

8 Noise and Vibration

8.1 Introduction

This chapter of the EIS assesses the potential noise and vibration impact of the Proposed Project on the baseline environment. The potential noise impact due to the construction and operational phase of the Proposed Project is considered. The baseline environment is described, the impact during the construction and operational phases is assessed and mitigation measures are proposed as required.

8.2 Assessment Methodology

8.2.1 Introduction

The Traffic Noise and Air Quality Unit of Dublin City Council was requested to use their sound emission modelling software and the Dublin City 'Noise Model' to assess any potential noise impact on the implementation of traffic management measures at College Green, creating a public plaza. Noise modelling was carried out using the Bruel & Kjaer Predictor V11.1 noise modelling software and incorporating CRTN (TRL) assessment Method 3. This method is accepted by the EPA for strategic noise mapping, as per EU Directive 2002/49/EC and Statutory Instrument S.I. No 140 of 2006. The aim of the study was to assess the impact of the Proposed Project ambient sound levels in Dublin City Centre with a particular focus on noise emissions along Parliament Street. The noise model study consisted of the following:

- Noise modelling of five scenarios - 2012 base year, the scheme opening year 2018 Do Minimum (DM), 2018 Do Something (DS), 2035 Do Minimum (DM) and 2035 Do Something (DS). Where the DM and DS scenarios are as defined in Chapter 1 *Introduction*.
- Calculation of the change in ambient sound levels at total address points and residential address points within the study area;
- An assessment of the impact of the various scenarios at total address points and residential address points within the study area using the 'Desirable/Undesirable' descriptions as set out in the Dublin Agglomeration Environmental Noise Action Plan Dec. 2013- Nov. 2018.

The Do-Minimum Scenario represents movement and access in the city centre as it exists currently, taking into account developments with approved planning permissions, as well as projects committed to be implemented prior to the Proposed Project. This scenario includes the continuation of all east-west through traffic at College Green during the weekends and public transport access only from Monday to Friday. This scenario includes no plaza provided at College Green.

There are two representative 'Do-Something' scenarios. The first represents a situation where the Proposed Project has been implemented as well as other planned projects outlined in the do-minimum scenario (by 2018).

The second represents a situation where the NTA Dublin City Centre Transport Study (DCC, NTA, 2015) has been implemented in totality (by 2035). This includes the Proposed Project, as well as a number of 'other planned projects'.

CRTN (TRL) Method 3 was used to calculate the impact of the five scenarios outlined above on the ambient sound levels in the study area. The traffic volume inputs for the sound model were derived from the NTA's 'Regional Modelling System East Regional Model (ERM)', except for the 2012 base year scenario, and were based on the report 'College Green Traffic Management Measures Draft Modelling Report, March 2017' (NTA, 2017)- the results of which are outlined in **Appendix 6.1**. As such the resulting sound level outputs are solely based on these inputs. The model structure including building heights, barriers, ground hardness etc., were all taken from Dublin City Council's main ambient sound model datasets, which are used to calculate 'noise maps' for the purpose of compliance with Directive 2002/49/EC. The outputs from this model have been accepted by the EPA, the European Commission and the European Environment Agency to be in compliance with this directive.

8.2.2 Study area

The Study area is bounded to the North by the North Quays from Inns Quay to Eden Quay, to the South from College Street, Suffolk Street\St. Andrew Street via Dame Street to High Street, to the East by O'Connell Bridge to D'Olier Street via College Street and Grafton Street and to the West by Church Street to Bridge Street Upper. This area encompasses the proposed College Green Plaza itself and includes all roads directly associated with those relocated traffic movements which were determined to have the greatest impacts, and in particular public transport movements, related to the proposal.

8.2.3 Limits and Significance Criteria

8.2.3.1 Construction Phase

There is currently no published statutory Irish guidance relating to the maximum allowable noise level that may be generated during the construction phase of a project.

BS 5228-1:2009+A1:2014 *Code of Practice for Noise and Vibration Control on Construction and Open Sites - Noise*, sets relative construction noise criteria with reference to the existing noise environment. These limits are considered the most appropriate noise limits to apply in this instance as they consider the existing baseline noise environment. The significance criteria are the recommended range of 'total noise' (i.e. the ambient combined with the construction noise) which should not be exceeded for each assigned category. **Table 8.1** sets out construction noise criteria presented in BS5228.

Table 8.1 - BS5228 (Part 1) ABC Assessment Categories and Thresholds (BSI, 2014)

Assessment Category and Threshold Value Period L_{Aeq}	Threshold Value in Decibels (dB)		
	A ^{A)}	B ^{B)}	C ^{C)}
Night (23:00-07:00hrs)	45	50	55
Evening ^{D)}	55	60	65
Day (07:00-19:00hrs)	65	70	75

- A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values
- B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values
- C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A
- D) 19:00 – 23:00hrs weekdays, 13:00-23:00hrs Saturdays and 07:00-23:00hrs Sundays

The limits outlined in **Table 8.2** will be applied at the nearest sensitive receptor to the works area. Sensitive receptors are defined in BS5228 as any occupied premises outside a site used as a dwelling, place of worship, educational establishment, hospital or similar institution or any other property likely to be adversely affected by an increase in noise level. Based on noise predictions in the area shown in **Figure 8.1**, Category C limits apply, refer to **Table 8.2**.

Table 8.2 - Noise Limits to be applied based on BS5228 Criteria

Assessment Category and Threshold Value Period L_{Aeq}	Threshold Value in Decibels (dB)
Night (23:00-07:00hrs) (L_{Aeq} , dB)	55
Evening (19:00-23:00hrs) (L_{Aeq} , dB)	65
Day (07:00-19:00hrs) (L_{Aeq} , dB)	75

The main vibration source during the construction phase will be during the excavation of existing pathways and stone setts. Vibration limits during construction phase of the Proposed Project is provided in the TII Noise guidance, refer to **Table 8.3**.

