of the proposed alignment and on a cul-de-sac. Noise levels during the survey periods were dominated by distant traffic on N9 and to a lesser extent local traffic on the road to and from Bennettsbridge. Noise levels were in the range 44 to 51dB $L_{Aeq}$ and 45 to 48dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 46dB.

*S51*
This position is north west of the proposed alignment and at end of a laneway. Noise levels during the survey periods were dominated by distant traffic on the N9 and to a lesser extent local traffic on the road to and from Bennettsbridge. They were in the range 37 to 42dB $L_{Aeq}$ and 39 to 45dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 41dB.

*S52*
This position is east of the proposed alignment and on the local road leading to Bennettsbridge. Noise levels during the survey periods were influenced by local traffic on the road to and from Bennettsbridge. They were in the range 40 to 45 $L_{Aeq}$ and 44 to 49dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 46dB.

*S53*
This position is east of the proposed alignment and on a laneway a short distance from the N9. Noise levels during the survey periods were dominated by traffic on the N9 and traffic movement including cars and tractors at the house. Noise levels were in the range 45 to 51dB $L_{Aeq}$ and 46 to 57dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 50dB.

*S54*
This position is east of the proposed alignment and directly adjacent to the N9. Noise levels during the survey periods were dominated by traffic on the N9. They were in the range 61 to 62dB $L_{Aeq}$ and 66 to 67dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 65dB.

*S55*
A private residence was the location for this 24-hour fixed meter. This position is just north of the proposed alignment. Noise levels at the fixed unattended meter during day were in the range 58 to 69dB $L_{Aeq}$ and were influenced by local traffic. Noise levels during the night were in range 31dB to 60dB $L_{Aeq}$.

Noise levels during the day at the associated attended measurement location were in the range 57 to 71dB $L_{Aeq}$ and 52 to 71dB $L_{A10}$. Local traffic and tractors generated these noise levels. The 71dB $L_{Aeq}$ measurement here was due to a farmer carrying out hedge cutting on the boundary of the measurement position and is not representative of the typical noise levels expected at this property. The derived $L_{A10(18hour)}$ is 59dB.

*S56*
This position is north of the proposed alignment and at the end of a laneway leading off the R700 road from Bennettsbridge to Kilkenny City. Noise levels during the survey periods were influenced by traffic on the local roads and activities from a nearby quarry. Noise levels were in the range 45 to 49dB $L_{Aeq}$ and of the order of 47dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 46dB.

*S57*
This position is north of the proposed alignment and directly adjacent to the R700 road from Bennettsbridge to Kilkenny City. Noise levels during the survey periods were influenced by traffic on the local road and nearby quarry activities. Noise levels were in the range 52 to 53dB $L_{Aeq}$ and 53 to 54dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 53dB.

*S58*
This position is south of the proposed alignment and directly adjacent to the R700 road from Bennettsbridge to Kilkenny City. Noise levels during the survey periods were influenced by traffic on the local road and sheep feeding in a field adjacent to measurement position. Noise levels were in the range 53 to 56dB $L_{Aeq}$ and 57 to 58dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 58dB.

*S59*
This position is a single story dwelling south of the proposed alignment. Local traffic and occasional train movements on the Dublin to Waterford Railway Line dominated noise levels during the survey periods. Noise levels were in the range 43 to 48dB $L_{Aeq}$ and 45 to 49dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 47dB.

*S60*
This position is a close to a group of dwellings south of the proposed alignment and at end of a long laneway. Occasional local traffic movements dominated noise levels during the survey periods. Noise levels were in the range 45 to 47dB $L_{Aeq}$ and 43 to 50dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 46dB.

*S61*
A private residence at Dunbell was the location for this 24-hour fixed meter. This position is south west of the proposed alignment. Noise levels at the fixed unattended meter during day were in the range 50 to 57dB $L_{Aeq}$ and were influenced mainly by local farming activity and the adjacent train line to Kilkenny. Noise levels during the night were in range 31 to 49dB $L_{Aeq}$.

Noise levels during the day at the attended measurement location were in the range 50 to 57dB $L_{Aeq}$ and 52 to 54dB $L_{A10}$. Traffic in and around the farmyard generated these noise levels. The derived $L_{A10(18hour)}$ is 52dB.

*S62*
This position is north of the proposed alignment. It is a two story dwelling set back from the local road. Occasional local traffic, infrequent train movements and rural farming activity influenced the noise climate at this location. Noise levels were in the range 46 to 49dB $L_{Aeq}$ and 49 to 52dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 49dB.

*S063*
This position is west of the proposed alignment. It is a two story dwelling set back from the local road. Local traffic, occasional train movements and rural farming activity influenced the noise climate at this location. Noise levels were in the range 44 to 46dB $L_{Aeq}$ and 46 to 48dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 46dB.

*S64*
This position is north west of the proposed alignment. It is a two story dwelling set back from the N10. Local farming activity and occasional train movements influenced the noise climate at this location. The levels were in the range 45 to 51dB $L_{Aeq}$ and 47 to 53dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 49dB.

*S065*
This position is south of the proposed alignment. It is a single story dwelling close to the local road. Local farming activity and occasional passing traffic influenced the noise climate at this location. Noise levels were in the range 53 to 60dB $L_{Aeq}$ and 49 to 56dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 52dB.

*S66*
This position is south of the proposed alignment. It is located on a private laneway leading to a farm. Local farming activity and occasional passing traffic influenced the noise climate at this location. Noise levels were in the range 50 to 55dB $L_{Aeq}$ and 49 to 54dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 51dB.

*S67*
A private residence in Templemartin was the location for this 24-hour fixed meter. This position is just north of the proposed alignment. Noise levels at the fixed unattended meter during day were in the range 48 to 63dB $L_{Aeq}$ and were influenced mainly by local farming activity and the adjacent train line to Kilkenny. Noise levels during the night were in range 39 to 51dB $L_{Aeq}$.

Noise levels during the day at the associated attended measurement location were in the range 48 to 50dB $L_{Aeq}$ and 50 to 53dB $L_{A10}$. Traffic in and around farmyard generated these noise levels. The derived $L_{A10(18hour)}$ is 50dB.

*S68*
This position is south of the proposed alignment. It is a farm dwelling set back from the existing N10. Traffic on the N10 was the dominant noise source at this location. Noise levels were in the range 53 to 57dB $L_{Aeq}$ and 56 to 60dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 57dB.

*S69*
This position is south of the proposed alignment. It is on a road junction with the existing N10. Traffic on the N10 was the dominant noise source at this location. Noise levels were in the range 69 to 70dB $L_{Aeq}$ and 73 to 74dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 73dB.

*S70*
This position is south of the proposed alignment. It is a large demesne set well back from the exiting N10. Traffic on the N10 was the dominant noise source in this area. The levels were in the range 48 to 51dB $L_{Aeq}$ and 47 to 50dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 48dB.

*S71*
This position is south of the proposed alignment. It is on a road junction with the existing N10. Traffic on the N10 was the dominant noise source in this area. The levels were in the range

79 to 81dB $L_{Aeq}$ and 84 to 86dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 84dB.

*S72*
This position is just north of the proposed alignment. It is on a local road leading from the existing N10. Traffic on the N10 was the dominant noise source in this area, although local traffic also contributed to the noise climate. The levels were in the range 51 to 52dB $L_{Aeq}$ and of the order of 53dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 52dB.

Section C – Ballyquirke to Powerstown

*S73*
This position is north west of the proposed alignment and was the location for a 24-hour fixed meter. Noise levels at the fixed unattended meter during day were in the range 43 to 47dB $L_{Aeq}$ and were influenced mainly by distant traffic noise from the N10 and the nearby train line to Kilkenny. Noise levels during the night were in range 35dB to 44dB $L_{Aeq}$.

Noise levels during the day at the associated attended measurement location were in the range 41 to 45dB $L_{Aeq}$ and 43 to 46dB $L_{A10}$. Traffic on the N10 and occasional train noise contributed to these levels. The derived $L_{A10(18hour)}$ is 43dB.

*S74*
This position is just north of the proposed alignment. It is off a local road leading from the existing N9 and close to the village of Paulstown. Traffic on the N9/10 was the dominant noise source at this location. Noise levels were in the range 48 to 52dB $L_{Aeq}$ and 47 to 50dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 48dB.

*S75*
This position is just north of the proposed alignment. It is on a local road leading from the existing N9 and close to the village of Paulstown. Traffic on the N9/10 was the dominant noise at this location. Noise levels were in the range 48 to 53dB $L_{Aeq}$ and 48 to 50dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 48dB.

*S76*
Traffic on the N10 was the dominant noise source at this location. Noise levels were in the range 54 to 68dB $L_{Aeq}$ and 56 to 72dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 66dB.

*S77*
This position is just west of the proposed alignment. It is on a local road leading from the existing N10 and close to the village of Paulstown. Traffic on the N10 was the dominant noise source at this location. Noise levels were in the range 46 to 49dB $L_{Aeq}$ and 48 to 50dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 48dB.

*S78*
This position is just east of the proposed alignment. It is on a local road leading from the existing N10 and close to the village of Paulstown. Traffic on the N10 was the dominant noise source at this location. Noise levels were in the range 52 to 55dB $L_{Aeq}$ and 53 to 54dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 52dB.

*S79*
This position is east of the proposed alignment and was the location for a 24-hour fixed meter. Noise levels at the fixed unattended meter during day were in the range 42 to 49dB $L_{Aeq}$ and were influenced mainly by distant traffic noise from existing N9 and the nearby train line to Kilkenny. Noise levels during the night were in the range 35 to 45dB $L_{Aeq}$.

