5.7 Climate

5.7.1 Introduction

This chapter of the EIS assesses the impacts on air quality and climate associated with both the construction and operational phases of the proposed new cruise ship facility at Dun Laoghaire Harbour, Co. Dublin.

The assessment of both "Do Nothing" and "Do Something" scenarios was undertaken in order to quantify the impact of the proposed development in the context of the relative increase in ambient air quality concentrations.

5.7.2 Methodology

5.7.2.1 Ambient Air Quality Standards

In order to reduce the risk to health and the risk to the environment from poor air quality, national and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or "Air Quality Standards" are health- or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 5.7.1).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the *Air Quality Standards Regulations 2011* which incorporate *European Commission Directive 2008/50/EC*, which have set limit values for the pollutants SO_2, NO_2, PM_{10}, $PM_{2.5}$, benzene and CO (see Table 5.7.1).

Table 5.7.1. EU Air Quality Standards (based on European Commission Directive 2008/50/EC transposed as S.I. 180 of 2011)

Pollutant	Regulation [Note1]	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	None	200 µg/m^3 NO_2
		Annual limit for protection of human health	None	40 µg/m^3 NO_2
		Annual limit for protection of vegetation	None	30 µg/m^3 NO + NO_2
Lead	2008/50/EC	Annual limit for protection of human health	100%	0.5 µg/m^3
Sulphur dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	150 µg/m^3	350 µg/m^3
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 µg/m^3
		Annual & Winter limit for the protection of ecosystems	None	20 µg/m^3
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50%	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	20%	40 µg/m^3 PM_{10}
$PM_{2.5}$ (Stage 1)	2008/50/EC	Annual limit for protection of human health	20% from June 2008. Decreasing linearly to 0% by 2015	25 µg/m^3 $PM_{2.5}$
$PM_{2.5}$ (Stage 2) [Note 2]	-	Annual limit for protection of human health	None	20 µg/m^3 $PM_{2.5}$
Benzene	2008/50/EC	Annual limit for protection of human health	None	5 µg/m^3
Carbon Monoxide	2008/50/EC	8-hour limit (on a rolling basis) for protection of human health	60%	10 mg/m^3 (8.6 ppm)

Note 1: EU 2008/50/EC – Clean Air For Europe (CAFÉ) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

Note 2: EU 2008/50/EC states - 'Stage 2 — indicative limit value to be reviewed by the Commission in 2013 in the light of further information on health and environmental effects, technical feasibility and experience of the target value in Member States'.

5.7.2.2 Climate Agreements

Ireland ratified the United Nations Framework Convention on Climate Change (UNFCCC) in April 1994 and the *Kyoto Protocol* in principle in 1997 and formally in May 2002 (Framework Convention on Climate Change, 1999 and Framework Convention on Climate Change, 1997). For the purposes of the European Union burden sharing agreement under Article 4 of the *Kyoto Protocol*, in June 1998, Ireland agreed to limit the net growth of the six Greenhouse Gases (GHGs) under the *Kyoto Protocol* to 13% above the 1990 level over the period 2008 to 2012 (ERM, 1998). The UNFCCC is continuing detailed negotiations in relation to GHGs reductions and in relation to technical issues such as emissions trading and burden sharing.

The EU has published the "20-20-20 Climate and Energy Package" which calls for a 20% reduction in greenhouse gas emissions, a 20% share of renewable energy and 20% energy efficiency improvements by 2020.

5.7.2.3 Gothenburg Protocol

In 1999, Ireland signed the Gothenburg Protocol to the 1979 UN Convention on Long Range Transboundary Air Pollution. The objective of the Protocol is to control and reduce emissions of Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_X), Volatile Organic Compounds (VOCs) and Ammonia (NH_3). To achieve the targets Ireland will, by 2010, have to meet national emission ceilings of 42kt for SO_2 (67% below 2001 levels), 65kt for NO_X (52% reduction), 55kt for VOCs (37% reduction) and 116kt for NH_3 (6% reduction). European Commission Directive 2001/81/EC, the National Emissions Ceiling Directive, prescribes the same emission limits. Emissions of SO_2 and NH_3 from the transport sector are insignificant accounting for less than 2.5% of total emissions in Ireland in 2008. Transport emissions of Nitrogen Oxides (NO_X) and Volatile Organic Compounds (VOCs) are important accounting for 47.4% and 20.1% respectively of total emissions of these pollutants in Ireland in 2008 (EPA, 2010). A National Programme for the progressive reduction of emissions of the four transboundary pollutants is in place since April 2005 (DoEHLG, 2004). A review of the National Programme in 2007 (DEHLG 2007a) showed that Ireland was on target to comply with the emissions ceilings for SO_2, VOCs and NH_3 by 2010, but that the ceiling for NO_X presents a difficulty even with the implementation of additional measures. The most recent data available from the EU in 2012 indicates that Ireland complied with the emissions ceilings for SO_2, VOCs and NH_3 but failed to comply with the ceiling for NO_X (EEA 2013).

5.7.2.4 Local Air Quality Assessment

The air quality assessment has been carried out following procedures described in the publications by the EPA (EPA 2002, 2003) and using the methodology outlined in the guidance documents published by the UK DEFRA (UK DEFRA 2001, 2007, 2009a, 2009b; UK DETR 1998). The assessment of air quality was carried out using a phased approach as recommended by the UK DEFRA (UK DEFRA 2009a). The phased approach recommends that the complexity of an air quality assessment be consistent with the risk of failing to achieve the air quality standards. In the current assessment, an initial scoping of possible

key pollutants was carried out and the likely location of air pollution "hot-spots" identified. An examination of recent EPA and Local Authority data in Ireland (EPA 2014, 2015), has indicated that SO_2, smoke and CO are unlikely to be exceeded at locations such as the current one and thus these pollutants do not require detailed monitoring or assessment to be carried out. However, the analysis did indicate potential problems in regards to nitrogen dioxide (NO_2) and PM_{10} at busy junctions in urban centres (EPA 2014, 2015). Benzene, although previously reported at quite high levels in urban centres (EPA 2014), has recently been measured at several city centre locations to be well below the EU limit value (EPA 2014, 2015). Historically, CO levels in urban areas were a cause for concern. However, CO concentrations have decreased significantly over the past number of years and are now measured to be well below the limits even in urban centres (EPA 2014, 2015).

