7 AIR QUALITY

7.1 INTRODUCTION

The air quality assessment undertaken in 2009 comprehensively addressed the potential impacts of the emissions from the existing development on the air quality of the site and its environs. The 2009 study has been updated to allow for an increase in traffic associated with the proposed increase in waste accepted from 200,000 tonnes to a maximum of 220,000 tonnes (including a possible maximum of between 10,000 – 15,000 tpa of suitable hazardous waste streams).

The 2009 assessment was modelled on the maximum emission concentrations outlined in the Waste Incineration Directive (2000/76/EC), and assumed 110% of the nominal flue gas flow rate and also assumed 100% availability of the plant of 8760 hours per year. This found that the impact on air quality would not be significant. As outlined in Section 5.7 Stack Emissions, recent spot measurements of the volume flow at the facility have shown that the volume flow is slightly higher than was anticipated. The air modelling study has been updated to assess the impact of variations to the volume flow.

A summary of the key findings of the updated air quality assessment is presented below.

7.1.1 Study Methodology

The assessment methodology involved air dispersion modelling using the UK DMRB Screening Model[9] (Version 1.03c, July 2007) and the NO_x to NO_2 Conversion Spreadsheet[10] and following guidance issued by the NRA[11], UK DEFRA[6-9] and the EPA[12,13]. 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 standards.

7.2 EXISTING ENVIRONMENT

Air quality monitoring programs have been undertaken in recent years by the EPA and Local Authorities. The most recent annual report on air quality "Air Quality Monitoring Annual Report 2010"[1] details the range and scope of monitoring undertaken throughout Ireland.

As part of the implementation of the Air Quality Standards Regulations 2002 (S.I. No. 271 of 2002), four air quality zones have been defined in Ireland for air quality management and assessment purposes[1,2]. Dublin is defined as Zone A and Cork as Zone B. Zone C is composed of 21 towns with a population of greater than 15,000. The remainder of the country, which represents rural Ireland but also includes all towns with a population of less than 15,000, is defined as Zone D. In terms of air quality management, the facility is defined as Zone D[1,2].

Long-term NO_2 monitoring is carried out at two rural Zone D locations, Glashaboy and Kilkitt[1,2]. The NO_2 annual average in 2010 for both sites was 10 and 3 µg/m^3, respectively. The results of NO_2 monitoring carried out at the urban Zone D location in Castlebar in 2010 indicated an average NO_2 concentration of 10 µg/m^3 with no exceedances of the 1-hour limit value[1,2]. Hence, the long-term average concentrations measured at these locations were significantly lower than the annual average limit value of 40 µg/m^3. Based on the above information and previous baseline monitoring data carried out at the site as reported in the 2009 EIS, a conservative estimate of the background NO_2 concentration is 20 µg/m^3

Long-term PM_{10} monitoring was carried out at the urban Zone D locations of Castlebar and Longford in 2010[1]. The average concentrations measured at both sites were 15 and 21 µg/m^3, respectively. Long-term PM_{10} measurements carried out at the rural Zone D location in Kilkitt in 2010 gave an average level of 10 µg/m^3[1]. Data from the Phoenix Park in Dublin also provides a good indication of urban background levels, with an annual average in 2010 of 11 µg/m^3[1]. Based on the above information and previous baseline monitoring data carried out at the site as reported in the 2009 EIS, a conservative estimate of the background PM_{10} concentration is 20 µg/m^3.

The results of $PM_{2.5}$ monitoring at Rathmines (Zone A) in 2010[1] indicated an average $PM_{2.5}/PM_{10}$ ratio of 0.67. Based on this information, a conservative ratio of 0.70 was used to generate a rural background $PM_{2.5}$ concentration of 14 µg/m^3.

A summary of the background concentrations used for the air dispersion model is detailed in Table 7.4.

7.3 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

7.3.1 Forecasting Methods

The air quality assessment has been carried out following procedures described in the publications by the EPA[1,2] and using the methodology outlined in the guidance documents published by the UK DEFRA[3-9].

7.3.2 Construction

There will be some minor construction activities associated with this application. Two existing buildings will be converted from temporary to permanent structures but there are no construction activities associated with this. The construction activity is centred on an access road to the modular office building, additional parking spaces and the installation of a Puraflo® effluent treatment system.