Noise levels during the day at the associated attended measurement location were in the range 42 to 44dB $L_{Aeq}$ and 44 to 47dB $L_{A10}$. Distant traffic on N9 and occasional train noise contributed to these levels. The derived $L_{A10(18hour)}$ is 44dB.

*S80*
This position is just east of the proposed alignment. It is on a local road leading directly to the existing N9. Occasional local traffic was the dominant noise source at this location. Distant traffic from the N9 was audible during lulls in local sources. Noise levels were in the range 41 to 47dB $L_{Aeq}$ and 42 to 50dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 44dB.

*S81*
This position is just west of the proposed alignment. It is on a local road leading from the existing N9. Occasional local traffic movements were the dominant noise source at this location. Distant traffic from the N9 was audible during lulls in local sources. Noise levels were in the range 43 to 51dB $L_{Aeq}$ and 45 to 52dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 46dB.

*S82*
This position is west of the proposed alignment. It is on a local road west of the existing N9. Occasional local traffic movements were the

dominant noise sources in this area although distant traffic from the N9 was noticeable. Tractors and farmers working in the area also contributed to the noise climate at this location. Noise levels were in the range 48dB to 50dB $L_{Aeq}$ and 47 to 51dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 47dB.

*S83*
This position is west of the proposed alignment. It is on a local road west of the existing N9. Local traffic was the dominant noise source in this area although distant traffic from the N9 was also noted during lulls in local sources. Tractors and farmers working contributed to the noise climate at this location. Noise levels were in the range 44 to 47dB $L_{Aeq}$ and 47 to 51dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 48dB.

*S84*
This position is east of the proposed alignment. It is on a local road west of the existing N9. Occasional local traffic was the dominant noise source in this area although distant traffic from the N9 was noticeable during lulls in this source. Again tractors and farmers working in the area contributed to the noise climate at this location. Noise levels were in the range 44 to 49dB $L_{Aeq}$ and 47 to 53dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 49dB.

*S85*
This position is east of the proposed alignment and was the location for a 24-hour fixed meter. Noise levels at the fixed unattended meter during day were in the range 43 to 49dB $L_{Aeq}$ and were influenced mainly by farmyard noise, which included sheep, ducks, hens, cattle and dogs barking. Noise levels during the night were in range 33 to 47dB $L_{Aeq}$.

Noise levels during the day at the associated attended measurement location were in the range 42 to 45dB $L_{Aeq}$ and 44 to 47dB $L_{A10}$. Farm yard activities were the significant noise sources noted during this period. The derived $L_{A10(18hour)}$ is 45dB.

*S86*
This position is north of the proposed alignment in the townland of Tomard Lower. It is on a local road leading directly to the existing N9. Local traffic was the dominant noise source at this location. Noise levels were in the range 58 to 66dB $L_{Aeq}$ and 56 to 70dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 60dB.

*S87*
This position is north of the proposed alignment in the townland of Tomard Lower. It is on a local road leading directly to the existing N9. Local traffic was the dominant noise source at this location. Noise levels were in the range 58 to 73dB $L_{Aeq}$ and 58 to 71dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 62dB.

*S88*
This position is south of the proposed alignment in the townland of Tomard Lower. It is on a local road leading directly to the existing N9. Local traffic was the dominant noise source at this location. Noise levels were in the range 48 to 51dB $L_{Aeq}$ and 50 to 51dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 50dB.

*S89*
This position is south of the proposed alignment in the townland of Tomard Lower. It is on a local road leading directly to the existing N9. Local traffic was the dominant noise source at this location. Noise levels were in the range 43 to 49dB $L_{Aeq}$ and 44 to 51dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 46dB.

*S90*
This position is north of the proposed alignment in the townland of Tomard Lower. It is on a private laneway leading directly to local roads and the existing N9. Local traffic was the dominant noise source at this location. Noise levels were in the range 43 to 49dB $L_{Aeq}$ and 45 to 51dB $L_{A10}$. The derived $L_{A10(18hour)}$ is 47dB.

## 8.5 Assessment of Operational Noise

### 8.5.1 Noise Model

A computer-based prediction model was prepared in order to quantify the traffic noise level associated with the operational phase of the proposed road development. This section discusses the methodology behind the noise modelling process and presents the results of the modelling exercise.

### 8.5.2 Brüel & Kjær Type 7810 *Predictor*

Proprietary noise calculation software was used for the purposes of this impact assessment. The selected software, Brüel & Kjær Type 7810 *Predictor*, calculates traffic noise levels in accordance with CRTN and TRL guidance.

Brüel & Kjær Type 7810 *Predictor* is a proprietary noise calculation package for computing noise levels in the vicinity of noise

sources. *Predictor* predicts noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source in terms of sound power or traffic flow and average velocity;
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces; and
- the hardness of the ground between the source and receiver.

### 8.5.3 Prediction of Noise Traffic

Noise emissions during the operational phase of the project have been modelled using *Predictor* in accordance with CRTN and with application of the relevant conversion factors as detailed in the TRL document[5]. The CRTN method of predicting noise from a road development consists of the following five elements:

- divide the road development into segments so that the variation of noise within this segment is small;
- calculate the basic noise level at a reference distance of 10 metres from the nearside carriageway edge for each segment;
- assess for each segment the noise level at the reception point taking into account distance attenuation and screening of the source line;
- correct the noise level at the reception point to take account of site layout features including reflections from buildings and facades, and the size of source segment; and
- combine the contributions from all segments to give the predicted noise level at the receiver location for the whole road development.

Note that all calculations are performed to one decimal place. For the purposes of comparison with the design goal of 60dB $L_{den}$, the relevant noise level was rounded to the nearest whole number in accordance with guidance given in the NRA document.

### 8.5.4 Input to the Noise Model

The noise model was prepared using the following data:

- road alignments, topographical data and Ordnance Survey mapping supplied by the Design Consultants;
- traffic flow data supplied by the Design Consultants, consistent with the flows outlined in Chapter 6 of this EIS; and
- traffic speeds as set out in paragraph 14.2 of CRTN – see Table A8.20 in Appendix 8.1.

### 8.5.5 Output of the Noise Model

*Predictor* calculates noise levels for a set of receiver locations specified by the user. The results include an overall level in dB $L_{day}$, $L_{evening}$, $L_{night}$ and $L_{den}$.

### 8.5.6 Calibration

The purpose of noise model calibration is to ensure that the software is correctly interpreting the input data and providing results that are valid for the scenario under consideration. The CRTN prediction methodology has itself been previously validated.

Given the nature and scale of the road development in question it was decided that the most appropriate mechanism for calibration would be to compare the output from the *Predictor* model with the output from another CRTN package, i.e. the National Physical Laboratory's html utility.

The input data for a number of critical receptors was retrieved from the *Predictor* model and input to the NPL utility. The selected calibration locations encompassed a number of scenarios, including positions at a variety of distances and with different intervening topography. The results from the two models were compared in order to ensure that the variance was no greater than ±3dB(A) at any of the assessment locations.

The results of the calibration are presented in Table A8.18 of Appendix 8.1. The variance in results ranges from +2 to -2dB, hence it is concluded that the Predictor model is correctly interpreting the input data and providing results that are valid for the scenario under consideration.

[5] Conversion Method 1 has been used for this assessment. Method 1 is the stated preferred conversion method of the Authority.

### 8.5.7 Choice of Receiver Locations

Free field traffic noise levels have been predicted at a number of properties in the vicinity of proposed and existing roads. One hundred and eighty six properties have been considered in total.

The coordinates of all locations are provided in Table A8.19 of Appendix 8.1.

### 8.5.8 Traffic Noise Predictions for 2010 and 2025

A total of four scenarios have been considered as follows:

- Year 2010 – Do Minimum (i.e. proposed development does not take place);
- Year 2010 – Do Something (i.e. incorporates proposed development);
- Year 2025 – Do Minimum; and
- Year 2025 – Do Something.

The results of the traffic noise predictions are presented in Tables 8.3A, 8.3B and 8.3C. Note that the magnitude of the Do Minimum levels is understated in some instances due to the fact that some of the local roads in the vicinity of receiver locations are not included in the model as the associated traffic flows are either unknown or very low. Furthermore, in many cases the ambient noise levels are affected by sources other than traffic noise, as discussed in section 8.4.7.

Section A – Waterford to King's River

Year 2010

The combined expected maximum traffic noise level from the proposed road development together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB $L_{den}$ at eight locations; A05, A06, A29, A30, A45, A48, A49, and A59.

The noise level at three of these locations (i.e. A05, A06 and A45) is dominated by contributions from the existing road network. The Do Something levels for these locations are either lower than or equal to the levels predicted for the Do Minimum scenario. Mitigation measures are not required at these three locations.

For the remaining five locations (A29, A30, A48, A49, and A59), the Do Something level is at least 1dB higher than the Do Minimum level. Mitigation measures are required at these five locations.

Year 2025

The combined expected maximum traffic noise level from the proposed road development together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB $L_{den}$ at nine locations; A05, A06, A29, A30, A45, A48, A49, A59 and A62.

The noise level at four of these locations (i.e. A05, A06, A45 and A62) is dominated by contributions from the existing road network. The Do Something levels for these locations are either lower than or equal to the levels predicted for the Do Minimum scenario. Mitigation measures are not required at these four locations.

For the remaining five locations (A29, A30, A48, A49 and A59), the Do Something level is at least 1dB higher than the Do Minimum level. Mitigation measures are required at these five locations.

Section B – King's River to Ballyquirke

Year 2010

The combined expected maximum traffic noise level from the proposed road development together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB $L_{den}$ at four locations; B32, B34, B35 and B44.