The current assessment thus focused firstly on identifying the existing baseline levels of NO_2, PM_{10}, $PM_{2.5}$, benzene and CO and in the region of the proposed development, both currently (by an analysis of suitable EPA and local monitoring data), and when the proposed development is opened (through modelling). Thereafter, the impact of the proposed development on air quality at the neighbouring sensitive receptors was determined relative to "Do Nothing" levels for the opening year (2017) and design year without the Dun Laoghaire master plan (2032) and design year with the Dun Laoghaire master plan. The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model (UK DEFRA 2007) (Version 1.03c, July 2007), the NO_x to NO_2 Conversion Spreadsheet (UK DEFRA, 2010) (Version 3.2 (Released September 2012)) and following guidance issued by the NRA (NRA 2011), UK DEFRA (UK DEFRA 2007, 2009a) and the EPA (EPA 2002, 2003). The inputs to the air dispersion model consist of information on road layouts, receptor locations, annual average daily traffic movements (AADT), annual average traffic speeds and background concentrations. Using this input data the model predicts ambient ground level concentrations at the worst-case sensitive receptors using generic meteorological data. This worst-case concentration is then added to the existing background concentration to give the worst-case predicted ambient concentration. The worst-case predicted ambient concentration is then compared with the relevant ambient air quality standard to assess the compliance of the proposed development with the ambient air quality standards.

Although no relative impact, as a percentage of the limit value, is enshrined in EU or Irish Legislation, the NRA guidelines (NRA 2011) detail a methodology for determining air quality impact significance criteria for road schemes. The degree of impact is determined based on both the absolute and relative impact of the proposed development. The NRA significance criteria have been adopted for the proposed development and are detailed in Tables 5.7.2 – 5.7.4. The significance criteria are based on PM_{10} and NO_2 as these pollutants are most likely to exceed the limit values. However the criteria have also been applied to the predicted 8-hour CO, annual benzene and annual $PM_{2.5}$ concentrations for the purposes of this assessment.

Table 5.7.2 Definition of Impact Magnitude for Changes in Ambient Pollutant Concentrations

Magnitude of Change	**Annual Mean NO_2 / PM_{10}**	**No. days with PM_{10} concentration > 50 $\mu g/m^3$**	**Annual Mean $PM_{2.5}$**
Large	Increase / decrease ≥4 $\mu g/m^3$	Increase / decrease >4 days	Increase / decrease ≥2.5 $\mu g/m^3$
Medium	Increase / decrease 2 - <4 $\mu g/m^3$	Increase / decrease 3 or 4 days	Increase / decrease 1.25 - <2.5 $\mu g/m^3$
Small	Increase / decrease 0.4 - <2 $\mu g/m^3$	Increase / decrease 1 or 2 days	Increase / decrease 0.25 - <1.25 $\mu g/m^3$
Imperceptible	Increase / decrease <0.4 $\mu g/m^3$	Increase / decrease <1 day	Increase / decrease <0.25 $\mu g/m^3$

Source: Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes - National Roads Authority (2011)

Table 5.7.3 Air Quality Impact Significance Criteria For Annual Mean Nitrogen Dioxide and PM_{10} and $PM_{2.5}$ Concentrations at a Receptor

Absolute Concentration in Relation to Objective/Limit Value	Change in Concentration[Note 1]		
	Small	Medium	Large
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥40 µg/m^3 of NO_2 or PM_{10}) (≥25 µg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (36 - <40 µg/m^3 of NO_2 or PM_{10}) (22.5 - <25 µg/m^3 of $PM_{2.5}$)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (30 - <36 µg/m^3 of NO_2 or PM_{10}) (18.75 - <22.5 µg/m^3 of $PM_{2.5}$)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 of NO_2 or PM_{10}) (<18.75 µg/m^3 of $PM_{2.5}$)	Negligible	Negligible	Slight Beneficial

Note 1 Where the Impact Magnitude is Imperceptible, then the Impact Description is Negligible

Source: *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* - National Roads Authority (2011)

Table 5.7.4 Air Quality Impact Significance Criteria For Changes to Number of Days with PM_{10} Concentration Greater than 50 µg/m^3 at a Receptor

Absolute Concentration in Relation to Objective/Limit Value	**Change in Concentration**[Note 1]		
	Small	**Medium**	**Large**
Increase with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Adverse	Moderate Adverse	Moderate Adverse
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Adverse
Decrease with Scheme			
Above Objective/Limit Value With Scheme (≥35 days)	Slight Beneficial	Moderate Beneficial	Substantial Beneficial
Just Below Objective/Limit Value With Scheme (32 - <35 days)	Slight Beneficial	Moderate Beneficial	Moderate Beneficial
Below Objective/Limit Value With Scheme (26 - <32 days)	Negligible	Slight Beneficial	Slight Beneficial
Well Below Objective/Limit Value With Scheme (<26 days)	Negligible	Negligible	Slight Beneficial

Note 1 Where the Impact Magnitude is Imperceptible, then the Impact Description is Negligible

Source: *Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes* - National Roads Authority (2011)