Table 8.3 - Vibration limits at the nearest sensitive receptor

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 50 Hz	50 to 100 Hz (and above)
8mm/s	12.5mm/s	20mm/s

As the construction phase of the Proposed Project is not predicted to generate traffic increases of greater than 25%, no construction assessment has been undertaken, refer to Chapter 6 ‘*Traffic and Transportation*’.

8.2.3.2 Operational Phase

There are currently no Irish standards or limits governing the assessment of noise associated with new or existing roads. TII, formally the NRA, produced ‘Guidelines for the treatment of Noise and Vibration in National Road Schemes’.

There are no national roads within the Proposed Project. While the Proposed Project will involve a modal distribution of traffic flows, it does not involve the construction of new roads.

The Dublin Agglomeration Environmental Noise Action Plan Dec. 2013 - Nov. 2018 (DCC, 2103) was adopted by Dublin City Council as the plan, consisting of related actions, to be used in the management of various transport related sound emissions within the Dublin City Region over the period December 2013-

November 2018. It sets out levels that are considered to be desirable\undesirable within the Dublin Agglomeration (Ch.6, Para 6.2.1). These are:

Desirable Sound Levels L_{Aeq}	
Night (23:00-07:00hrs) (L_{Aeq} , dB)	< 50 dB(A) L_{night}
Day (07:00-19:00hrs) (L_{Aeq} , dB)	< 55 dB(A) L_{day}

Undesirable Sound Levels L_{Aeq}	
Night (23:00-07:00hrs) (L_{Aeq} , dB)	> 55 dB(A) L_{night}
Day (07:00-19:00hrs) (L_{Aeq} , dB)	> 70 dB(A) L_{day}

8.2.4 Impact Assessment Methodology

This study noise modelling was carried out using the Bruel & Kajer Predictor V11.1 noise modelling software and incorporating CRTN (TRL) assessment Method 3 which is accepted by the EPA for strategic noise mapping, as per EU Directive 2002/49/EC and Statutory Instrument S.I. No 140 of 2006.

The software inputs required to create a noise model, consist of building polygons and barriers with associated heights, ground hardness, ground height contours, and road centre lines with associate attributes such as road widths, pavement type, and slope. As previously stated, this data was extracted from Dublin City Council's noise model data sets.

Assigned to each road centre line are traffic volumes with associated attributes such as traffic speed and traffic type (HGV, LV). This data was provided by the NTA for each scenario, except the 2012 base year, and which was extracted from their Regional Modelling System East Regional Model (ERM).

Based on these inputs the software calculates a basic sound pressure level along the road centre lines. This basic sound level is then used by the software in further computations to assess, amongst other things, the impact of distance between source and receive, the impact of reflecting surfaces, buildings, barriers and hardness of the ground over which the sound travels.

The modelling process calculated sound emission values at 10m grid intervals across the study area which were used to produce sound contours and at 2m spacing around the façades of each building in order to assess the population exposure. Sound level emissions were apportioned to periods for day (L_{day}) 7am-7pm, evening ($L_{evening}$) 7pm – 11pm, night time (L_{night}) 11pm-7am, and a 24hr weighted value (L_{den}). The exposure assessment is based on the maximum calculated sound level value at the facades of each building.

An assessment as to the robustness of the model has been carried out using 2012 traffic volumes and measurements taken from the Dublin City Council's ambient sound monitoring network. In 2012, this network consisted of 11 sites monitoring 24 hours a day, 365 days of the year at fixed locations around Dublin. The averaged network wide measurements gave values of 56dB(A), 50dB(A) and 59dB(A) for the L_{day} , L_{night} and L_{den} respectively. The modelled values for the same network locations gave average values for L_{day} between the 50-55dB(A) band, L_{night} values between 45-50dB(A) band and the L_{den} values between 55-

60dB(A) band. From this it can be seen that the L_{night} and L_{den} measured values fall within the modelled bands, whilst the L_{day} is 1dB above the modelled bands. The noise modelled outputs could therefore be deemed to be robust.

8.3 Baseline Environment

The College Green area is surrounded by historical buildings 4-5 stories high, which enclose the area and which militate against the natural decay of the sound emitted in the area. There are 37 residential address points located in the immediate College Green area as per An Post's GeoDirectory.

Currently the College Green area is dominated by high sound emissions from traffic despite restrictions placed on access by heavy goods vehicles and a 7am-7pm bus gate, Monday -Friday, which prohibits through access for all vehicles other than for public transport.

The 2012 Dublin City 'Noise Map' (DCC, 2013) produced to fulfil the requirements of Directive 2002/49/EC and I.S. No.140 of 2006 indicates that sound emissions from traffic in the College Green area currently fall within the 60-65dB(A) band for night time (L_{night}) and the 'greater than 75dB(A)' band for the day time (L_{day}) period. These levels are considered undesirable with reference to the Noise Action Plan.

The implementation of the Proposed Project will mean the removal of all vehicles from the College Green area, thus requiring the existing volumes of traffic in that area to be absorbed over the wider Dublin City road network.

8.4 Predicted Impacts

8.4.1 Construction phase

The construction phase of the Proposed Project will involve site clearance, some excavation and the development of the plaza.

A variety of items of plant will be in use, such as excavators, breakers, crushers, lifting equipment, dumper trucks, compressors and generators. There will be vehicular movements to and from the site that will make use of existing roads and site access points.

Normal working hours during the construction phase will be as follows:

Start	Finish	
0700	1800	Monday to Friday
0800	1400	Saturday

However, it may be necessary to work outside of these hours at night and at weekends during certain activities and stages of the Proposed Project.