The noise level at one of these locations (i.e. B44) is dominated by contributions from the existing road network. The Do Something levels for this location is either lower than or equal to the levels predicted for the Do Minimum scenario. Mitigation measures are not required at this location.

For the remaining three locations (B32, B34 and B35), the Do Something level is at least 1dB higher than the Do Minimum level. Mitigation measures are required at these three locations.

Year 2025

The combined expected maximum traffic noise level from the proposed road development together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB $L_{den}$ at five locations; B32, B34, B35, B39 and B44.

The noise level at one of these locations (i.e. B44) is dominated by contributions from the existing road network. The Do Something levels for this location is either lower than or equal to the levels predicted for the Do Minimum scenario. Mitigation measures are not required at this location.

For the remaining four locations (B32, B34, B35 and B39), the Do Something level is at least 1dB higher than the Do Minimum level. Mitigation measures are required at these four locations.

Section C – Ballyquirke to Powerstown

Year 2010

The combined expected maximum traffic noise level from the proposed road development together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB $L_{den}$ at seven locations; C08, C21, C23, C26, C35, C42, and C48.

At all seven locations the Do Something level is at least 1dB higher than the Do Minimum level. Mitigation measures are required at these seven locations.

Year 2025

The combined expected maximum traffic noise level from the proposed road development together with other traffic in the vicinity (i.e. Do Something scenario) is greater than 60dB $L_{den}$ at ten locations; C07, C08, C10, C21, C23, C26, C35, C42, C48 and C51.

At all ten locations the Do Something level is at least 1dB higher than the Do Minimum level. Mitigation measures are required at these ten locations.

## 8.6 Description of Noise Mitigation Measures

Section A – Waterford to King's River

*Location A29*
The proposed mitigation for Location A29 consists of a 2m high bund running along the east side of the proposed route, from chainage 9+660 to 9+780.

With this mitigation measure in place, the predicted result for Year 2025 is 59dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4A. The extent of the bund is illustrated in Figure 4.57.

*Location A30*
The proposed mitigation for Location A30 consists of 3m high bunding and fencing running along the west side of the proposed route, from chainage 9+660 to 9+920.

With this mitigation measure in place, the predicted result for Year 2025 is 60dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4A. The extent of the combined bund / fence is illustrated in Figure 4.57.

*Location A48*
The proposed mitigation for Location A48 consists of a 2.5m high solid fence running along the east side of the proposed route, from chainage 16+870 to 17+180.

With this mitigation measure in place, the predicted result for Year 2025 is 65dB $L_{den}$. The mitigated result is detailed in Table 8.4A. The extent of the fence is illustrated in Figure 4.62.

*Location A49*
The proposed mitigation for Location A49 consists of a 2.5m high solid fence running along the east side of the proposed route, from chainage 18+100 to 18+400.

With this mitigation measure in place, the predicted result for Year 2025 is 64dB $L_{den}$. The mitigated result is detailed in Table 8.4A. The extent of the fence is illustrated in Figure 4.63.

*Location A59*
The proposed mitigation for Location A59 consists of a 2m high solid fence running along the west side of the proposed route, from chainage 23+420 to 23+580.

With this mitigation measure in place, the predicted result for Year 2025 is 59dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4A. The extent of the fence is illustrated in Figures 4.66 and 4.67.

Section B – King's River to Ballyquirke

*Location B32*
The proposed mitigation for Location B32 consists of 3.5m high bunding and fencing

running along the north side of the proposed route, from chainage 46+660 to 46+980. Note that this mitigation measure covers the cluster of houses at this location.

With this mitigation measure in place, the predicted result for Year 2025 is 60dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4B. The extent of the combined bund / fence is illustrated in Figure 4.82.

*Location B34*
The proposed mitigation for Location B34 consists of a 2m high solid fence running along the west side of the proposed route, from chainage 47+740 to 48+020.

With this mitigation measure in place, the predicted result for Year 2025 is 60dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4B. The extent of the fence is illustrated in Figure 4.83.

*Location B35*
The proposed mitigation for Location B35 consists of a 2m high solid fence running along the south side of the proposed route, from chainage 47+900 to 48+100.

With this mitigation measure in place, the predicted result for Year 2025 is 60dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4B. The extent of the fence is illustrated in Figure 4.83.

*Location B39*
The proposed mitigation for Location B39 consists of a 2m high bund running along the south side of the proposed route, from chainage 48+720 to 49+020.

With this mitigation measure in place, the predicted result for Year 2025 is 60dB $L_{den}$. This means that the mitigated noise levels do not exceed, and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4B. The extent of the bund is illustrated in Figure 4.83.

Section C – Ballyquirke to Powerstown

*Location C07*
The proposed mitigation for Location C07 consists of a 2m high solid fence running along the southeast side of the proposed route, from chainage 62+640 to 62+900.

With this mitigation measure in place, the predicted result for Year 2025 is 59dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4C. The extent of the fence is illustrated in Figure 4.85.

*Location C08*
The proposed mitigation for Location C08 consists of a 2m high solid fence running along the southeast side of the proposed route, from chainage 62+640 to 62+900.

With this mitigation measure in place, the predicted result for Year 2025 is 60dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4C. The extent of the fence is illustrated in Figure 4.85.

*Location C10*
The proposed mitigation for Location C10 consists of a 1.5m high solid fence running along the north side of the proposed route, from chainage 62+900 to 63+140.

With this mitigation measure in place, the predicted result for Year 2025 is 60dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4C. The extent of the fence is illustrated in Figure 4.85.

*Location C21*
The proposed mitigation for Location C21 consists of a 2 high bund running along the west side of the proposed route, from chainage 66+000 to 66+300.

With this mitigation measure in place, the predicted result for Year 2025 is 59dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4C. The extent of the bund is illustrated in Figure 4.87 and 4.88.

*Location C23*
The proposed mitigation for Location C23 consists of a 2m high bund running along the west side of the proposed route, from chainage 66+000 to 66+300.
With this mitigation measure in place, the predicted result for Year 2025 is 60dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4C. The extent of the bund is illustrated in Figure 4.88.

*Location C26*
The proposed mitigation for Location C26 consists of a 1.5m high bund on the top of the cutting running along the east side of the proposed route, from chainage 66+750 to 66+900.

With this mitigation measure in place, the predicted result for Year 2025 is 59dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4C. The extent of the bund is illustrated in Figure 4.88.

*Location C35*
The proposed mitigation for Location C35 consists of a 2m high solid fence running along the east side of the proposed route, from chainage 69+000 to 69+100.

With this mitigation measure in place, the predicted result for Year 2025 is 60dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4C. The extent of the fence is illustrated in Figure 4.89 and 4.90.

*Location C42*
The proposed mitigation for Location C42 consists of a 2.25m high bund running along the east side of the proposed route, from chainage 72+450 to 72+620.

With this mitigation measure in place, the predicted result for Year 2025 is 60dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4C. The extent of the bund is illustrated in Figure 4.92.

*Location C48*
The proposed mitigation for Location C48 consists of a 2.5m high solid fence running along the northwest side of the proposed route, from chainage 74+660 to 74+930.

With this mitigation measure in place, the predicted result for Year 2025 is 60dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4C. The extent of the fence is illustrated in Figure 4.93.

*Location C51*
The proposed mitigation for Location C51 consists of a 1m high bund running along the west side of the proposed route, from chainage 75+020 to 75+150.

With this mitigation measure in place, the predicted result for Year 2025 is 60dB $L_{den}$. This means that the mitigated noise levels do not exceed and therefore satisfy the adopted criteria. The mitigated result is detailed in Table 8.4C. The extent of the bund is illustrated in Figure 4.93.

## 8.7 Assessment of Construction Noise Impacts and Mitigation Measures

### 8.7.1 Standards and Guidelines

The NRA guidelines recommend maximum permissible construction noise levels at the facades of dwellings for weekday daytime and evening periods as well as Saturday, Sunday and Bank Holiday daytime. Given the scale and nature of the road development under consideration, it was considered prudent to also set limits for periods outside those covered in the NRA document. The limits that were adopted are as follows:

| | **07:00-19:00 (Day)** | | **19:00-22:00 (Evening)** | |
|---|---|---|---|---|
| | $L_{Aeq(1hr)}$ | $L_{Amax}$ | $L_{Aeq(1hr)}$ | $L_{Amax}$ |
| **Monday to Friday** | 70 | 80 | 60 | 65 |
| | **08:00-16:30 (Day)** | | | |
| | $L_{Aeq(1hr)}$ | $L_{Amax}$ | | |
| **Saturday** | 65 | 75 | | |
| **Sunday & Bank Hols** | 60 | 65 | | |

As is generally the case for this type of development, it was not practicable to conduct detailed prediction calculations for the construction phase of the project in support of

the EIS. This is due to the fact that the programme for construction works was not established in sufficient detail. However, in order to demonstrate that it will be possible to comply with the limits set out above, indicative noise prediction calculations were undertaken for a range of activities along the mainline. These predictions were performed in accordance with ISO9613[6] using sound power data taken from BS5228: Parts 1&4[7].

### 8.7.2 Assessment of Construction Noise

Construction noise prediction calculations have generally been prepared in order to establish typical maximum noise levels at sensitive receptors in the immediate vicinity of the proposed development.

A variety of items of plant will be in use throughout the construction works, such as dozers, dump trucks, asphalt spreaders and road rollers. Table 8.5 lists these items of plant along with the associated sound power levels taken from BS5228.

Table 8.6 summarises the predicted maximum expected noise levels at the stated distances back from construction works on the mainline. It should be noted that the predicted noise levels referred to in this section are indicative only and are intended for comparison with the construction noise criteria. It should also be noted that the predicted maximum expected levels are expected to occur for only short periods of time at a very limited number of properties. Construction noise levels will generally be lower than these levels for the majority of the time at the majority of properties in the vicinity of the proposed development, although greater levels may also occur.