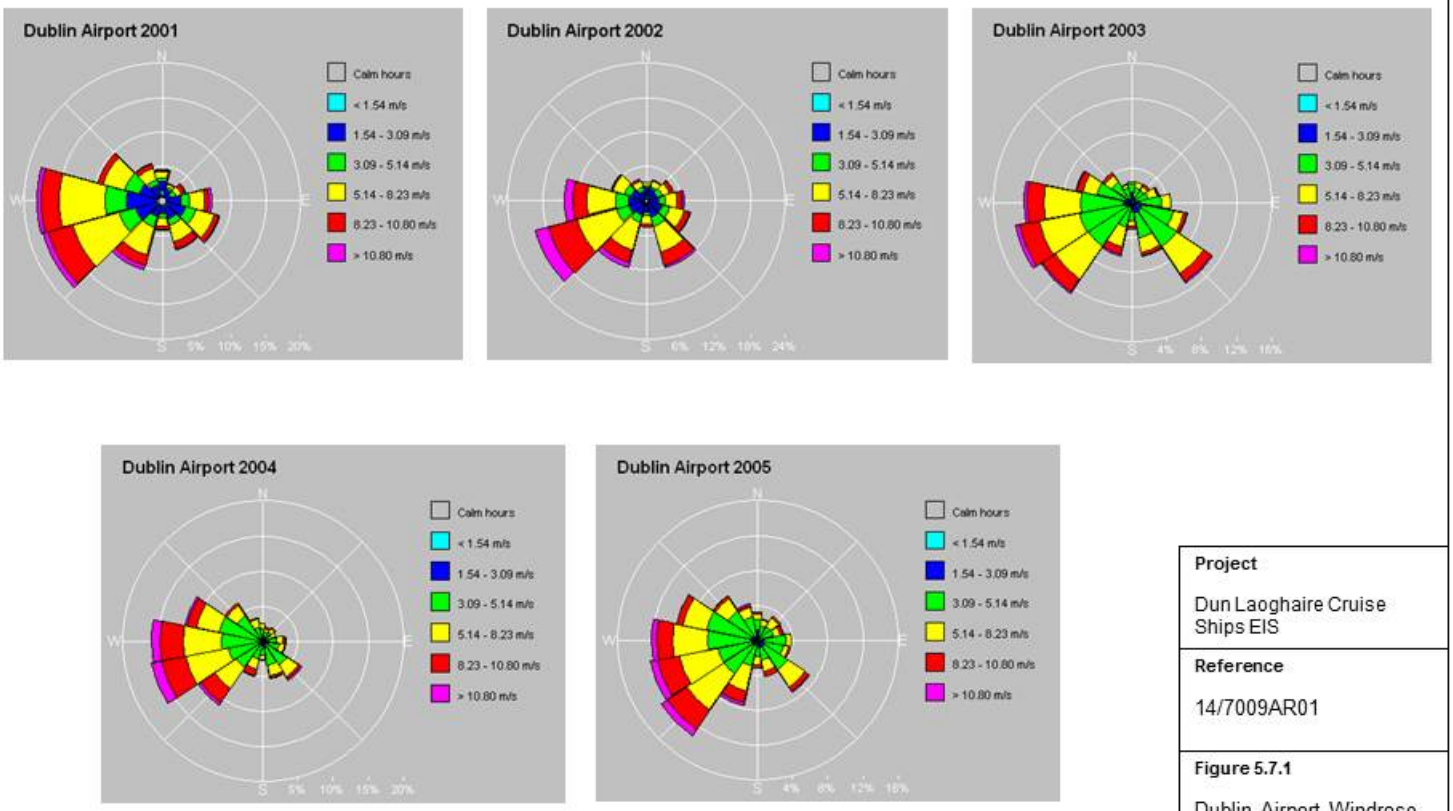
5.7.3 Air Quality

5.7.3.1 Receiving Environment

Meteorological Data

A key factor in assessing temporal and spatial variations in air quality is the prevailing meteorological conditions. Depending on wind speed and direction, individual receptors may experience very significant variations in pollutant levels under the same source strength (i.e. traffic levels) (WHO 2006). Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are generally inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will generally be greatest under very calm conditions and low wind speeds when the movement of air is restricted. In relation to PM_{10}, the situation is more complex due to the range of sources of this pollutant. Smaller particles (less than $PM_{2.5}$) from traffic sources will be dispersed more rapidly at higher wind speeds. However, fugitive emissions of coarse particles ($PM_{2.5}$ - PM_{10}) will actually increase at higher wind speeds. Thus, measured levels of PM_{10} will be a non-linear function of wind speed.

The nearest representative weather station collating detailed weather records is Dublin Airport meteorological station, which is located approximately 16 km northwest of the proposed development. For data collated during five representative years (2001 - 2005), the predominant wind ranges from southerly to westerly in direction with an average wind speed of approximately 5.3 m/s over the period 1981-2010 (see Figure 5.7.1 below).



Project

Dun Laoghaire Cruise Ships EIS

Reference

14/7009AR01

Figure 5.7.1

Dublin Airport Windrose 2001 - 2005

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Trends in Air Quality

Air quality is variable and subject to both significant spatial and temporal variation. In relation to spatial variations in air quality, concentrations generally fall significantly with distance from major road sources (UK DEFRA 2007). Thus, residential exposure is determined by the location of sensitive receptors relative to major roads sources in the area. Temporally, air quality can vary significantly by orders of magnitude due to changes in traffic volumes, meteorological conditions and wind direction.

Background Data

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality in Ireland is the "*Air Quality In Ireland 2013*" (EPA, 2014). The EPA website details the range and scope of monitoring undertaken throughout Ireland and provides both monitoring data and the results of previous air quality assessments (EPA, 2015).

In terms of air monitoring and assessment, Dun Laoghaire is within the Zone A Dublin region (EPA, 2014). The long-term monitoring data has been used to determine background concentrations for the key pollutants in the region of the proposed development. The background concentration accounts for all non-traffic derived emissions (e.g. natural sources, industry, home heating etc.).

With regard to NO_2, continuous monitoring data from the EPA at suburban locations in Rathmines, Dun Laoghaire, Ringsend, Blanchardstown and Swords show that current levels of NO_2 are below both the annual and 1-hour limit values (see Table 5.7.5), with average levels ranging from 15 – 30 µg/m^3 in 2012. Sufficient data is available for stations in Rathmines and Dun Laoghaire to observe long-term trends over the period 2006 - 2012 (see Table 5.7.5), with results averaging between 18 - 25 µg/m^3 with few exceedences of the one-hour limit value. Based on these results, a conservative estimate of the background NO_2 concentration in the region of Dun Laoghaire in 2015 is 23 µg/m^3.

Continuous PM_{10} monitoring carried out at the suburban locations of Rathmines, Dun Laoghaire and Ringsend showed average levels of 12 - 20 µg/m^3 respectively in 2012, with at most 2 exceedances (in Rathmines) of the 24-hour limit value of 50 µg/m^3 (36 exceedances are permitted per year)(EPA, 2014) (see Table 5.7.6). In addition, average PM_{10} levels at the urban background monitoring location in the Phoenix Park in 2012 were 11 µg/m^3, with no exceedances of 50 µg/m^3 (EPA, 2014). The long-term data at Rathmines, Phoenix Park and Dun Laoghaire shows a general downward trend in PM_{10} concentrations. Based on the EPA data (Table 5.7.6), an estimate of the background PM_{10} concentration in the region of Dun Laoghaire in 2015 is 18 µg/m^3.

Continuous $PM_{2.5}$ monitoring carried out at the Zone A locations of Coleraine Street, Rathmines and Marino showed average levels of 8 - 11 µg/m^3 respectively in 2012. The annual average level measured in Rathmines in 2012 was 11 µg/m^3, with an average $PM_{2.5}/PM_{10}$ ratio of 0.79. The $PM_{2.5}/PM_{10}$ ratio at the Zone B location at Old Station Road in Cork in 2012 was 0.53. Based on this information, a ratio of 0.70 was used to generate a background $PM_{2.5}$ concentration in the region of Dun Laoghaire in 2015 of 12.6 µg/m^3.