8.4.2 Operational Phase

8.4.2.1 Introduction

The transport changes likely to contribute to noise impacts during the operational phase of the Proposed Project is due to the rerouting of buses due to the closure of College Green to east-west traffic. These re-routings are inputted into the noise model to determine the noise impact.

The largest increase in bus numbers during the AM peak is predicted to occur along Grafton Street, an increase of 100 buses compared to the DM scenario.

The North Quays show an increase in bus numbers during the AM peak between Ormond Quay and Bachelors Walk (54 buses), and on Eden Quay (28 buses). The South Quays show an increase between Aston Quay and Wellington Quay (44 buses) and on Burgh Quay (22 buses).

Winetavern Street, Parliament Street, and College Street also show an increase (50, 47 and 30 buses respectively) in the DS scenario during the AM peak.

Bus numbers are predicted to decrease along South Great George's Street and Dame Street.

In the 2035 scenario, the largest increase in bus numbers during the AM peak is along Winetavern Street, Ormond Quay and Bachelors Walk, an increase of 44, 41 and 45 buses respectively. There is a decrease of bus numbers along South Great George's Street and Dame Street.

Due to the narrowness of streets such as Parliament Street and the proximity of building facades to the road, more detailed results are provided in these areas.

Further details on bus rerouting are provided in Chapter 6 *Traffic and Transportation*.

8.4.2.2 2018 Do Minimum Scenario

The noise model was run based on the NTA's East Regional Model (ERM) 2018 Do Minimum traffic outputs. A total of 5,311 address points are located within the study area, of which 2,892 are residential addresses. The outputs of this run indicate that 28% of all address points and 20% of residential address points are predicted to fall within the undesirable category during the day. 41% of all address points and 49% of 'Residential Addresses Points' are predicted to fall within the desirable category during the day.

During the night time period, 49% of all address points and 37% of residential address points are predicted to fall within the undesirable band. 44% of all address points and 54% of residential address points are predicted to fall within the desirable band during the night.

Refer to **Table 8.4** for the number of properties falling into each noise band for residential address points and **Table 8.5** for all address points for the 2018 Do Minimum Scenario within the study area.

Table 8.4 - 2018 Do Minimum number of Residential Address Points in each noise band within the study area

Noise band (dB)	Day	Night	L _{den}
<45	595	1,232	521
45-50	322	317	276
50-55	512	270	552
55-60	331	219	335
60-65	83	833	154
65-70	466	21	255
70-75	575	0	784
>=75	8	0	15

<50@ Night-Desirable		<55@ Day-Desirable	
>55@ Night -Undesirable		>70@ Day -Undesirable	

Table 8.5 - 2018 Do Minimum number of Total Address Points in each noise band within the study area

Noise band (dB)	Day	Night	L _{den}
<45	826	1,813	685
45-50	512	542	450
50-55	813	378	851
55-60	471	622	543
60-65	187	1,838	255
65-70	1,035	120	667
70-75	1,417	0	1,798
>=75	52	0	64

<50@ Night-Desirable		<55@ Day-Desirable	
>55@ Night -Undesirable		>70@ Day -Undesirable	

Figures 8.1 and **Figure 8.2** display the day and night time outputs from the model in colour contour format. The highest noise levels during the day are shown to occur along Dame Street, from the Trinity Street junction through to College Green, Westmorland Street, D'Olier Street and O'Connell Bridge. On Parliament Street, the noise levels at building facades are predicted to fall within the 70-75dB(A) band. This equates to 110 address points falling within this band, with 65 of them being residential. Road facing building facades on Winetavern Street are also predicted to fall within this noise contour. The majority of road facing facades along both the north and south quays of the Liffey are predicted to fall within the 65-70dB(A) band.

During the night, the highest levels are predicted between College Green and O'Connell Bridge and from College Green along Dame Street to South Great Georges Street. The majority of the road facing building facades on Parliament Street are predicted to fall within the 60-65dB(A) band at night, equating to 103 address points, 59 of them being residential. The remaining address points are predicted to fall within the next highest decibel band.