### 8.7.3 Construction Noise Mitigation Measures

The contract documents will clearly specify that the Contractor undertaking the construction of the works will be obliged to take specific noise abatement measures and comply with the recommendations of BS 5228: Part 1. These measures will ensure that:

- No plant used on site will be permitted to cause an ongoing public nuisance due to noise;
- The best means practicable, including proper maintenance of plant, will be employed to minimise the noise produced by on site operations;
- All vehicles and mechanical plant will be fitted with effective exhaust silencers and maintained in good working order for the duration of the contract;
- Compressors will be attenuated models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic tools shall be fitted with suitable silencers;
- Machinery that is used intermittently will be shut down or throttled back to a minimum during periods when not in use;
- Any plant, such as generators or pumps, that is required to operate before 07:00hrs or after 19:00hrs will be surrounded by an acoustic enclosure or portable screen; and
- During the course of the construction programme, supervision of the works will include ensuring compliance with the limits detailed in Table 8.5 using methods outlined in BS 5228 "*Noise and Vibration Control on Construction and open sites*", Annex E. It should be noted that BS 5228 does not detail any specific noise limits in relation to construction noise.

### 8.7.4 Emergency Work

Normal working times will be 07:00 to 19:00hrs Monday to Friday, and 08:00 to 16:30 on Saturday. Works other than the pumping out of excavations, security and emergency works will not be undertaken outside these working hours without the written permission of the Contracting Authority. This permission, if granted, can be withdrawn at any time should the working regulations be breached.

Works other than the pumping out of excavations, security and emergency works will not be undertaken at night and on Sundays without the written permission of the Contracting Authority. Night is defined as 19:00 to 07:00hrs.

When overtime and shift work is permitted, the hauling of spoil and delivery of materials outside

[6] ISO9613: 1996: *Acoustics - Attenuation of sound during propagation outdoors.*

[7] BS5228: *Noise and vibration control on construction and open sites, Part 1: Code of practice for basic information and procedures for noise and vibration control (1997), Part 4: Code of practice for noise and vibration control applicable to piling operations (1992).*

normal working hours is prohibited and the noise limits outlined in in Section 8.7.1 will apply.

### 8.7.5 Construction Traffic

Information in relation to construction traffic was made available as part of this assessment and is detailed in Chapter 4. This section contains an appraisal of the potential noise impact of this traffic.

The volumes of traffic generated by the proposed road development during construction are relatively low, hence they are not expected to give rise to any significant increase in traffic noise levels along national and regional roads.

In order to be able to assess the potential noise impact of construction traffic, specific noise levels due to construction vehicles have been predicted at the facades of those noise sensitive locations closest to each site access point. The results of this exercise are summarised in Table 8.7.

The predicted values are well within even the most stringent criterion as set out in the EIS or new NRA guidelines.

## 8.8 Residual Noise Impacts

### 8.8.1 Construction Stage

During the construction phase of the project there will be some small impact on nearby residential and business properties due to noise emissions from site traffic and other activities. The application of binding noise limits and hours of operation, along with implementation of appropriate noise control measures, will ensure that noise impact is kept to a minimum.

### 8.8.2 Operational Stage

There are a number of locations highlighted in this document where the proposed road development meets the three conditions that must be satisfied before noise mitigation measures are deemed necessary.

In these instances, mitigation measures have been considered and commented on. Once mitigation measures have been assessed all locations comply with the adopted criteria with the exception of locations A48 and A49.

At these locations, the Landscape and Visual aspects were key considerations, as discussed in Chapter 10 of this EIS.

However, in respect of these locations a structured approach has been taken in order to ameliorate road traffic noise as far possible, in accordance with the NRA guidelines.

Overall, the proposed road development complies with the appropriate guidance criteria in relation to noise and the appropriate measures are envisaged to reduce or remedy, where possible, significant adverse effects.

Furthermore it should be noted that traffic noise levels are expected to decrease at a number of locations in the vicinity of existing national and primary routes in the area as a result of the proposed development, thereby conferring benefit at other locations.

## 8.9 Introduction to Vibration

This section deals with the potential for vibration during both construction and operational phases of the proposed development.
The new NRA Guidelines provide guidance in relation to vibration from the construction and operational phases of road developments and this is referenced in this section.

## 8.10 Description of Existing Vibration Environment

A survey of vibration along the proposed route corridor was not undertaken, as levels associated with existing roads would not be expected to be of a magnitude sufficient to cause disturbance to people or structural damage to property. Furthermore, vibration was not perceptible at any of the noise survey locations.

## 8.11 Potential Vibration Impacts – Operational Stage

As a vehicle travels along a road, vibration can be generated in the road and subsequently propagate towards nearby buildings. Such vibration is generated by the interaction of a vehicle's wheels and the road surface and by direct transmission through the air of energy waves. Some of these waves arise as a function of the size, shape and speed of the vehicle, and others from pressure fluctuations due to engine, exhaust and other noises generated by the vehicle.

It has been established that ground vibrations produced by road traffic are unlikely to cause perceptible structural vibration in properties located near to well-maintained and smooth road

surfaces. Problems attributable to road traffic vibration can therefore be largely avoided by maintenance of the road surface.

## 8.12 Potential Vibration Impacts – Construction Stage

The potential for vibration at neighbouring sensitive locations during construction is typically limited to demolition, excavation works, rock-breaking operations and lorry movements on uneven road surfaces. The more significant of these is the vibration from excavation and rock-breaking operations; the method of which will be selected and controlled to ensure there is no likelihood of structural or even cosmetic damage to existing neighbouring dwellings.

Blasting for the purposes of excavation will be required during the construction phase.

## 8.13 Mitigation Measures and Residual Impacts for Vibration

### 8.13.1 General

The NRA Guidelines recommend that in order to ensure that there is no potential for vibration damage during construction, vibration from construction activities be limited to the values set out in Table 8.8.

Measures shall be taken to minimize vibration due to plant and machinery on the site and no machine which uses the dropping of heavy weights for the purpose of demolition will be permitted. Where appropriate, at agreed locations, prior to construction activities, baseline vibration surveys may be carried out.

Ground vibration from additional traffic due to the development under consideration is expected to be orders of magnitude less than that required to cause cosmetic or structural damage to buildings or lead to disturbance of occupiers, hence mitigation measures are not required in respect of the operational phase.

The proposed road development is not expected to give rise to vibration that is either significantly intrusive or capable of giving rise to structural or even cosmetic damage.

### 8.13.2 Blasting

The contractor will be required to ensure that the specific peak particle velocity for the specified frequency band in the contact documents is not exceeded. Vibration monitoring of blasting operations will take place as necessary, typically at the property nearest the site where the blasting is taking place. The contract documents will specify that the Contractor will be obliged to take specific abatement measures complying with the recommendations of BS 5228: Part 1 and the European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001, during blasting operations.

The particular methods used to minimise complaints in relation to blasting are set out below.

- A publicity campaign undertaken before any blasting starts, explaining what is being done and why.
- The firing of blasts at similar times to reduce the ‘startle’ effect.
- On going circulars informing people of the progress of the works.
- The implementation of an on site documented complaints procedure.
- The use of independent monitoring by external bodies for verification of results.
- Trial blasts in less sensitive areas to assist in blast designs and identify potential zones of influence.

In the vicinity of the blasting site, all buildings and structures liable to damage will be surveyed and adequate insurance cover, for both people and property, will be provided.

**Table 8.1 Details of Survey Locations**

| Location | Description of Survey Location | Grid Reference | | Derived dB $L_{A10(18hour)}$ |
|---|---|---|---|---|
| | | N | E | |
| S01 | A private residence east of proposed road close to existing N9. | 258,279 | 116,951 | 64 |
| S02 | To the east of the existing N9 and east of the proposed road. | 258,419 | 116,754 | 56 |
| S03 | West of the existing N9 on a local road, just east of the proposed road. | 258,051 | 116,327 | 46 |
| S04 | Close to S017 but west of the proposed road. | 257,929 | 116,394 | 45 |
| S05 | Some distance east from existing N9, the proposed new road is just a short distance to the west. | 258,799 | 117,664 | 50 |
| S06 | Some distance east from existing N9, and close to S019. The proposed new road is just a short distance to the east. | 258,509 | 117,764 | 52 |
| S07 | At a private residence east of the proposed road and located on a rural local road. | 258,593 | 119,034 | 44 |
| S08 | West of the proposed alignment close to existing N9 and 2km east of the village of Kilmacow. | 257,869 | 119,444 | 53 |
| S09 | This position on the same local road as S021. It is west of the proposed alignment close to the existing N9 and 2km east of the village of Kilmacow. | 258,129 | 119,044 | 49 |
| S10 | This position on the same local road as S022. It is west of the proposed alignment close to the existing N9 and 2km east of the village of Kilmacow. | 258,279 | 118,444 | 46 |
| S11 | On a local road further east of the N9. East of the proposed alignment close to the existing N9 and 4km east of the village of Kilmacow. | 258,789 | 118,544 | 42 |
| S12 | This position is on the same local road as S024. It is east of the proposed alignment close to the existing N9 and 4km east of the village of Kilmacow. | 258,369 | 119,594 | 39 |
| S13 | At a private residence in the townland of Rahard, east of the proposed road on a rural local road. | 257,549 | 121,094 | 48 |
| S14 | Just east of the proposed alignment and on a quiet local road east of the existing N9. | 256,899 | 122,374 | 43 |
| S15 | Close to S026 and on the western side of the proposed alignment and on a quiet local road east of the existing N9. | 256,709 | 122,284 | 41 |
| S16 | Close to S027 and on the western side of the proposed alignment and on a quiet local road east of the existing N9. | 256,783 | 121,974 | 46 |
| S17 | West of the proposed alignment and south of Mullinavat in townland of Rahard. | 257,039 | 121,164 | 52 |
| S18 | Close to S029 and just east of the proposed alignment and south of Mullinavat in the townland of Rahard. | 257,199 | 121,264 | 49 |
| S19 | At a private residence east of Mullinavat Village on a local road and east of the proposed road. | 256,981 | 123,947 | 45 |
| S20 | A dwelling house on the R704 east of Mullinavat. | 256,890 | 124,980 | 49 |
| S21 | West of the proposed alignment and in the centre of the village of Mullinavat on the N9 | 256,509 | 124,324 | 75 |