In terms of benzene, Table 5.7.7 outlines measurements carried out in Rathmines over the period 2006 - 2012. The average concentration measured over the period 2006 - 2012 was 1.5 µg/m^3, which is well below the limit value of 5 µg/m^3 (EPA, 2014, 2015). Annual average levels ranged from 0.8 - 2.8 µg/m^3. Based on this EPA data, a conservative estimate of the background benzene concentration in Dun Laoghaire in 2015 is 1.5 µg/m^3.

With regard to CO, annual averages at the Zone A locations at Winetavern Street, Coleraine Street and Ringsend are low, peaking at 6% of the limit value (10 mg/m^3) (EPA 2014, 2015) in 2012 (see Table 5.7.8). Similarly low levels were measured in 2006 - 2012, although trends in the data are not apparent. Based on the annual average EPA data, a conservative estimate of the background CO concentration in the region of Dun Laoghaire in 2015 is 0.40 mg/m^3.

In summary, existing baseline levels of NO_2, PM_{10}, $PM_{2.5}$, CO and benzene based on extensive long-term data from the EPA and Dublin City Council are expected to be below ambient air quality limit values in the vicinity of the proposed development. A summary of the background concentrations is detailed in Table 5.7.9.

Table 5.7.5 Trends In Dublin City Air Quality - Nitrogen Dioxide (µg/m^3)

Station	Station Classification Council Directive 96/62/EC	Averaging Period	Year						
			2006	2007	2008	2009	2010	2011	2012
Rathmines	Urban Traffic	Annual average NO_2 Note 1	23	23	23	23	25	20	21
	Distance From Road = 3 m	Maximum 1-hr NO_2 Note 2,3	[105]	[132]	[138]	[116]	[139]	[118]	[138]
Coleraine Street	Urban Traffic	Annual average NO_2	31	39	36	36	33	26	26
	Distance From Road = 3 m	Maximum 1-hr NO_2	[126]	[127]	[143]	[179]	[168]	[167]	[142]
Dun Laoghaire	Urban Background	Annual average NO_2	-	-	19	18			18
		Maximum 1-hr NO_2	-	-	[116]	[146]			[136]
Wood Quay /	Urban Traffic	Annual average NO_2	35	34	34	45	35	34	29
Winetavern Street	Distance From Road = 7 m	Maximum 1-hr NO_2	[134]	[182]	[186]	[176]	[148]	[181]	[136]

Note 1 Annual average limit value - 40 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 1-hour limit value - 200 µg/m^3 as a 99.8th%ile, i.e. not to be exceeded >18 times per year (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 3 ( ): represent the 98th%ile of maximum 1-hour concentrations. [ ]: represents the 99.8th%ile of maximum 1-hour concentrations.

Table 5.7.6 Trends In Dublin City Air Quality - PM_{10} ($\mu g/m^3$)

Station	Station Classification Council Directive 96/62/EC	Averaging Period	Year						
			2006	2007	2008	2009	2010	2011	2012
Rathmines	Urban Traffic	Annual average PM_{10} Note 1	19	17	17	15	18	16	14
	Distance From Road = 3 m	24-hr PM_{10} > 50 $\mu g/m^3$ Note 2	13	7	11	1	5	10	2
Wood Quay / Winetavern St	Urban Traffic	Annual average PM_{10}	20	18	17	17	19	14	13
	Distance From Road = 7 m	24-hr PM_{10} > 50 $\mu g/m^3$	10	7	7	1	7	7	0
Phoenix Park	Suburban Background	Annual average PM_{10}	14	12	11	10	11	12	11
	Distance From Road = 250	24-hr PM_{10} > 50 $\mu g/m^3$	2	2	1	0	1	3	0
Dun Laoghaire	Suburban Background	Annual average PM_{10}	-	-	15	15	15	15	12
		24-hr PM_{10} > 50 $\mu g/m^3$	-	-	5	8	5	11	1

Note 1 Annual average limit value - 40 $\mu g/m^3$ (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Note 2 24-hour limit value - 50 $\mu g/m^3$ as a 90.4th%ile, i.e. not to be exceeded >35 times per year (EU Council Directive 1999/30/EC & S.I. No. 180 of 2011).

Table 5.7.7 Dublin City and Urban Centre Air Quality - Benzene (µg/m^3)

Station	Station Classification	Averaging Period	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012
Rathmines	Zone A Urban Traffic Distance From Road = 3 m	Annual[Note 1]	2.7	2.8	0.9	0.8	0.8	1.6	1.2

Note 1 Annual average limit value - 5 µg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Table 5.7.8 Dublin City and Urban Centre Air Quality - CO (mg/m^3)

Station	Station Classification	Averaging Period	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012
Wood Quay / Winetavern Street	Zone A Urban Traffic Distance From Road = 7 m	8-Hour Maximum[Note 1]	5.2	3.4	3.5	3.2	2.0	0.9	1.4
		Annual Average	0.3	0.2	0.3	0.2	0.3	0.1	0.1
Coleraine Street	Zone A Urban Traffic Distance From Road = 3 m	8-Hour Maximum	6.2	3.3	6.2	2.7	2.8	2.7	3.5
		Annual Average	0.7	0.5	0.5	0.4	0.4	0.4	0.4

Note 1 Maximum 8-hour limit value - 10 mg/m^3 (EU Council Directive 2008/50/EC & S.I. No. 180 of 2011).

Table 5.7.9 Summary of background concentrations used in the air dispersion model.

Background Values [Note 1]	Nitrogen Oxides ($\mu g/m^3$)	Nitrogen Dioxide ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	Particulates (PM_{10}) ($\mu g/m^3$)	Particulates ($PM_{2.5}$) ($\mu g/m^3$) [Note 2]	Carbon Monoxide (mg/m^3)
2015	33.80	23.00	1.50	18.00	12.60	0.40
2017	25.90	19.35	1.52	17.87	12.51	0.40
2032	15.40	12.12	1.58	17.84	12.49	0.42

Note 1 Reduction in future years using the Netcen background calculator (January 2006).

Note 2 A ratio of 0.7 has been used for the ratio of $PM_{2.5}$ / PM_{10}.

5.7.3.2 Characteristics of the Proposal

Construction Phase

There is the potential for a number of emissions to the atmosphere during the construction of the proposed development. In particular, the construction activities may generate quantities of dust in the immediate region of the site and along the route of haulage trucks. Construction vehicles, generators etc., will also give rise to some exhaust emissions.