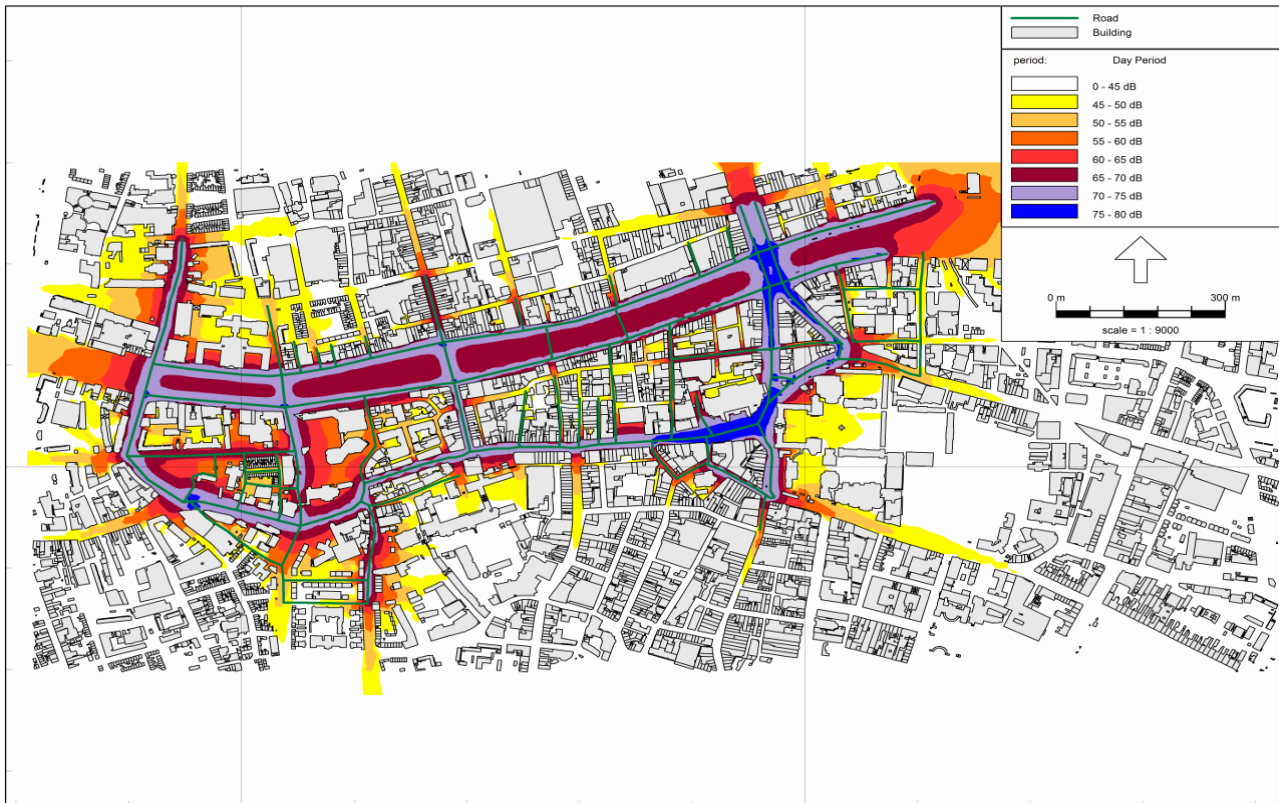


Figure 8.1 - 2018 Do Minimum Scenario (L_{day})

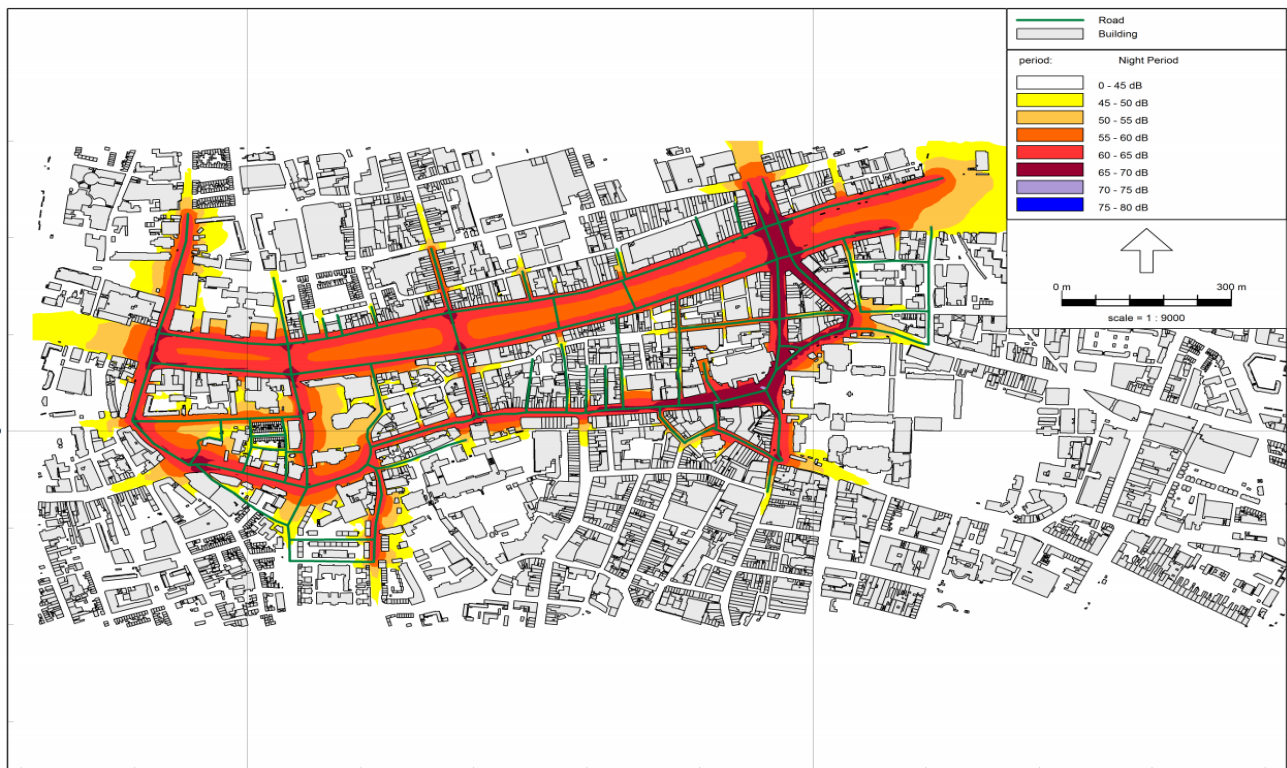


Figure 8.2 - 2018 Do Minimum Scenario (L_{night})

8.4.2.3 2018 Do Something Scenario

The noise model for the 2018 DS scenario was run based on the traffic data from the NTA's East Regional Model (ERM) for 2018 with the Proposed Project in place. A total of 5,311 address points are located within the study area of which 2,892 are residential addresses. The outputs of this run indicate that 25% of all address points and 25% of residential address points are predicted to fall within the undesirable category during the day. 40% of all address points and 47% of residential addresses points are predicted to fall within the desirable category during the day.

During the night time period, 50% of all address points and 42% of residential address points are predicted to fall within the undesirable band. 45% of all address points and 53% of residential address points are predicted to fall within the desirable band during the night.