**Table 8.1 (Cont'd) Details of Survey Locations**

| Location | Description of Survey Location | Grid Reference | | Derived dB $L_{A10(18hour)}$ |
|---|---|---|---|---|
| | | N | E | |
| S22 | West of the proposed alignment and just east of the village of Mullinavat close to the Catholic Church | 256,809 | 124,304 | 52 |
| S23 | West of the proposed alignment and just south of the village of Mullinavat | 256,560 | 123,390 | 51 |
| S24 | West of the proposed alignment and adjacent to the railway line on a local road leading out of Mullinavat | 256,579 | 123,904 | 48 |
| S25 | At a private residence just north of Mullinavat Village on a local road and east of the proposed road. | 256,524 | 125,923 | 53 |
| S26 | At the entrance to the grounds of a house at the north end of Ballylusky, to the west of the proposed road | 256,263 | 126,650 | 49 |
| S27 | In a field adjacent to a house in Ballylusky, to the west of the proposed road | 256,323 | 125,974 | 53 |
| S28 | In the grounds of a house in Ballylusky, to the west of the proposed road | 256,192 | 126,385 | 52 |
| S29 | In a field adjacent to a house at the southern end of Ballylusky, west of the proposed road | 256,904 | 125,259 | 51 |
| S30 | In the yard at the side of a private house, east of the proposed road, approximately 200m distance from the local road R704 | 256,499 | 125,290 | 52 |
| S31 | At a private residence north west of Mullinavat Village in a rural location and west of the proposed road. | 252,668 | 130,601 | 47 |
| S32 | East of the proposed alignment on the side of a local road | 253,435 | 128,827 | 54 |
| S33 | East of the proposed alignment in the farmyard of a residential property | 253,641 | 128,505 | 43 |
| S34 | East of the proposed alignment in the garden of a residential property | 255,629 | 127,734 | 47 |
| S35 | East of the proposed alignment in the garden of a residential property and close to the existing N9 | 254,769 | 128,814 | 55 |
| S36 | West of the proposed alignment in the farmyard of a nearby farm | 253,217 | 129,573 | 46 |
| S37 | At a private residence in Kyleva, west of the proposed alignment in a rural location | 251,764 | 132,996 | 43 |
| S38 | West of the proposed alignment along a small country road | 251,653 | 133,633 | 40 |
| S39 | East of the proposed alignment outside a residential property | 252,098 | 133,860 | 43 |
| S40 | West of the proposed alignment outside a residential property | 251,905 | 132,781 | 40 |
| S41 | West of the proposed alignment to the rear of a residential property | 251,696 | 132,604 | 41 |
| S42 | East of the proposed alignment along country road | 252,282 | 132,369 | 48 |
| S43 | At a private residence in Stonecarthy, west of the proposed road and approximately 400m from the existing local road. | 251,643 | 140,966 | 36 |
| S44 | In front of a private house, some 150m from the local road, lying to the west of the proposed road. | 251,318 | 141,555 | 43 |
| S45 | In a field next to a farmstead, some 100m from the local road, lying to the east of the proposed road. | 251,763 | 141,854 | 50 |
| S46 | In front of a private house, approximately 30m from the local road, lying to the west of the proposed | 251,554 | 141,538 | 42 |

**Table 8.1 (Cont'd) Details of Survey Locations**

| Location | Description of Survey Location | Grid Reference | | Derived dB $L_{A10(18hour)}$ |
|---|---|---|---|---|
| | | N | E | |
| | road | | | |
| S47 | In a field adjacent to a farmstead, some 120m from the local road, lying to the west of the proposed road. | 251,204 | 140,631 | 45 |
| S48 | In a field adjacent to a house, some 150m from the local road, lying to the west of the proposed road. | 251,422 | 140,050 | 38 |
| S49 | At a private residence west of the proposed road and a few hundred meters from existing N9 | 251,844 | 147,213 | 57 |
| S50 | East of the proposed alignment and on a cul-de-sac | 252,677 | 147,758 | 46 |
| S51 | North west of the proposed alignment and at end of a laneway | 252,336 | 147,883 | 41 |
| S52 | East of the proposed alignment and on the local road leading to Bennettsbridge | 253,349 | 148,334 | 46 |
| S53 | East of the proposed alignment and on a laneway a short distance from the N9 | 252,614 | 146,752 | 50 |
| S54 | East of the proposed alignment and directly adjacent to the N9 | 252,254 | 146,499 | 65 |
| S55 | At a private residence just north of the proposed road on a local road north east of Bennettsbridge | 255,915 | 150,459 | 59 |
| S56 | North of the proposed alignment and at the end of a laneway leading off the R700 road from Bennettsbridge to Kilkenny City | 254,987 | 150,406 | 46 |
| S57 | North of the proposed alignment and directly adjacent to the R700 road from Bennettsbridge to Kilkenny City. | 255,005 | 149,852 | 53 |
| S58 | South of the proposed alignment and directly adjacent to the R700 road from Bennettsbridge to Kilkenny City | 254,912 | 150,189 | 56 |
| S59 | A single story dwelling south of the proposed alignment on a local road leading eastwards out of Bennettsbridge | 255,674 | 149,873 | 34 |
| S60 | Close to a group of dwellings south of the proposed alignment and at end of a long laneway leading from a local road out off Bennettsbridge | 256,258 | 150,217 | 46 |
| S61 | At a private residence in Dunbell, south east of the proposed road, the house is in a rural location some distance from the local road | 258,196 | 153,709 | 52 |
| S62 | North of the proposed alignment, a two story dwelling set back from the local road | 257,417 | 153,571 | 49 |
| S63 | West of the proposed alignment, a two story dwelling set back from the local road | 257,105 | 153,222 | 46 |
| S64 | North west of the proposed alignment, a two story dwelling set back from the main N10 | 257,373 | 154,321 | 49 |
| S65 | South of the proposed alignment, a single story dwelling close to the local road | 257,408 | 153,102 | 52 |
| S66 | South of the proposed alignment, on a private laneway leading to Eddie Phelan's farm | 258,087 | 153,269 | 51 |
| S67 | At a private residence in Templemartin north of the new N10, on a local road north of the existing N10 | 255,196 | 155,322 | 50 |
| S68 | South of the existing N10 alignment and north east of the proposed route | 256,738 | 154,691 | 57 |
| S69 | South of the proposed alignment, a farm dwelling set back from the existing N10 | 255,456 | 154,661 | 73 |
| S70 | South of the proposed alignment, on a road junction | 254,400 | 155,450 | 48 |

**Table 8.1 (Cont'd) Details of Survey Locations**

| Location | Description of Survey Location | Grid Reference | | Derived dB $L_{A10(18hour)}$ |
|---|---|---|---|---|
| | | N | E | |
| | with the existing N10 | | | |
| S71 | South of the proposed alignment, a large demesne set well back from the existing N10 | 256,055 | 154,621 | 84 |
| S72 | North of the proposed alignment, on a local road leading from the existing N10 | 255,363 | 155,129 | 52 |
| S73 | At a private residence north west of the existing N9 and railway, west of the proposed road | 264,556 | 158,995 | 43 |
| S74 | North of the proposed alignment, off a local road leading from the existing N9 and close to the village of Paulstown | 265,161 | 159,745 | 48 |
| S75 | North of the proposed alignment, on a local road leading from the existing N9 and close to the village of Paulstown | 265,200 | 159,569 | 48 |
| S76 | West of the village of Paulstown and located on the N10 | 265,612 | 159,215 | 66 |
| S77 | West of the proposed alignment, on a local road leading from the existing N10 and close to the village of Paulstown | 264,004 | 158,197 | 48 |
| S78 | East of the proposed alignment, on a local road leading from the existing N10 and close to the village of Paulstown | 264,263 | 158,036 | 52 |
| S79 | At a private residence in a rural location west of the existing N9 but east of the proposed road | 266,839 | 162,453 | 44 |
| S80 | East of the proposed alignment, on a local road leading directly to the existing N9 | 266,965 | 163,428 | 44 |
| S81 | West of the proposed alignment, on a local road leading from the existing N9 | 266,717 | 163,428 | 46 |
| S82 | West of the proposed alignment, on a local road west of the existing N9 | 266,513 | 162,824 | 47 |
| S83 | West of the proposed alignment, on a local road west of the existing N9 | 266,380 | 162,070 | 48 |
| S84 | East of the proposed alignment, on a local road west of the existing N9 | 266,784 | 161,805 | 49 |
| S85 | At a private residence at the end of a long lane leading off a local road, just south of the proposed road | 268,786 | 167,995 | 45 |
| S86 | North of the proposed alignment in the townland of Tomard Lower, on a local road leading directly to the existing N9 | 269,609 | 169,059 | 60 |
| S87 | North of the proposed alignment in the townland of Tomard Lower, on a local road leading directly to the existing N9 | 269,423 | 168,791 | 62 |
| S88 | South of the proposed alignment in the townland of Tomard Lower, on a local road leading directly to the existing N9 | 269,493 | 168,474 | 50 |
| S89 | South of the proposed alignment in the townland of Tomard Lower, on a local road leading directly to the existing N9 | 269,361 | 168,267 | 46 |
| S90 | North of the proposed alignment in the townland of Tomard Lower, on a private laneway leading directly to local roads and the existing N9 | 269,181 | 168,446 | 47 |