Operational Phase

Detailed traffic flow information was obtained from the traffic consultant for the project and has been used to model pollutant levels under various traffic scenarios and under sufficient spatial resolution to assess whether any significant air quality impact on sensitive receptors may occur. The traffic data corresponded to the opening year of 2017, the design year of 2032 without the Dun Laoghaire master plan and the design year of 2032 with the Dun Laoghaire master plan. The traffic data used represented capacity figures for the "Do Nothing" and "Do Something" (i.e. with the proposed development in place) scenarios.

Cumulative effects have been assessed, as recommended in the EU Directive on EIA (Council Directive 97/11/EC) and using the methodology of the UK DEFRA (UK DEFRA 2009a, UK DETR 1998). Firstly, background concentrations (UK DEFRA 2009a) have been included in the modelling study, for both "Do Nothing" and "Do Something" scenarios. These background concentrations are year-specific and account for non-localised sources of the pollutants of concern (UK DEFRA 2009a). Appropriate background levels were selected based on the available monitoring data provided by the EPA and Local Authorities (EPA 2014, 2015) (see Section 5.7.3.1).

Once appropriate background concentrations were established, the existing situation, including background levels, was assessed in the absence of the proposed development for the opening and design years. The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model (Version 1.03c) (UK DEFRA 2007), the NO_x to NO_2 Conversion Spreadsheet (UK DEFRA, 2010) (Version 3.2 (Released September 2012)) and the following guidance issued by the UK DEFRA (UK DETR 1998; UK DEFRA 2007, 2009a, 2009b). Ambient concentrations of CO, benzene, NO_2, PM_{10} and $PM_{2.5}$ for 2017 and 2032

were predicted at the nearest sensitive receptors to the proposed development. "Do Nothing" and "Do Something" modelling was carried out at the building façade of the worst-case receptors for both 2017 and 2032. This assessment allows the significance of the proposed development, with respect to both relative and absolute impact, to be determined both temporally and spatially.

5.7.3.3 Potential Impact of the Proposal

Construction Phase

Air Quality

There is the potential for a number of emissions to the atmosphere during the construction of the development. In particular, the construction activities may generate quantities of dust. Construction vehicles, generators etc., will also give rise to some exhaust emissions. However, due to the size and nature of the construction activities, exhaust emissions during construction will have a negligible impact on local air quality. A dust minimisation plan will be formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions (detailed in Section 5.7.3.4).

Climate

There is the potential for a number of greenhouse gas emissions to atmosphere during the construction of the development. Construction vehicles, generators etc., may give rise to CO_2 and N_2O emissions. However, due to the size and nature of the construction activities, CO_2 and N_2O emissions during construction will have a negligible impact on climate.

Operational Phase

Air Quality

Road traffic would be expected to be the dominant source of emissions in the region of the proposed development (with the possible exception of PM_{10} as this can originate from a large variety of sources including construction activities, agricultural and industrial processes, combustion of fossil fuels and wood and particles which become airborne from roads and other hard surfaces). Thus, road traffic is the focus of the current assessment.

Climate

Road traffic would also be expected to be the dominant source of greenhouse gas emissions as a result of the development. Vehicles will give rise to CO_2 and N_2O emissions near the proposed development.

"Do Nothing" Scenario – Local Air Quality

CO & Benzene

The results of the "Do Nothing" modelling assessment for CO and benzene in the opening year are shown in Tables 5.7.11 – 5.7.12. Concentrations are well within the limit values at all worst-case receptors. Levels of both pollutants range from 20 - 33% of the respective limit values in 2017 and 2032.

PM_{10}

The results of the "Do Nothing" modelling assessment for PM_{10} in the opening year are shown in Table 5.7.13. Predicted annual average concentrations are below the ambient standards at all worst-case receptors, ranging from 45 - 47% of the annual limit value in 2017 and 2032. In addition, the 24-hour PM_{10} concentration was only exceeded twice in 2017 and 2032.

$PM_{2.5}$

The results of the "Do Nothing" modelling assessment for $PM_{2.5}$ in the opening year are shown in Tables 5.7.14. Predicted annual average concentrations are below the ambient standards at all worst-case receptors, ranging from 51 - 54% of the annual limit value in 2017 and 2032.

NO_2

The results of the "Do Nothing" assessment of annual average and maximum 1-hour NO_2 concentrations in the opening year are shown in Tables 5.7.15 – 5.7.16. Predicted levels are within the limit values at all worst-case receptors, ranging from 33 - 60% of the annual limit value in 2017 and 2032.

Worst-case Scenario

The worst-case scenario corresponds to the situation where the mitigation measures fail or are not implemented. Should dust mitigation measures not be implemented during the construction phase, dust nuisance is likely in areas close to the construction site. Furthermore, there is also the potential for exceedances of the PM_{10} and $PM_{2.5}$ air quality standards during the construction period. The results of the air dispersion modelling assessment show that no mitigation measures are required during the operational phase and therefore the worst-case scenario is not applicable.

5.7.3.4 Ameliorative, Remedial or Reductive Measures

Construction Phase

Air Quality

In order to sufficiently ameliorate any potential negative impacts on the air environment, a schedule of measures has been formulated for the construction phase associated with the proposed development.

The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of dust produced will be deposited close to the generated source. A dust minimisation plan will be formulated for the construction phase of the project, as construction activities are likely to generate some dust emissions.

In order to ensure that no dust nuisance occurs, a series of measures will be implemented. In summary the measures which will be implemented will include:

- Hard surface roads will be swept to remove mud and aggregate materials from their surface while any un-surfaced roads will be restricted to essential site traffic.
- Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.
- Vehicles using site roads will have their speed restricted, and this speed restriction must be enforced rigidly.
- Public roads outside the site will be regularly inspected for cleanliness, and cleaned as necessary.
- Material handling systems and site stockpiling of materials will be designed and laid out to minimise exposure to wind. Water misting or sprays will be used as required if particularly dusty activities are necessary during dry or windy periods.
- Before entrance onto public roads, trucks will be adequately inspected to ensure no potential for dust emissions.

At all times, these procedures will be strictly monitored and assessed. In the event of dust nuisance occurring outside the site boundary, movements of materials likely to raise dust would be curtailed and satisfactory procedures implemented to rectify the problem before the resumption of construction operations.

Climate

Emissions of carbon dioxide will be mitigated by appropriate scheduling of construction activities to minimise duration and the shutting off of equipment during periods of inactivity if they do occur. No additional mitigation measures are considered necessary.