7.3.3 Incineration

Incineration would be expected to be the dominant source of air emissions associated with the proposed development. For the purposes of this assessment, the "Do Nothing" scenario is based on the facility in operation treating 200,000 tonnes of residual household and commercial waste whilst the "Do Something" scenario is based on the facility in operation treating 200,000 tonnes of residual household and commercial waste and 20,000 tonnes additional throughput (with a maximum of 10,000 – 15,000 of select hazardous waste streams). A detailed air modelling assessment was previously undertaken in the air quality chapter of the 2009 EIS which represents the current "Do Nothing" scenario. The assessment, based on the proposed maximum volume flow and based on the maximum emission concentrations outlined in the Waste Incineration Directive (2000/76/EC), found that the impact on air quality would not be significant (based on continuous operations for 8760 hours per year). In relation to the "Do Something" scenario, as mentioned in Section 5.7 Stack Emissions, recent spot measurements of the volume flow at the facility have shown that the volume flow is slightly higher than was anticipated. The current air modelling study has been undertaken to assess the impact of variations to the volume flow. The assessment includes the maximum spot volume flow, the minimum spot volume flow and the 110% maximum volume flow as shown in Table 7.5. This assessment has been undertaken in order to ascertain whether any signficant variation in ambient ground level concentrations of the regulated pollutants occurs due to the variation in volume flows.

7.3.4 Road Traffic

Additional road traffic related to the additional tonnage of waste to the plant will result in additional air emissions. Waste will be transported from the source of the waste to the site for disposal whilst the residues will subsequently be removed from the facility to be treated appropriately.

The current assessment focused firstly on identifying the existing baseline levels of NO_2, PM_{10} and $PM_{2.5}$ (pollutants which are most associated with road traffic) in the region of the proposed road development, both currently (by analysis of suitable EPA monitoring data), and with the proposed development in place (through modelling). Thereafter, the impact of the development on air quality at the neighbouring sensitive receptors was determined relative to the existing baseline for the design year (Year 2023).

Although no relative impact, as a percentage of the limit value, is enshrined in EU or Irish Legislation, the NRA guidelines[(11)] 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 development. The NRA significance criteria have been adopted for the current development and are detailed in Tables 7.1 – 7.3. The significance criteria are based on PM_{10}, $PM_{2.5}$ and NO_2 as these pollutants, derived from traffic sources, are most likely to exceed the limit values.

7.4 PREDICTED IMPACT OF DEVELOPMENT ON AIR QUALITY

7.4.1 Construction

The construction activities associated with this development will be minor and temporary in nature. Dust emissions associated with the construction phase of the project will be negligible.

7.4.2 Incineration

Full details of the air dispersion modelling input parameters and modelling methodology are as per the Carranstown WTE Facility EIS which was undertaken in 2009 with the exception that the USEPA air dispersion model, AERMOD, has been updated from version 07026 to version 12060. This would be expected to have only a minor effect on the ambient ground level concentrations.

As shown in Tables 7.6 – 7.9, a comparison between the ambient ground level process contributions of the regulated pollutants shows only a very minor variation as the volume flow changes.

At the maximum spot value volume flow, ambient ground level concentrations are similar compared to results derived using the EIS maximum volume flow with variations ranging from between +<0.01% to +2% of the ambient air quality standards. Thus, the impact of increasing the volume flow in terms of ambient air quality is insignificant for the maximum flow scenario.

At the 110% maximum volume flow, ambient ground level concentrations are similar compared to results derived using the EIS maximum volume flow with variations ranging from between +<0.01% to +2% of the ambient air quality standards. Thus, the impact of increasing the volume flow in terms of ambient air quality is insignificant for the maximum flow scenario.

At the average volume flow, ambient ground level concentrations are similar compared to results derived using the EIS average volume flow with variations ranging from between +<0.01% to +1.9% of the ambient air quality standards. Thus, the impact of increasing the volume flow in terms of ambient air quality is insignificant for the average flow scenario.

At the minimum spot value volume flow, ambient ground level concentrations are similar compared to results derived using the EIS average volume flow with variations ranging from between +0.01% to +0.5% of the ambient air quality standards. Thus, the impact of increasing the volume flow in terms of ambient air quality is insignificant for the minimum spot value volume flow scenario.

Results indicate that the changes to volume flow do not result in a significant change in the ambient ground level concentration with results increased by no more than 2% of any ambient air quality standard.

7.4.3 Road Traffic

Two receptor locations were modelled in the region of the facility. R1 was located adjacent to the R152 / M1 junction whilst R2 was located along the R152, 400m west of the R150 junction with the R152. The receptors modelled represent the worst-case locations in the vicinity of the facility. Annual average traffic speeds are required as an input to the DMRB screening model[9]. Results are reported for a typical traffic speed of 80 kph on all roads with a worst-case speed of 10 kph.