**Table 8.2 Derived $L_{den}$ Values**

| Survey Location Reference | TRL Derived Levels |
|---|---|
| | $L_{den}$ |
| S01 | 63 |
| S02 | 56 |
| S03 | 47 |
| S04 | 46 |
| S05 | 50 |
| S06 | 67 |
| S07 | 65 |
| S08 | 58 |
| S09 | 59 |
| S10 | 70 |
| S11 | 63 |
| S12 | 62 |
| S13 | 48 |
| S14 | 44 |
| S15 | 42 |
| S16 | 47 |
| S17 | 52 |
| S18 | 49 |
| S19 | 46 |
| S20 | 49 |
| S21 | 73 |
| S22 | 52 |
| S23 | 51 |
| S24 | 48 |
| S25 | 53 |
| S26 | 49 |
| S27 | 53 |
| S28 | 52 |
| S29 | 51 |
| S30 | 52 |
| S31 | 47 |
| S32 | 54 |
| S33 | 44 |
| S34 | 47 |
| S35 | 55 |
| S36 | 47 |
| S37 | 44 |
| S38 | 41 |
| S39 | 44 |
| S40 | 41 |
| S41 | 42 |
| S42 | 48 |
| S43 | 37 |
| S44 | 44 |
| S45 | 50 |
| S46 | 43 |
| S47 | 46 |
| S48 | 39 |
| S49 | 57 |
| S50 | 47 |
| S51 | 42 |
| S52 | 47 |

**Table 8.2 (Cont'd) Derived $L_{den}$ Values**

| Survey Location Reference | TRL Derived Levels |
|---|---|
| | $L_{den}$ |
| S53 | 50 |
| S54 | 64 |
| S55 | 58 |
| S56 | 47 |
| S57 | 53 |
| S58 | 56 |
| S59 | 48 |
| S60 | 47 |
| S61 | 52 |
| S62 | 49 |
| S63 | 47 |
| S64 | 49 |
| S65 | 52 |
| S66 | 51 |
| S67 | 50 |
| S68 | 57 |
| S69 | 71 |
| S70 | 48 |
| S71 | 81 |
| S72 | 52 |
| S73 | 44 |
| S74 | 48 |
| S75 | 48 |
| S76 | 65 |
| S77 | 48 |
| S78 | 52 |
| S79 | 45 |
| S80 | 45 |
| S81 | 47 |
| S82 | 47 |
| S83 | 48 |
| S84 | 49 |
| S85 | 46 |
| S86 | 59 |
| S87 | 61 |
| S88 | 50 |
| S89 | 47 |
| S90 | 47 |

**Table 8.3A Predicted Noise Levels for Years 2010 and 2025 for "Do Minimum" and "Do Something" Scenarios Section A**

**WATERFORD CITY BY-PASS TO KING'S RIVER**

| Receiver Location Reference | Opening Year 2010 | | Mitigation Required? | Design Year 2025 | | Mitigation Required? |
|---|---|---|---|---|---|---|
| | Predicted Noise Level | | | Predicted Noise Level | | |
| | Do Minimum | Do Something | | Do Minimum | Do Something | |
| | $L_{den}$ | $L_{den}$ | | $L_{den}$ | $L_{den}$ | |
| A01 | 40 | 52 | No | 41 | 53 | No |
| A02 | 46 | 58 | No | 47 | 59 | No |
| A03 | 46 | 59 | No | 47 | 60 | No |
| A04 | 48 | 57 | No | 49 | 59 | No |
| A05 | ***63*** | ***61*** | No | ***64*** | ***62*** | No |
| A06 | ***65*** | ***64*** | No | ***66*** | ***65*** | No |
| A07 | 43 | 56 | No | 44 | 57 | No |
| A08a | 43 | 52 | No | 44 | 53 | No |
| A08b | 43 | 52 | No | 44 | 53 | No |
| A08 | 46 | 53 | No | 47 | 54 | No |
| A09 | 46 | 55 | No | 47 | 56 | No |
| A10 | 46 | 54 | No | 47 | 55 | No |
| A11 | 42 | 55 | No | 43 | 56 | No |
| A12 | 43 | 53 | No | 44 | 54 | No |
| A13 | 48 | 51 | No | 49 | 52 | No |
| A14 | 44 | 51 | No | 45 | 53 | No |
| A15 | 53 | 53 | No | 54 | 54 | No |
| A16 | 45 | 54 | No | 46 | 55 | No |
| A17 | 51 | 53 | No | 52 | 54 | No |
| A18 | 43 | 57 | No | 44 | 58 | No |
| A19 | 49 | 58 | No | 50 | 59 | No |
| A20 | 46 | 53 | No | 47 | 54 | No |
| A21 | 47 | 55 | No | 48 | 56 | No |
| A22 | 46 | 59 | No | 47 | 60 | No |
| A23 | 42 | 57 | No | 43 | 58 | No |
| A24 | 47 | 56 | No | 48 | 58 | No |
| A25 | 47 | 53 | No | 48 | 55 | No |
| A26 | 47 | 51 | No | 48 | 52 | No |
| A27 | 45 | 58 | No | 46 | 59 | No |
| A28 | 44 | 55 | No | 45 | 56 | No |

**Table 8.3A (Cont'd) Predicted Noise Levels for Years 2010 and 2025 for "Do Minimum" and "Do Something" Scenarios Section A**

**WATERFORD CITY BY-PASS TO KING'S RIVER**

| Receiver Location Reference | Opening Year 2010 | | Mitigation Required? | Design Year 2025 | | Mitigation Required? |
|---|---|---|---|---|---|---|
| | Predicted Noise Level | | | Predicted Noise Level | | |
| | Do Minimum | Do Something | | Do Minimum | Do Something | |
| | $L_{den}$ | $L_{den}$ | | $L_{den}$ | $L_{den}$ | |
| A29 | 42 | ***61*** | Yes | 43 | ***62*** | Yes |
| A30 | 43 | ***63*** | Yes | 44 | ***64*** | Yes |
| A31 | 44 | 59 | No | 45 | 60 | No |
| A32 | 45 | 55 | No | 46 | 56 | No |
| A33 | 53 | 55 | No | 55 | 56 | No |
| A34 | 51 | 59 | No | 53 | 60 | No |
| A35 | 52 | 55 | No | 55 | 57 | No |
| A36 | 50 | 53 | No | 52 | 54 | No |
| A37 | 52 | 52 | No | 53 | 53 | No |
| A38 | 46 | 54 | No | 47 | 55 | No |
| A39 | 47 | 52 | No | 48 | 53 | No |
| A40 | 44 | 49 | No | 45 | 50 | No |
| A41 | 48 | 56 | No | 49 | 57 | No |
| A42 | 44 | 56 | No | 45 | 57 | No |
| A43 | 42 | 53 | No | 43 | 54 | No |
| A44 | 54 | 55 | No | 55 | 56 | No |
| A45 | ***63*** | ***61*** | No | ***64*** | ***62*** | No |
| A46 | 45 | 53 | No | 45 | 54 | No |
| A47 | 37 | 56 | No | 38 | 57 | No |
| A48* | 47 | ***64*** | Yes | 47 | ***66*** | Yes |
| A49* | 54 | ***65*** | Yes | 54 | ***66*** | Yes |
| A50 | 41 | 55 | No | 41 | 56 | No |
| A51* | 41 | 57 | No | 41 | 58 | No |
| A52 | 34 | 54 | No | 35 | 55 | No |
| A53 | 33 | 49 | No | 35 | 50 | No |
| A54 | 31 | 53 | No | 32 | 54 | No |
| A55 | 34 | 49 | No | 35 | 50 | No |
| A56 | 35 | 50 | No | 36 | 51 | No |
| A57 | 36 | 54 | No | 38 | 55 | No |
| A58* | 46 | 58 | No | 46 | 59 | No |

**Table 8.3A (Cont'd) Predicted Noise Levels for Years 2010 and 2025 for "Do Minimum" and "Do Something" Scenarios Section A**

**WATERFORD CITY BY-PASS TO KING'S RIVER**

| Receiver Location Reference | Opening Year 2010 | | Mitigation Required? | Design Year 2025 | | Mitigation Required? |
|---|---|---|---|---|---|---|
| | Predicted Noise Level | | | Predicted Noise Level | | |
| | Do Minimum | Do Something | | Do Minimum | Do Something | |
| | $L_{den}$ | $L_{den}$ | | $L_{den}$ | $L_{den}$ | |
| A59* | 44 | ***61*** | Yes | 44 | ***62*** | Yes |
| A60 | 49 | 56 | No | 50 | 57 | No |
| A61 | 58 | 59 | No | 58 | 60 | No |
| A62 | ***61*** | 60 | No | ***62*** | ***61*** | No |
| A63 | 51 | 59 | No | 52 | 60 | No |
| A64 | 37 | 52 | No | 38 | 53 | No |
| A65 | 38 | 56 | No | 39 | 57 | No |
| A66 | 38 | 59 | No | 39 | 60 | No |
| A67 | 37 | 53 | No | 38 | 54 | No |
| A68 | 38 | 53 | No | 39 | 54 | No |
| A69 | 39 | 50 | No | 40 | 51 | No |
| A70 | 38 | 57 | No | 39 | 58 | No |
| A71 | 37 | 52 | No | 38 | 53 | No |
| A72 | 37 | 50 | No | 38 | 51 | No |
| A73 | 37 | 51 | No | 39 | 52 | No |
| A74 | 35 | 58 | No | 36 | 60 | No |

Note* indicates $L_{den}$ Do Minimum levels have been amended to reflect the fact that Do Minimum levels have been understated in some instances due to the fact that some of the local roads in the vicinity of receiver locations are not included in the model as the associated traffic flows are either unknown or very low. Furthermore, in many cases the ambient noise levels are affected by sources other than traffic noise.