Operational Phase

Air Quality

Mitigation measures in relation to traffic-derived pollutants have focused generally on improvements in both engine technology and fuel quality. EU legislation, based on the EU sponsored Auto-Oil programmes, has imposed stringent emission standards for key pollutants (REGULATION (EC) No 715/2007) for passenger cars to be complied with in 2009 (Euro V) and 2014 (Euro VI). With regard to heavy duty vehicles, EU Directive 2005/78/EC defines the emission standard currently in force, Euro IV, as well as the next stage (Euro V) which has entered into force since October 2009. In addition, it defines a non-binding standard called Enhanced Environmentally-friendly Vehicle (EEV). In relation to fuel quality, SI No. 407 of 1999 and SI No. 72 of 2000 have introduced significant reductions in both sulphur and benzene content of fuels.

In relation to design and operational aspects of developments whereby road traffic is expected to increase road schemes, emissions of pollutants from road traffic can be controlled most effectively by either diverting traffic away from heavily congested areas or ensuring free flowing traffic through good traffic management plans and the use of automatic traffic control systems (UK DEFRA 2009b).

Improvements in air quality are likely over the next few years as a result of the on-going comprehensive vehicle inspection and maintenance program, fiscal measures to encourage the use of alternatively fuelled vehicles and the introduction of cleaner fuels.

Climate

Improvements in air quality are likely over the next few years as a result of the on-going comprehensive vehicle inspection and maintenance program, fiscal measures to encourage the use of alternatively fuelled vehicles and the introduction of cleaner fuels.

CO_2 emissions for the average new car fleet were reduced to 120 g/km over the period 1995 - 2012 through EU legislation on improvements in vehicle motor technology and by an increased use of biofuels. This measure reduced CO_2 emissions from new cars by an average of 25% in the period from 1995 to 2008/2009 whilst 15% of the necessary effort towards the overall climate change target of the EU was met by this measure alone (DEHLG 2000).

Additional measures included in the National Climate Change Strategy (DEHLG 2006, 2007b) include: (1) VRT and Motor Tax rebalancing to favour the purchase of more fuel-efficient vehicles with lower CO_2 emissions; (2) continuing the Mineral Oils Tax Relief (MOTR) II Scheme and introduction of a biofuels obligation scheme; (3) implementation of a national efficient driving awareness campaign, to promote smooth and safe driving at lower engine revolutions; and (4) enhancing the existing mandatory vehicle labelling system to provide more information on CO_2 emission levels and on fuel economy.

5.7.3.5 Predicted Impact of the Proposal

Construction Phase

Air Quality

The greatest potential impact on air quality during the construction phase of the proposed development is from construction dust emissions and the potential for nuisance dust. While construction dust tends to be deposited within 200m of a construction site, the majority of the deposition occurs within the first 50m. Most importantly, when the dust minimisation measures detailed in Section 5.7.3.4 of the EIS are implemented, fugitive emissions of dust from the site will be insignificant and pose no nuisance at nearby receptors.

Climate

Due to the size and nature of the construction activities, CO_2 and N_2O emissions during construction will have a negligible impact on climate.

Operational Phase

Air Quality

Five locations were modelled close to the proposed development. The receptors modelled represent the worst-case locations in the vicinity of the proposed development and were chosen due to their close proximity to the proposed development as well as existing local roads. Details of the assessment locations are provided in Table 5.7.10.

Table 5.7.10 DMRB Screening Air Quality Assessment, Proposed Cruise Ship Facility at Dun Laoghaire. Details of Assessment Locations.

Receptor	Location	OS Co-ordinates
1	Queen Road Apartments	724584, 728609
2	The Anchorage Apartments	723873, 728913
3	Coast Guard Cottages	723932, 728981
4	Marine Road	724351, 728695
5	Charlemont Terrace	724192, 728838

CO and Benzene

The results of the modelled impact of the proposed development for CO and benzene in the opening year are shown in Tables 5.7.11 – 5.7.12. Predicted pollutant concentrations with the proposed development in place are below the ambient standards at all locations. Levels of both pollutants range from 20 - 32% of the respective limit values in 2017.

Future trends indicate similarly low levels of CO and benzene. Levels of both pollutants are below the relevant limit values, ranging from 21 – 33% of their respective limits in 2032.

The impact of the proposed development can be assessed relative to "Do Nothing" levels in 2017 and 2032 (see Tables 5.7.11 – 5.7.12). Relative to baseline levels, some small increases and decreases in pollutant levels at the worst-case receptors are predicted as a result of the proposed development. With regard to impacts at individual receptors, none of the 5 receptors assessed will experience an increase in concentrations of greater than 5% of the limit value in either 2017 or 2032 and thus the magnitude of the changes in air quality is either small or imperceptible at all receptors based on the criteria outlined in Table 5.7.2.

The greatest impact on CO and benzene concentrations in either 2017 or 2032 will be an increase of 0.2% of the limit value for CO at Receptor 3. Furthermore, the greatest improvement in CO and benzene concentrations will be a decrease of 0.0046% of the limit value for benzene at Receptor 1.

Thus, using the assessment criteria for NO_2 and PM_{10} outlined in Tables 5.7.2 and 5.7.3, and applying these criteria to CO and benzene, the impact of the Proposed Development in terms of CO and benzene is negligible.

Table 5.7.11 DMRB Screening Air Quality Assessment, Proposed Cruise Ship Facility at Dun Laoghaire. Predicted Maximum 8-Hour CO Concentrations.

Receptor	Location	Maximum 8-Hour CO Concentrations (mg/m^3)					
		Do Nothing			*Do Something*		
		2017	***2032 Without MP***	***2032 With MP***	***2017***	***2032 Without MP***	***2032 With MP***
1	Queen Road Apartments	2.1	2.2	2.3	2.1	2.2	2.3
2	The Anchorage Apartments	2.3	2.4	2.4	2.3	2.4	2.4
3	Coast Guard Cottages	2.1	2.2	2.3	2.1	2.2	2.3
4	Marine Road	2.1	2.3	2.3	2.2	2.3	2.3
5	Charlemont Terrace	2.0	2.1	2.2	2.0	2.1	2.2
Ambient Limit Value[Note 1]		10 mg/m^3					

Note 1 Maximum 8-hour CO Limit Value: S.I. No. 180 of 2011 & EU Directive 2008/50/EC

Table 5.7.12 DMRB Screening Air Quality Assessment, Proposed Cruise Ship Facility at Dun Laoghaire. Predicted Annual Mean Benzene Concentrations