Compared to the 2018 DM scenario, an increase of 5% of residential address points in the undesirable day time category is predicted and a decrease of 2% of residences in the desirable category is expected. When comparing the two scenarios for night time a 5% increase in residential numbers in the undesirable band is predicted in the DS scenario and a slight decrease of approximately 1% is expected in the desirable band in the 2018 DS scenario.

Refer to **Table 8.6** for the number of properties falling into each noise band for residential address points and **Table 8.7** for all address points for the 2018 Do Something Scenario.

Table 8.6 - 2018 Do Something number of Residential Address Points in each noise band within the study area

Noise band (dB)	Day	Night	L _{den}
<45	570	1,156	500
45-50	399	386	271
50-55	378	142	508
55-60	235	348	272
60-65	253	846	145
65-70	341	14	399
70-75	708	0	789
>=75	8	0	8

<50dB at night-desirable		<55dB at day-Desirable	
>55dB at night -undesirable		>70dB at day -Undesirable	

Table 8.7 - 2018 Do Something number of Total Address Points in each noise band within the study area

Noise band (dB)	Day	Night	L _{den}
<45	823	1786	695
45-50	636	628	456
50-55	645	245	808
55-60	382	787	478
60-65	376	1824	247
65-70	1107	43	990
70-75	1326	0	1603
>=75	18	0	36

<50dB at night-desirable		<55dB at day-Desirable	
>55dB at night -undesirable		>70dB at day -Undesirable	

Figures 8.3 and **Figure 8.4** display the day and night time outputs from the model in colour contour format. The highest noise levels during the day are predicted to occur on O'Connell Bridge, High Street and Winetavern Street. On Parliament Street, the noise levels along the road facing façades are predicted to fall within the 70-75dB(A) band. This equates to 110 address points falling within this band, with 65 of them being residential; the same as the DM scenario. Buildings along Winetavern Street are similarly exposed. Daytime noise levels are predicted to drop to the 60-65dB(A) band in front of the Central Bank of Ireland, College Green compared to the DM scenario. The highest night time levels are predicted at the same locations as daytime. The majority of building facades on Parliament Street are predicted to fall within the 60-65dB(A) band at night, equating to 103 address points, 59 of them being residential, as per the DM scenario. The remaining address points are predicted to fall within the next highest decibel band and on Winetavern Street portion of the road is exposed to the 65-70dB(A).

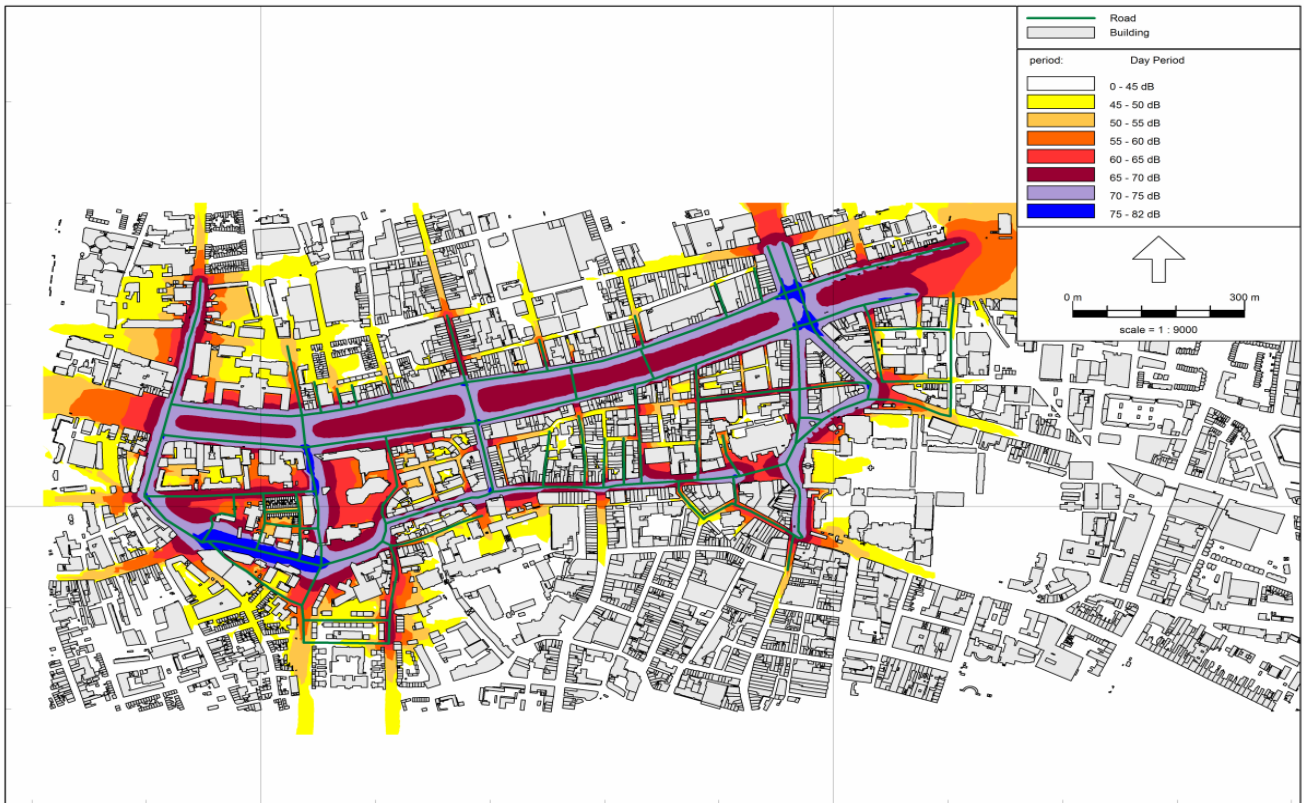


Figure 8.3 - 2018 Do Something Scenario (L_{day})



Figure 8.4 - 2018 Do Something Scenario (L_{night})

Figures 8.5 and **Figure 8.6** display the day and night time outputs from the model in colour contour format. The highest noise levels are predicted on High Street, along Lord Edward Street, Dame Street and Parliament Street. During the night time, the same roads as daytime are predicted to experience the highest noise levels. Most building facades in Parliament Street are predicted to be exposed to noise levels in the 70-75dB(A) band during the day which equates to 103 address points of which 59 are residential. The remaining address points are predicted to fall within the next highest decibel band. At night time most of the facades are predicted to be exposed to noise levels in the 65-70dB(A) band at night. This equates to 110 address points of which 65 are residential.