**Table 8.3B Predicted Noise Levels for Years 2010 and 2025 for "Do Minimum" and "Do Something" Scenarios Section B**

**KING'S RIVER TO BALLYQUIRKE (INCLUDING THE KILKENNY LINK ROAD)**

| Receiver Location Reference | Opening Year 2010 | | Mitigation Required? | Design Year 2025 | | Mitigation Required? |
|---|---|---|---|---|---|---|
| | Predicted Noise Level | | | Predicted Noise Level | | |
| | Do Minimum | Do Something | | Do Minimum | Do Something | |
| | $L_{den}$ | $L_{den}$ | | $L_{den}$ | $L_{den}$ | |
| B01 | 38 | 55 | No | 39 | 56 | No |
| B02 | 36 | 53 | No | 37 | 55 | No |
| B03 | 39 | 49 | No | 40 | 50 | No |
| B04 | 45 | 54 | No | 46 | 53 | No |
| B05 | ***68*** | 57 | No | ***70*** | 58 | No |
| B06 | 51 | 57 | No | 52 | 58 | No |
| B07 | 48 | 47 | No | 49 | 48 | No |
| B08 | 42 | 54 | No | 43 | 55 | No |
| B09 | 44 | 49 | No | 46 | 50 | No |
| B10 | 40 | 52 | No | 41 | 53 | No |
| B11 | 38 | 54 | No | 39 | 55 | No |
| B12 | 36 | 53 | No | 38 | 54 | No |
| B13 | 35 | 50 | No | 36 | 51 | No |
| B14 | 34 | 46 | No | 35 | 47 | No |
| B15 | 33 | 48 | No | 34 | 49 | No |
| B16* | 33 | 58 | No | 34 | 59 | No |
| B17 | 33 | 52 | No | 34 | 53 | No |
| B18 | 33 | 51 | No | 34 | 52 | No |
| B19 | 33 | 58 | No | 34 | 59 | No |
| B20 | 33 | 53 | No | 34 | 54 | No |
| B21 | 35 | 44 | No | 36 | 45 | No |
| B22 | 35 | 55 | No | 36 | 56 | No |
| B23 | 34 | 42 | No | 35 | 44 | No |
| B24 | 35 | 51 | No | 36 | 52 | No |
| B25 | 38 | 50 | No | 39 | 51 | No |
| B26 | 40 | 57 | No | 41 | 58 | No |
| B27 | 37 | 48 | No | 38 | 49 | No |
| B28 | 39 | 47 | No | 40 | 47 | No |
| B29 | 38 | 56 | No | 39 | 57 | No |
| B30 | 41 | 57 | No | 42 | 56 | No |

**Table 8.3B (Cont'd) Predicted Noise Levels for Years 2010 and 2025 for "Do Minimum" and "Do Something" Scenarios Section B**

**KING'S RIVER TO BALLYQUIRKE (INCLUDING THE KILKENNY LINK ROAD)**

| Receiver Location Reference | Opening Year 2010 Predicted Noise Level | | Mitigation Required? | Design Year 2025 Predicted Noise Level | | Mitigation Required? |
|---|---|---|---|---|---|---|
| | Do Minimum | Do Something | | Do Minimum | Do Something | |
| | $L_{den}$ | $L_{den}$ | | $L_{den}$ | $L_{den}$ | |
| B31 | 50 | 51 | No | 51 | 53 | No |
| B32* | 39 | ***67*** | Yes | 40 | ***68*** | Yes |
| B33 | 44 | 51 | No | 45 | 52 | No |
| B34 | 59 | ***63*** | Yes | 55 | ***64*** | Yes |
| B35 | 58 | ***61*** | Yes | 58 | ***63*** | Yes |
| B36 | 48 | 58 | No | 49 | 59 | No |
| B37 | 48 | 55 | No | 49 | 56 | No |
| B38 | 44 | 55 | No | 45 | 56 | No |
| B39 | 49 | 60 | No | 50 | ***61*** | Yes |
| B40 | 45 | 53 | No | 46 | 54 | No |
| B41 | 45 | 55 | No | 46 | 56 | No |
| B42 | 40 | 53 | No | 41 | 53 | No |
| B43 | 51 | 54 | No | 52 | 55 | No |
| B44 | ***62*** | ***62*** | No | ***63*** | ***63*** | No |
| B45 | 48 | 53 | No | 49 | 54 | No |
| B46 | 48 | 54 | No | 49 | 56 | No |
| B47 | 48 | 54 | No | 49 | 55 | No |
| B48 | 46 | 48 | No | 47 | 49 | No |
| B49 | 44 | 48 | No | 45 | 49 | No |
| B50 | 42 | 47 | No | 43 | 48 | No |
| B51 | 42 | 48 | No | 43 | 49 | No |
| B52 | 40 | 47 | No | 41 | 48 | No |
| B53 | 40 | 55 | No | 41 | 56 | No |
| B54 | 39 | 59 | No | 40 | 60 | No |
| B55 | 39 | 53 | No | 40 | 54 | No |
| B56 | 39 | 49 | No | 40 | 50 | No |

Note * indicates $L_{den}$ Do Minimum levels have been amended to reflect the fact that Do Minimum levels have been understated in some instances due to the fact that some of the local roads in the vicinity of receiver locations are not included in the model as the associated traffic flows are either unknown or very low. Furthermore, in many cases the ambient noise levels are affected by sources other than traffic noise.

**Table 8.3C Predicted Noise Levels for Years 2010 and 2025 for "Do Minimum" and "Do Something" Scenarios Section C**

**BALLYQUIRKE TO POWERSTOWN**

| Receiver Location Reference | Opening Year 2010 Predicted Noise Level | | Mitigation Required? | Design Year 2025 Predicted Noise Level | | Mitigation Required? |
|---|---|---|---|---|---|---|
| | Do Minimum | Do Something | | Do Minimum | Do Something | |
| | $L_{den}$ | $L_{den}$ | | $L_{den}$ | $L_{den}$ | |
| C01 | 45 | 49 | No | 46 | 50 | No |
| C02 | 45 | 52 | No | 46 | 53 | No |
| C03 | 46 | 52 | No | 47 | 53 | No |
| C04 | 45 | 54 | No | 46 | 55 | No |
| C05 | 46 | 55 | No | 47 | 56 | No |
| C06 | 48 | 58 | No | 49 | 59 | No |
| C07 | 48 | 60 | Yes | 49 | ***62*** | Yes |
| C08 | 49 | ***61*** | Yes | 50 | ***62*** | Yes |
| C09 | 49 | 58 | No | 50 | 59 | No |
| C10 | 50 | 60 | Yes | 51 | ***61*** | Yes |
| C11 | 48 | 57 | No | 49 | 58 | No |
| C12 | 53 | 55 | No | 54 | 56 | No |
| C13 | 47 | 55 | No | 48 | 56 | No |
| C14 | 51 | 51 | No | 52 | 52 | No |
| C15 | 50 | 52 | No | 51 | 53 | No |
| C16 | 46 | 55 | No | 47 | 56 | No |
| C17 | 49 | 59 | No | 50 | 60 | No |
| C18 | 47 | 59 | No | 48 | 60 | No |
| C19 | 45 | 52 | No | 46 | 53 | No |
| C20 | 43 | 51 | No | 44 | 52 | No |
| C21 | 43 | ***61*** | Yes | 43 | ***62*** | Yes |
| C22 | 43 | 52 | No | 44 | 53 | No |
| C23 | 42 | ***61*** | Yes | 43 | ***62*** | Yes |
| C24 | 41 | 54 | No | 42 | 55 | No |
| C25 | 42 | 55 | No | 43 | 56 | No |
| C26 | 40 | ***61*** | Yes | 41 | ***62*** | Yes |
| C27 | 39 | 59 | No | 40 | 60 | No |
| C28 | 39 | 51 | No | 40 | 52 | No |
| C29 | 38 | 58 | No | 39 | 59 | No |
| C30 | 36 | 55 | No | 37 | 56 | No |

**Table 8.3C (Cont'd) Predicted Noise Levels for Years 2010 and 2025 for "Do Minimum" and "Do Something" Scenarios Section C**

**BALLYQUIRKE TO POWERSTOWN**

| Receiver Location Reference | Opening Year 2010 Predicted Noise Level | | Mitigation Required? | Design Year 2025 Predicted Noise Level | | Mitigation Required? |
|---|---|---|---|---|---|---|
| | Do Minimum | Do Something | | Do Minimum | Do Something | |
| | $L_{den}$ | $L_{den}$ | | $L_{den}$ | $L_{den}$ | |
| C31* | 47 | 50 | No | 47 | 51 | No |
| C32 | 35 | 56 | No | 36 | 57 | No |
| C33 | 36 | 56 | No | 37 | 57 | No |
| C34 | 35 | 57 | No | 36 | 58 | No |
| C35* | 45 | ***61*** | Yes | 45 | ***62*** | Yes |
| C36 | 37 | 58 | No | 37 | 59 | No |
| C37 | 35 | 54 | No | 36 | 55 | No |
| C38 | 34 | 58 | No | 35 | 59 | No |
| C39 | 39 | 56 | No | 40 | 57 | No |
| C40 | 34 | 55 | No | 34 | 56 | No |
| C41 | 41 | 55 | No | 42 | 56 | No |
| C42 | 35 | ***63*** | Yes | 36 | ***64*** | Yes |
| C43 | 37 | 51 | No | 38 | 52 | No |
| C44 | 38 | 57 | No | 39 | 58 | No |
| C45 | 37 | 54 | No | 38 | 55 | No |
| C46 | 37 | 54 | No | 38 | 54 | No |
| C47 | 36 | 53 | No | 37 | 54 | No |
| C48 | 40 | ***63*** | Yes | 41 | ***64*** | Yes |
| C49 | 40 | 57 | No | 41 | 58 | No |
| C50 | 39 | 56 | No | 40 | 57 | No |
| C51 | 41 | 60 | Yes | 42 | ***61*** | Yes |
| C52 | 41 | 54 | No | 42 | 55 | No |
| C53 | 43 | 56 | No | 43 | 57 | No |
| C54 | ***64*** | 58 | No | ***65*** | 59 | No |

Note * indicates $L_{den}$ Do Minimum levels have been amended to reflect the fact that Do Minimum levels have been understated in some instances due to the fact that some of the local roads in the vicinity of receiver locations are not included in the model as the associated traffic flows are either unknown or very low. Furthermore, in many cases the ambient noise levels are affected by sources other than traffic noise.