Receptor	Location	Annual Mean Benzene Concentrations (µg/m^3)					
		Do Nothing			*Do Something*		
		2017	***2032 Without MP***	***2032 With MP***	***2017***	***2032 Without MP***	***2032 With MP***
1	Queen Road Apartments	1.55	1.61	1.62	1.55	1.61	1.62
2	The Anchorage Apartments	1.58	1.64	1.65	1.58	1.64	1.66
3	Coast Guard Cottages	1.55	1.61	1.62	1.55	1.61	1.62
4	Marine Road	1.55	1.62	1.63	1.55	1.61	1.63
5	Charlemont Terrace	1.53	1.59	1.61	1.53	1.59	1.61
Ambient Limit Value[Note 1]		5 µg/m^3					

Note 1 Annual Average Benzene Limit Value: S.I. No. 180 of 2011 & EU Directive 2008/50/EC

PM_{10}

The results of the modelled impact of the proposed development for PM_{10} in the opening year are shown in Table 5.7.13. Predicted annual average concentrations in the region of the proposed development are below the ambient standards at all worst-case receptors, ranging from 45 - 47% of the limit value in 2017. In addition, the 24-hour limit value will be exceeded only 2 times in 2017. 35 exceedances of the 24-hour limit value are permitted per year (see Table 5.7.1).

Future trends with the Proposed Development in place indicate similarly low levels of PM_{10}. Annual average PM_{10} concentrations range from 45 - 47% of the limit in 2032. Furthermore, the results show that the 24-hour limit value will be exceeded two times in 2032.

The impact of the proposed development can be assessed relative to "Do Nothing" levels in 2017 and 2032 (see Table 5.7.13). Relative to baseline levels, some small increases and decreases in PM_{10} levels at the worst-case receptors are predicted as a result of the proposed development. With regard to impacts at individual receptors, none of the 5 receptors assessed will experience an increase in concentrations of over 5% of the limit value in 2017 or 2032. Thus the magnitude of the changes in air quality is small or imperceptible at all receptors based on the criteria outlined in Table 5.7.2.

The greatest impact on PM_{10} concentrations in the region of the proposed development in 2017 or 2032 will be an increase of 0.38% of the annual limit value at Receptor 1.

Thus, using the assessment criteria outlined in Tables 5.7.2 – 5.7.4, the impact of the proposed development with regard to PM_{10} is negligible at all 5 of the receptors assessed.

Table 5.7.13 DMRB Screening Air Quality Assessment, Proposed Cruise Ship Facility at Dun Laoghaire. Predicted Annual Mean PM_{10} Concentrations

Receptor	Location	Annual Mean PM_{10} Concentrations (µg/m^3)					
		Do Nothing			*Do Something*		
		2017	***2032 Without MP***	***2032 With MP***	***2017***	***2032 Without MP***	***2032 With MP***
1	Queen Road Apartments	18.3	18.3	18.4	18.5	18.5	18.4
2	The Anchorage Apartments	18.8	18.8	18.9	18.9	18.9	19.0
3	Coast Guard Cottages	18.3	18.3	18.4	18.4	18.4	18.5
4	Marine Road	18.3	18.3	18.5	18.5	18.5	18.5
5	Charlemont Terrace	18.0	18.0	18.4	18.0	18.0	18.4
Ambient Limit Value[Note 1]		40 µg/m^3					

Note 1 Annual Average PM_{10} Limit Value: S.I. No. 180 of 2011 & EU Directive 2008/50/EC

$PM_{2.5}$

The results of the modelled impact of the proposed development for $PM_{2.5}$ in the opening year are shown in Table 5.7.14. Predicted annual average concentrations in the region of the proposed development are below the ambient standards at all worst-case receptors, ranging from 51 - 54% of the limit value in 2017.

Future trends with the Proposed Development in place indicate similarly low levels of $PM_{2.5}$. Annual average $PM_{2.5}$ concentrations range from 51 - 55% of the limit in 2032. Furthermore, the results show that the 24-hour limit value will be exceeded two times in 2032.

The impact of the proposed development can be assessed relative to "Do Nothing" levels in 2017 and 2032 (see Table 5.7.14). Relative to baseline levels, some small increases and decreases in $PM_{2.5}$ levels at the worst-case receptors are predicted as a result of the proposed development. With regard to impacts at individual receptors, none of the 5 receptors assessed will experience an increase in concentrations of over 5% of the limit value in 2017 or 2032. Thus the magnitude of the changes in air quality is small or imperceptible at all receptors based on the criteria outlined in Table 5.7.2.

The greatest impact on $PM_{2.5}$ concentrations in the region of the proposed development in 2017 or 2032 will be an increase of 0.6% of the annual limit value at Receptor 3.

Thus, using the assessment criteria outlined in Tables 5.7.2 and 5.7.3, the impact of the proposed development with regard to $PM_{2.5}$ is negligible at all 5 of the receptors assessed.

Table 5.7.14 DMRB Screening Air Quality Assessment, Proposed Cruise Ship Facility at Dun Laoghaire. Predicted Annual Mean $PM_{2.5}$ Concentrations

Receptor	Location	Annual Mean $PM_{2.5}$ Concentrations (µg/m^3)					
		Do Nothing			*Do Something*		
		2017	***2032 Without MP***	***2032 With MP***	***2017***	***2032 Without MP***	***2032 With MP***
1	Queen Road Apartments	12.9	13.0	13.0	13.1	13.1	13.0
2	The Anchorage Apartments	13.4	13.5	13.6	13.5	13.5	13.6
3	Coast Guard Cottages	13.0	13.0	13.1	13.0	13.0	13.2
4	Marine Road	13.0	13.0	13.2	13.1	13.1	13.2
5	Charlemont Terrace	12.7	12.6	13.0	12.7	12.7	13.1
Ambient Limit Value[Note 1]		25 µg/m^3					

Note 1 Annual Average $PM_{2.5}$ Limit Value: S.I. No. 180 of 2011 & EU Directive 2008/50/EC

NO_2

The results of the assessment of the impact of the proposed development for NO_2 in the opening year are shown in Tables 5.7.15 – 5.7.16. The annual average concentration is within the limit value at all worst-case receptors. Future trends, with the Proposed Development in place, indicate similarly low levels of NO_2. Levels of NO_2 range from 33 - 61% of the annual limit value in 2017 and 2032.

Maximum one-hour NO_2 levels with the proposed development in place will be below the limit value, with levels at the worst-case receptor reaching 61% of the limit value in 2017 and 44% of the limit value in 2032.