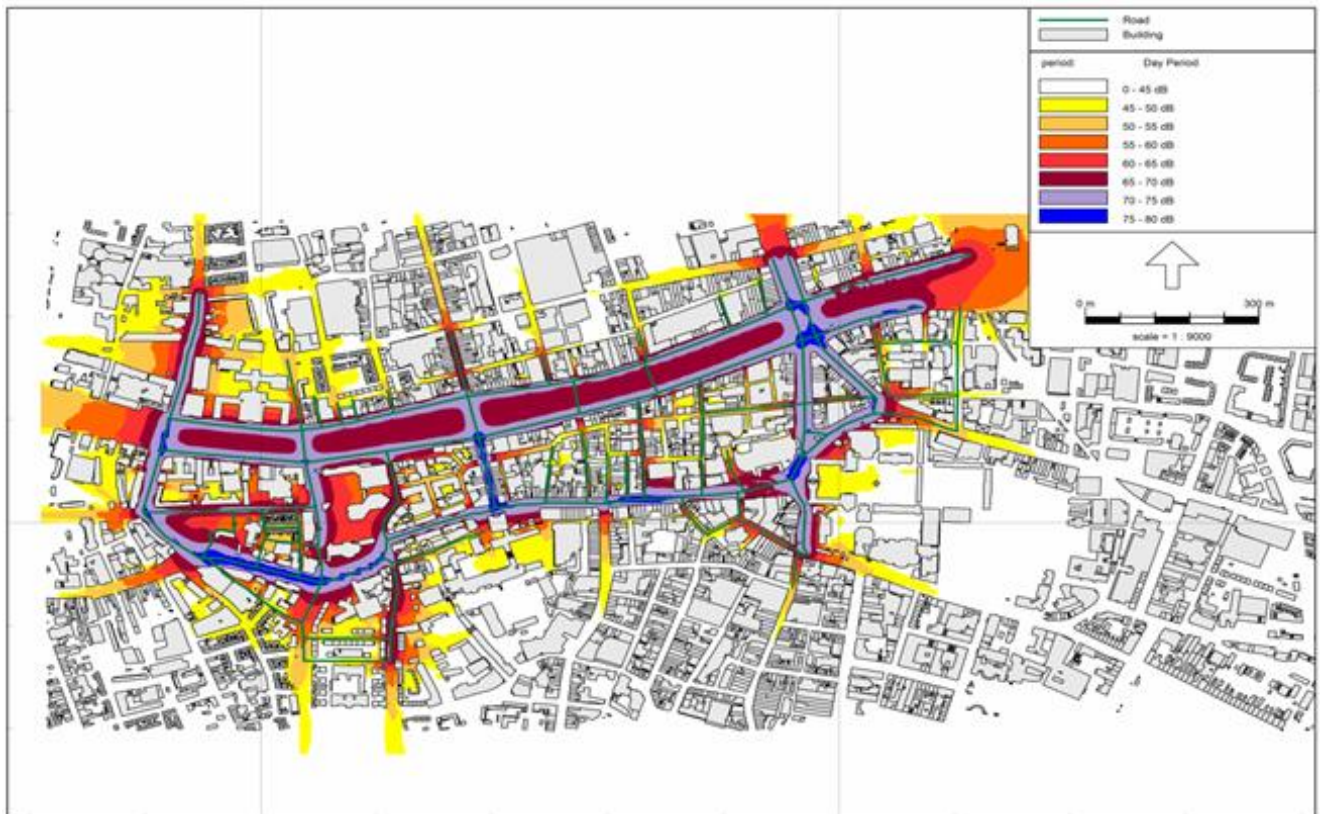


Figure 8.5 - 2035 Do Minimum Scenario (Lday)



Figure 8.6 - 2035 Do Minimum Scenario (L_{night})

8.4.2.5 2035 Do Something Scenario

The noise model for the 2035 DS scenario was run based on traffic data from the NTA's East Regional Model (ERM) model for 2035 with the Proposed Project in place. A total of 5,311 address points are located within the study area of which 2,892 are residential addresses. The outputs of this run indicated that 33% of all address points and 29% of residential address points are predicted to fall within the undesirable category during the day. 37% of 'All Address Points' and 43% Residential address points are predicted to fall within the desirable category during the day.

During the night time period, 50% of all address points and 42% of residential address points are predicted to fall within the undesirable band. 44% of 'All Address points' and 51% of residential address points are predicted to fall within the desirable band during the night. The night time percentages are very similar to the 2035 Do Minimum Scenario outputs.

Refer to **Table 8.10** for the number of properties falling into each noise band for residential address points and **Table 8.11** for all address points for the 2035 Do Something Scenario.