**Table 8.4A Predicted Noise Levels for Years 2025 for "Do Minimum" and "Do Something" Scenarios Considering Mitigation Measures for 50dB $L_{night}$ and 60dB $L_{den}$ Section A**

**WATERFORD CITY BY-PASS TO KING'S RIVER**

| Receiver Location Reference | Proposed Mitigation Measure | Opening Year 2010 Predicted Noise Level | | Mitigation Required? | Design Year 2025 Predicted Noise Level | | Mitigation Required? |
|---|---|---|---|---|---|---|---|
| | | Do Minimum | Do Something | | Do Minimum | Do Something | |
| | | $L_{den}$ | $L_{den}$ | | $L_{den}$ | $L_{den}$ | |
| A29 | 2m bund | 42 | 58 | No | 43 | 59 | No |
| A30 | 3m bund/fence | 43 | 59 | No | 44 | 60 | No |
| A48 | 2.5m fence | 47 | ***63*** | No | 47 | ***65*** | No * |
| A49 | 2.5m fence | 54 | ***63*** | No | 54 | ***64*** | No * |
| A59 | 2m fence | 44 | 58 | No | 44 | 59 | No |

*Note: * a structured approach has been taken in order to ameliorate road traffic noise at these locations, as far possible, thereby complying with the NRA guidelines.*

**Table 8.4B Predicted Noise Levels for Years 2025 for "Do Minimum" and "Do Something" Scenarios Considering Mitigation Measures for 50dB $L_{night}$ and 60dB $L_{den}$ Section B**

**KING'S RIVER TO BALLYQUIRKE (INCLUDING THE KILKENNY LINK ROAD)**

| Receiver Location Reference | Proposed Mitigation Measure | Opening Year 2010 Predicted Noise Level | | Mitigation Required? | Design Year 2025 Predicted Noise Level | | Mitigation Required? |
|---|---|---|---|---|---|---|---|
| | | Do Minimum | Do Something | | Do Minimum | Do Something | |
| | | $L_{den}$ | $L_{den}$ | | $L_{den}$ | $L_{den}$ | |
| B32 | 4m bund/fence | 39 | 59 | No | 40 | 60 | No |
| B34 | 2m fence | 59 | 59 | No | 55 | 60 | No |
| B35 | 2m fence | 58 | 58 | No | 58 | 60 | No |
| B39 | 2m bund | 49 | 59 | No | 50 | 60 | No |

**Table 8.4C Predicted Noise Levels for Years 2025 for "Do Minimum" and "Do Something" Scenarios Considering Mitigation Measures for 50dB $L_{night}$ and 60dB $L_{den}$ Section C**

**BALLYQUIRKE TO POWERSTOWN**

| Receiver Location Reference | Proposed Mitigation Measure | Opening Year 2010 | | Mitigation Required? | Design Year 2025 | | Mitigation Required? |
|---|---|---|---|---|---|---|---|
| | | Predicted Noise Level | | | Predicted Noise Level | | |
| | | Do Minimum | Do Something | | Do Minimum | Do Something | |
| | | $L_{den}$ | $L_{den}$ | | $L_{den}$ | $L_{den}$ | |
| C07 | 1m fence | 48 | 57 | No | 49 | 59 | No |
| C08 | 1m fence | 49 | 59 | No | 50 | 60 | No |
| C10 | 1m fence | 50 | 59 | No | 51 | 60 | No |
| C21 | 2m bund | 43 | 58 | No | 43 | 59 | No |
| C23 | 2m bund | 42 | 59 | No | 43 | 60 | No |
| C26 | 1.5m bund | 40 | 58 | No | 41 | 59 | No |
| C35 | 2m fence | 45 | 59 | No | 45 | 60 | No |
| C42 | 2.25m bund | 35 | 59 | No | 36 | 60 | No |
| C48 | 2.5m fence | 40 | 59 | No | 41 | 60 | No |
| C51 | 1m bund | 41 | 59 | No | 42 | 60 | No |

**Table 8.5: Source Noise Level Data for Construction Plant**

| Details | | Sound Power Level $L_w$ dB(A) re. $10^{-12}$W | BS5228 Ref. | Notes |
|---|---|---|---|---|
| Typical Sources | Dozer | 111 | Pt. 1, Table C3: 65 | - |
| | Dump Truck | 102 | Pt. 1, Table C9: 19 | - |
| | Asphalt Spreader | 101 | Pt. 1, Table C8: 24 | - |
| | Road Roller | 101 | Pt. 1, Table C8: 30 | - |

**Table 8.6: Maximum Expected Values for Construction Noise Levels in the Vicinity of Mainline Construction Activities**

| Details | Plant Item | Highest predicted noise level at stated distance from edge of works (dB $L_{Aeq(1hr)}$) | | | | |
|---|---|---|---|---|---|---|
| | | 20m | 40m | 60m | 80m | 100m |
| Without mitigation | Dozer | 68 | 64 | 62 | 59 | 58 |
| | Dump Truck | 60 | 55 | 52 | 50 | 48 |
| | Asphalt Spreader | 59 | 55 | 52 | 49 | 48 |
| | Road Roller | 58 | 54 | 51 | 49 | 47 |
| With basic mitigation in the form of exhaust silencers and a site hoarding | Dozer | 58 | 54 | 52 | 49 | 48 |
| | Dump Truck | 50 | 45 | 42 | 40 | 38 |
| | Asphalt Spreader | 54 | 50 | 47 | 42 | 43 |
| | Road Roller | 48 | 44 | 41 | 39 | 37 |

**Table 8.7: Maximum Expected Values for Construction Traffic Noise Levels on Existing Road Network**

| Section of the Proposed Road | Side Roads | Chainage | HCVs / Day [8] | $L_{Aeq(1hr)}$ dB |
|---|---|---|---|---|
| Waterford By-Pass to Railway Line | N9 | 2+100 | 396 | 52 |
| Railway to Ballygreek River | LS7462 | 5+060 | 59 | 43 |
| | LS7453 | 9+640 | 59 | 43 |
| Ballygreek River to Derrylacky River | R704 | 10+700 | 484 | 52 |
| Derrylacky River to Railway | N9 at Lukeswell | 14+390 | 304 | 50 |
| Railway to King's River | LS8260 | 20+140 | 26 | 40 |
| | LP4211 | 23+420 | 26 | 40 |
| | R699 | 25+250 | 261 | 50 |
| | LS8201 | 29+470 | 26 | 40 |
| | LP1023 | 31+120 | 26 | 40 |
| King's River to River Nore | LS5067 | 31+700 | 34 | 41 |
| | N10 | 35+200 | 140 | 47 |
| | LP4200 | 37+100 | 34 | 41 |
| | R700 | 39+350 | 175 | 48 |
| River Nore to Ballyquirke | LP2632 | 40+500 | 72 | 44 |
| | LS6706 | 43+200 | 76 | 44 |
| | R702 | 47+330 | 191 | 48 |
| | N10 | 48+050 | 224 | 49 |
| | Kilkenny Ring Road | 0+000 | 81 | 45 |

[8] Assume movements occur over a twelve hour day.

**Table 8.7 (Cont'd): Maximum Expected Values for Construction Traffic Noise Levels on Existing Road Network**

| Section of the Proposed Road | Side Roads | Chainage | HCVs / Day [9] | $L_{Aeq(1hr)}$ dB |
|---|---|---|---|---|
| Kilkenny Link | N10 (along Kilkenny Link Road) | 5+520 | 208 | 49 |
| Ballyquirke to Jordanstown | L2623 | 63+020 | 419 | 52 |
| Jordanstown to River Barrow | L2625 | 64+850 | 342 | 51 |
| | L7117 | 67+735 | 387 | 52 |
| | L3037 | 71+220 | 291 | 50 |
| | L3038 | 75+000 | 374 | 51 |
| River Barrow to Powerstown | N9 | 76+450 | 443 | 52 |

**Table 8.8 Allowable Vibration Levels During Construction Phase**

| Allowable vibration velocity (Peak Particle Velocity) at the closest part of any sensitive property to the source of vibration, at a frequency of | | |
|---|---|---|
| Less than 10Hz | 10 to 50Hz | 50 to 100Hz (and above) |
| 8 mm/s | 12.5 mm/s | 20 mm/s |

[9] Assume movements occur over a twelve hour day.