The discussion below provides modelling results for PM_{10}, $PM_{2.5}$ and NO_2 based on typical speeds.

"Do Minimum" Modelling Assessment

PM_{10}

The results of the "Do Minimum" modelling assessment for PM_{10} in the design year are shown in Table 7.10. Concentrations are well within the annual limit value at both worst-case receptors. In addition, the 24-hour PM_{10} concentration of 50 μg/m^3 is in compliance with the limit value at each of the receptors modelled. Annual average PM_{10} concentrations range from 51 - 52% of the limit value in 2023.

$PM_{2.5}$

The results of the "Do Minimum" modelling assessment for $PM_{2.5}$ in the design year are shown in Table 7.10. The predicted concentrations at both worst-case receptors are well below the $PM_{2.5}$ limit value of 25 μg/m^3. The annual average $PM_{2.5}$ concentration peaks at 58% of the limit value in 2023.

NO_2

The results of the "Do Minimum" assessment of annual average NO_2 concentrations in the design year are shown in Table 7.10. Concentrations are well below the limit value at both locations, with levels ranging from 59-60% of the limit value in 2023.

The hourly limit value for NO_2 is 200 μg/m^3 are expressed as a 99.8th percentile (i.e. it must not be exceeded more than 18 times per year). Maximum 1-hour NO_2 concentrations for the "Do Minimum" scenario are given in Table 7.10. Predicted levels in 2023 are below the limit value, with levels at the worst-case receptor 60% of the limit.

Modelled Impact of the Development Once Operational ("Do Something")

PM_{10}

The results of the modelled impact of the proposal for PM_{10} in the design year are shown in Table 7.10. Predicted annual average concentrations in the region of the proposal are well below the ambient standards at both worst-case receptors, ranging from 51-52% of the limit value in 2023. In addition, compliance will be achieved with the 24-hour limit value at both locations in 2023.

The impact of the proposal can be assessed relative to "Do Nothing" levels in 2023 (see Table 7.10). Relative to baseline levels, a negligible increase in PM_{10} levels at both worst-case receptors is predicted as a result of the proposal. The greatest impact on PM_{10} concentrations in the region of the proposal in 2023 will be an increase of <0.1% of the annual limit value.

Thus, using the assessment criteria outlined in Tables 7.1 – 7.3, the impact of the proposal with regard to PM_{10} is negligible at both receptors assessed.

$PM_{2.5}$

The results of the modelled impact of the proposal for $PM_{2.5}$ in the design year are shown in Table 7.10. Predicted annual average concentrations in the region of the proposal are well below the ambient standards at both worst-case receptors, ranging from 57.9 – 58.4% of the limit value in 2023.

The impact of the proposal can be assessed relative to "Do Nothing" levels in 2023 (see Table 7.10). Relative to baseline levels, a negligible increase in $PM_{2.5}$ levels at both worst-case receptors is predicted as a result of the proposal. The greatest impact on $PM_{2.5}$ concentrations in the region of the proposal in 2023 will be an increase of <0.1% of the annual limit value.

Thus, using the assessment criteria outlined in Tables 7.1 – 7.3, the impact of the proposal with regard to $PM_{2.5}$ is negligible at both receptors assessed.

NO_2

The results of the assessment of the impact of the proposal for NO_2 in the design year are shown in Table 7.10. The annual average concentration is well within the limit value at both worst-case receptors. Levels of NO_2 range from 59 - 60% of the annual limit value in 2023.

Maximum one-hour NO_2 levels with the proposal in place will be significantly below the limit value, with levels at the worst-case receptor reaching 60% of the limit value in 2023.

The impact of the proposal on maximum one-hour NO_2 levels can be assessed relative to "Do Nothing" levels in 2023 (see Tables 7.10). Relative to baseline levels, a negligible increase in pollutant levels is predicted as a result of the proposal. The greatest impact on NO_2 concentrations in the region of the proposal in 2023 will be an increase of <0.1% of the annual or maximum 1-hour limit value.

Thus, using the assessment criteria outlined in Tables 7.1 – 7.3, the impact of the proposal in terms of NO_2 is negligible at both receptors assessed.