Table 8.10 - 2035 Do Something Scenario number of Residential Address Points in each noise band within the study area

Noise band (dB)	Day	Night	Lden
<45	564	1115	503
45-50	435	359	286
50-55	236	195	395
55-60	348	210	328
60-65	168	984	188
65-70	290	29	189
70-75	849	0	975
>=75	2	0	28

<50dB at night-desirable		<55dB at day-desirable	
>55dB at night -undesirable		>70dB at day -undesirable	

Table 8.11 - 2035 Do Something number of Total Address Points in each noise band within the study area

Noise band (dB)	Day	Night	Lden
<45	810	1,720	689
45-50	652	613	486
50-55	502	329	655
55-60	542	574	582
60-65	285	1,993	305
65-70	788	84	599
70-75	1,710	0	1,925
>=75	24	0	72

<50dB at night-desirable		<55dB at day-desirable	
>55dB at night -undesirable		>70dB at day -undesirable	

Figures 8.7 and **Figure 8.8** display the day and night time outputs from the model in colour contour format. The highest day time noise levels are predicted on High Street, along Lord Edward Street/Dame Street to Parliament Street and portions of Winetavern Street. During the night time, the same roads as daytime are predicted to experience the highest noise levels. Most building facades on Parliament St are predicted to be exposed to noise levels in the 70-75dB(A) band during the day which equates to 110 address points of which 65 are residential and the 60-65dB(A) band at night, which equates to 97 address points of which 59 are residential. The remaining address points are predicted to fall within the next highest decibel band.

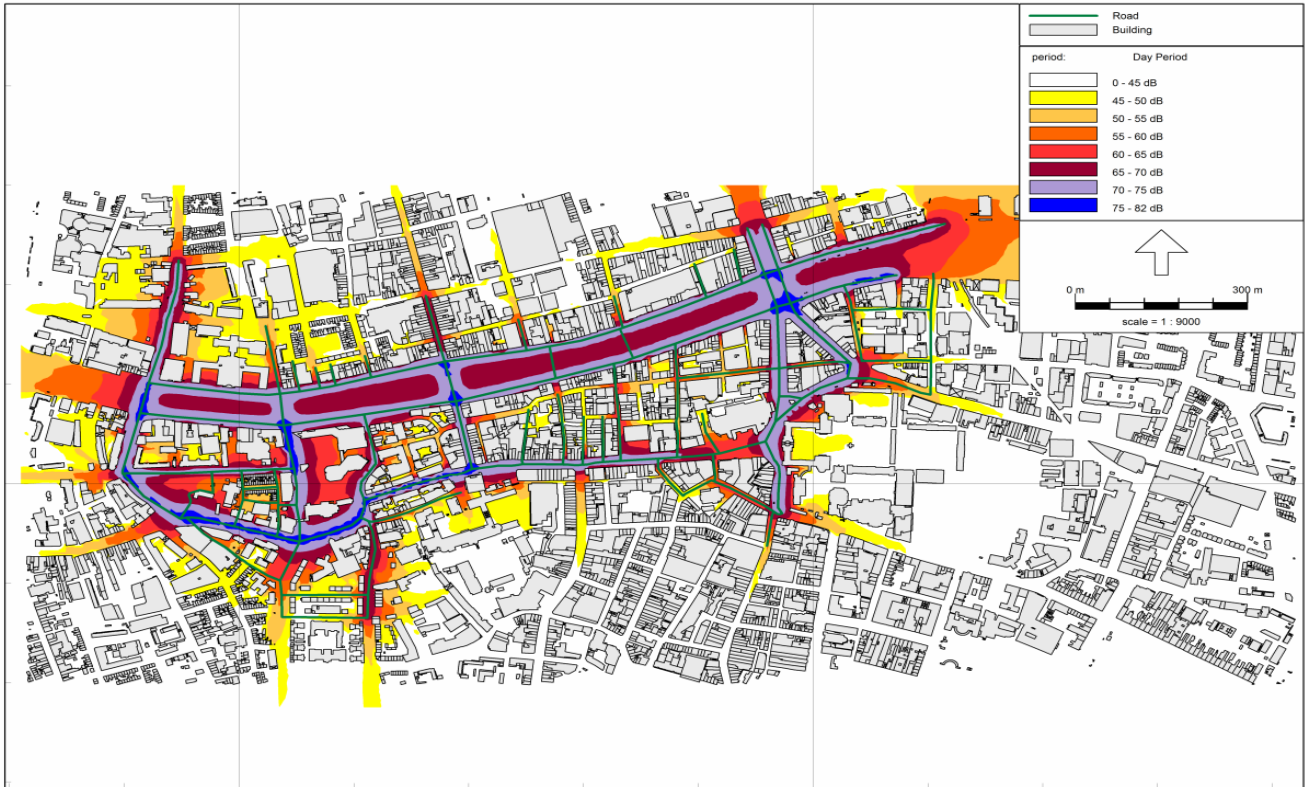


Figure 8.7 - 2035 Do Something Scenario (L_{day})