The impact of the proposed development on maximum one-hour NO_2 levels can be assessed relative to "Do Nothing" levels in 2017 and 2032 (see Tables 5.7.15 – 5.7.16). Relative to baseline levels, some small increases and decreases in NO_2 levels at the worst-case receptors are predicted as a result of the proposed development. With regard to impacts at individual receptors, none of the receptors assessed will experience an increase in concentrations of over 5% of the limit value in 2017 or 2032. Thus the magnitude of the changes in air quality is small or imperceptible at all receptors based on the criteria outlined in Table 5.7.2.

The greatest impact on NO_2 concentrations in the region of the proposed development in 2017 or 2032 will be an increase of 4.2% of the annual or maximum 1-hour limit value at Receptor 1. Furthermore, the greatest improvement in NO_2 concentrations will be a decrease of 0.1% of the annual or maximum 1-hour limit value at Receptor 5.

Thus, using the assessment criteria outlined in Tables 5.7.2 – 5.7.3, the impact of the proposed development in terms of NO_2 is negligible at all 5 of the receptors assessed.

Table 5.7.15 DMRB Screening Air Quality Assessment, Proposed Cruise Ship Facility at Dun Laoghaire. Predicted Annual Mean NO_2 Concentrations

Receptor	Location	Annual Mean NO_2 Concentrations (µg/m^3)					
		Do Nothing			*Do Something*		
		2017	***2032 Without MP***	***2032 With MP***	***2017***	***2032 Without MP***	***2032 With MP***
1	Queen Road Apartments	21.1	13.9	14.3	22.8	15.5	14.3
2	The Anchorage Apartments	23.8	16.6	17.2	24.3	17.0	17.6
3	Coast Guard Cottages	21.6	14.4	15.0	22.0	14.7	15.5
4	Marine Road	21.3	14.1	15.0	23.0	15.7	15.1
5	Charlemont Terrace	20.3	13.0	15.1	20.2	13.1	15.5
Ambient Limit Value[Note 1]		40 µg/m^3					

Note 1 Annual Average NO_2 Limit Value: S.I. No. 180 of 2011 & EU Directive 2008/50/EC

Table 5.7.16 DMRB Screening Air Quality Assessment, Proposed Cruise Ship Facility at Dun Laoghaire. Predicted Maximum 1-Hour NO_2 Concentrations

Receptor	Location	Maximum 1-Hour NO_2 Concentrations (µg/m^3)					
		Do Nothing			*Do Something*		
		2017	***2032 Without MP***	***2032 With MP***	***2017***	***2032 Without MP***	***2032 With MP***
1	Queen Road Apartments	105.7	69.6	71.3	114.0	77.6	71.4
2	The Anchorage Apartments	119.2	82.8	86.1	121.6	85.0	87.8
3	Coast Guard Cottages	108.0	71.8	75.2	110.0	73.7	77.6
4	Marine Road	106.7	70.7	74.8	114.9	78.6	75.3
5	Charlemont Terrace	101.3	65.1	75.4	101.1	65.6	77.3
Ambient Limit Value[Note 1]		200 µg/m^3					

Note 1 Maximum 1-Hour NO_2 Limit Value: S.I. No. 180 of 2011 & EU Directive 2008/50/EC

Air Quality Impacts on Sensitive Ecosystems

The EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the "Habitats Directive") requires an Appropriate Assessment to be carried out where there is likely to be a significant impact upon a European protected site. Such sites include Natural Heritage Areas (NHA), Special Areas of Conservation (SAC), Special Protection Areas (SPA), National Parks, Nature Reserves, Refuges for Fauna, Refuges for Flora, Wildfowl Sanctuaries, Ramsar Sites, Biogenetic Reserves and UNESCO Biosphere Reserves.

The NRA guidelines (NRA 2011) state that as the potential impact of a scheme / development is limited to a local level, detailed consideration need only be given to roads where there is a significant change to traffic flows (>5%) and the designated site lies within 200m of the road centre line.

The impact of NO_x (i.e. NO and NO_2) emissions resulting from development traffic at the South Dublin Bay SPA was assessed. Two roads, West Pier Road and Harbour Road are predicted to have a 5% increase in traffic as a result of the development and are within 200m of the South Dublin Bay SPA. Dispersion modelling and prediction was carried out at typical traffic speeds at this location. Unfortunately, traffic data in the required format was not available for West Pier Road and Harbour Road, however, modelling took place whereby the AADT was increased incrementally to determine the level of traffic required to exceed the limit value for NO_x for the protection of vegetation of 30 µg/m^3. AADT would need to be in excess of 100000 on each road in order for the limit value to be exceeded. As this level of daily traffic would be confined to motorways and not urban areas such as this, it can be stated that the operational traffic emissions as a result of the proposed development will not cause significant air quality impacts on the Dublin Bay SPA.

Air Quality Impacts From Docked Cruise Ships

Air emissions from the proposed docked cruise ships were modelled using the USEPA approved AERSCREEN air dispersion model. AERSCREEN is an approved regulatory screening model which uses a full set of meteorological conditions including all stability classes and wind speeds to find the maximum short-term impact. Screening models are usually applied before a refined air quality model to determine if more detailed modelling is needed. Thus AERSCREEN is designed to be conservative in its prediction of ambient pollutant concentrations.

The AERSCREEN model requires a number of site specific stack input parameters in order to carry out the dispersion modelling predictions. In this assessment the cruise ship comprises of one emission point (stack). The stack parameters have been obtained based on worst-case information collected from an air pollution emission inventory report for cruise ships docking in Alaska.

Results from the screening dispersion model show that worst-case predicted NO_2 concentrations will be significantly below the annual mean and 1-hour maximum limit values at the worst-case sensitive receptors. The predicted concentrations will reach 4% and 9% of the annual and maximum one-hour limit values, respectively, for NO_2.

Climate

Due to the nature and scale of development, the impact of the proposed development on climate and Ireland's obligations under the Kyoto Protocol is not significant.

Worst Case Impact

The worst case impact of the proposed development would be the generation of nuisance dust at nearby sensitive receptors during the construction phase. This would only occur if the construction phase mitigation measures described in Section 5.7.3.4 are not implemented.

Summary

In relation to air quality, during both the construction and operational phase of the proposed development, compliance will be maintained with all relevant ambient air quality standards and guideline values and thus the impact of the development is not significant.

Due to the nature and scale of development, the impact of the proposed development on climate and Ireland's obligations under the Kyoto Protocol is not significant.