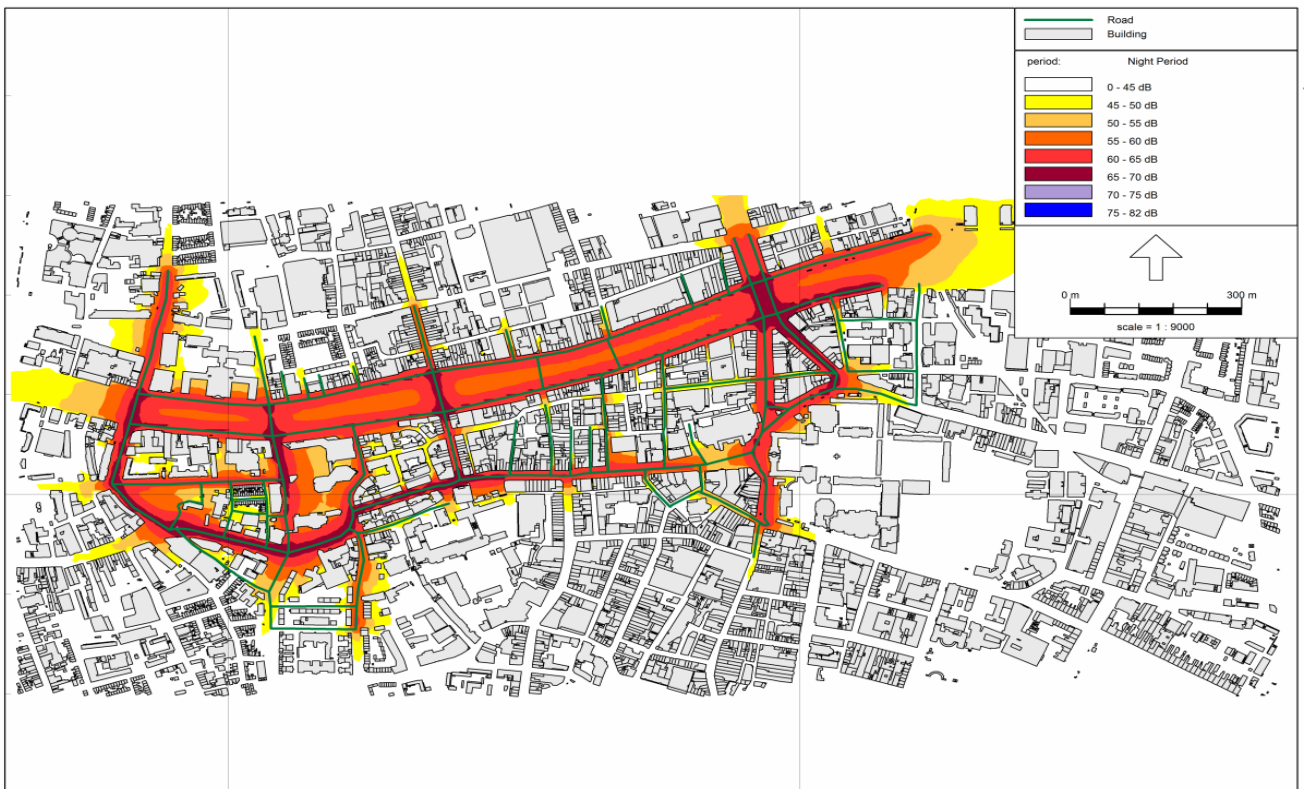


Figure 8.8 - 2035 Do Something Scenario (L_{night})

Vibration

The Proposed Project requires the redistribution of buses due to the closure of College Green. There is the potential for an increase in vibration levels at properties in the areas where large increases in bus numbers are predicted. The areas of Grafton Street and the quays currently experience high volumes of buses. The additional buses are unlikely to generate a noticeable vibration effect.

Increases in bus numbers are also predicted on Parliament Street. However, the restriction on private vehicle access to Parliament Street will have the effect of reducing traffic volumes on this road. On this basis, the additional buses are unlikely to generate a noticeable vibration effect.

8.5 Mitigation Measures

8.5.1 Construction Phase

This section describes typical measures to minimise the potential for noise and vibration disturbance to the surrounding area which will be employed by the Contractor. This will ensure the noise and vibration criteria outlined in **Table 8.1** and **Table 8.2** are not exceeded in the vicinity of the works. BS 5228 includes guidance on several aspects of construction site practices, including, but not limited to:

- Selection of quiet plant and the control of noise sources – the use of proprietary acoustic enclosures and the quietest plant, where possible;
- Selection of the method of excavation to ensure there is no likelihood of structural or cosmetic damage to neighbouring buildings;
- Screening – the effectiveness of screening is based on the location, height and length of the barrier;
- Liaison with the public – a designated liaison officer will be appointed to deal with any complaints relating to noise.

8.5.2 Operational Phase

No mitigation measures are deemed appropriate in this instance. The locations where potential noise impacts may occur are located in a busy city centre environment, where noise levels are already elevated. The provision of noise mitigation measures in the form of noise barriers are not feasible in such an environment.

8.6 Residual Impacts

8.6.1 2018 Do Something Scenario

The modelling outputs for the day time 2018 DS scenario predict an increase of 5% in residential addresses points in the undesirable day time category and a decrease of 2% in residential locations in the desirable category.

The study concludes that when comparing the DM and DS 2018 scenarios for night time, a 5% increase in residential locations in the undesirable band and a slight decrease of approximately 1% in the desirable band is predicted.

At Parliament Street, it is predicted that there will be no difference to noise exposure levels at all address points, for either day or night time.

8.6.2 2035 Do Something Scenario

The modelling outputs for the day time 2035 DS scenario predict an increase of 9% in residential addresses points in the undesirable day time category and a decrease of 3% in residential locations in the desirable category.

The study concludes that when comparing the DM and DS 2035 scenarios for night time, a 1% increase in residential locations in the undesirable band and a slight decrease of approximately 2% in the desirable band is predicted.

At Parliament Street, it is predicted that there will be no difference to noise exposure levels at all address points, for either day or night time.

8.7 Difficulties Encountered

No difficulties were encountered in this assessment.

8.8 References

TII (formerly NRA) Guidelines for the Treatment of Noise and Vibration in National Road Schemes' NRA, 2004

BS 5228-1 and 2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Noise and vibration

EPA Guidelines on the Information to be contained in Environmental Impact Statements EPA, 2002;

EPA Advice Notes on Current Practice in the preparation of Environmental Impact Statements, EPA, 2003;

EPA Revised Guidelines on the Information to be contained in Environmental Impact Statements Draft September 2015;

EPA Advice Notes for Preparing Environmental Impact Statements Draft September 2015; and

Council Directive 2002/49/EC of 25 June 2002 relating to the assessment and management of environmental noise

NTA College Green Traffic Management Measures Draft Modelling Report, 2017

Dublin City Council, Dublin Agglomeration Environmental Noise Action Plan, 2013

NTA Regional Modelling System- East Regional Model, 2012

DCC, NTA Dublin City Centre Transport Study, 2015