Worst-case Traffic Speed Scenario

An assessment of the effect of changing the traffic speed (for the entire assessment year) from an average speed of 80 km/hr to a worst case peak hour speed of 10 km/hr has also been carried out for all pollutants (see Table 7.11). The results indicate that pollutant levels are increased at the worst-case traffic speed. Nevertheless, pollutant levels are still significantly below the relevant limit values for PM_{10}, NO_2, and $PM_{2.5}$.

7.5 DESCRIPTION OF MITIGATION MEASURES

7.5.1 Construction

As there will be no significant impact on air quality, no mitigation measures are proposed.

7.5.2 Incineration

As there will be no significant impact on air quality, no mitigation measures are proposed.

7.5.3 Road Traffic

As there will be no significant impact on air quality, no mitigation measures are proposed.

7.6 REFERENCES

(1) Environmental Protection Agency (2011) Air Quality Monitoring Report 2010 (& previous annual reports 1997-2009)

(2) EPA Website (2011) http://www.epa.ie/whatwedo/monitoring/air/

(3) UK DEFRA (2009) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. TG(09)

(4) UK DETR (1998) Preparation of Environmental Statements for Planning Projects That Require Environmental Assessment - A Good Practice Guide, Appendix 8 - Air & Climate

(5) UK DEFRA (2007) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 1 - HA207/07 (Document & Calculation Spreadsheet)

(6) UK DEFRA (2000) Air Quality & Transport, LAQM.G3(00)

(7) UK DEFRA (2009) Part IV of the Environment Act 1995: Local Air Quality Management, LAQM. PG(09)

(8) UK DEFRA (2001) DMRB Model Validation for the Purposes of Review and Assessment

(9) UK DEFRA (2009) Guidance on Running the DMRB Screening Model

(10) UK DEFRA (2010) NO_x to NO_2 Conversion Spreadsheet (Version 2.1)

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

(12) EPA (2002) Guidelines On Information To Be Contained in Environmental Impact Statements

(13) EPA (2003) Advice Notes On Current Practice (In The Preparation Of Environmental Impact Statements)

Table 7.1 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 µg/m^3	Annual Mean $PM_{2.5}$
Large	Increase / decrease ≥4 µg/m^3	Increase / decrease >4 days	Increase / decrease ≥2.5 µg/m^3
Medium	Increase / decrease 2 - <4 µg/m^3	Increase / decrease 3 or 4 days	Increase / decrease 1.25 - <2.5 µg/m^3
Small	Increase / decrease 0.4 - <2 µg/m^3	Increase / decrease 1 or 2 days	Increase / decrease 0.25 - <1.25 µg/m^3
Imperceptible	Increase / decrease <0.4 µg/m^3	Increase / decrease <1 day	Increase / decrease <0.25 µg/m^3

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

Table 7.2 Air Quality Impact Significance Criteria

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 7.3 Air Quality Impact Significance Criteria For Changes to Number of Days with PM_{10} Concentration Greater than 50 µg/m³ 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)

Table 7.4 Summary of background concentrations used in the air dispersion model.

Background Values	Nitrogen Dioxide (µg/m³)	Particulates (PM_{10}) (µg/m³)	Particulates ($PM_{2.5}$) (µg/m³) Note 1
Zone D (Rural)	20.0	20.0	14.0

Note 1 A ratio of 0.70 has been used for the ratio of $PM_{2.5}$ / PM_{10}.

Table 7.5 Process Emission Design Details – EIS & Actual Measurements

Scenario	Stack Height (m) OD	Exit Diameter (m)	Cross-Sectional Area (m^2)	Temp. (K)	Volume Flow (Nm^3/hr)(1)	Exit Velocity (m/sec actual)
EIS – Maximum Operation	95.8	2.2	3.80	413	147,000	16.40(2)
EIS – Average Operation	95.8	2.2	3.80	413	134,000	14.95(2)
Maximum Spot Value	95.8	2.2	3.80	422	192,086	19.63(3)
110% Maximum	95.8	2.2	3.80	422	183,700	18.77(3)
Average	95.8	2.2	3.80	422	167,000	17.06(3)
Minimum Spot Value	95.8	2.2	3.80	422	134,641	13.76(3)

Note 1 Normalised to 273K, 11% Oxygen, dry gas.

Note 2 Actual - 413K, 6.6% Oxygen, 21.4% H_2O

Note 3 Actual - 422K, 5.6% Oxygen, 20.7% H_2O

Table 7.6 Comparison Of Ambient Ground Level Concentrations At A Stack Height of 95.8 O.D. Between The Maximum Volume Flow In The EIS & The Maximum Spot Volume Flow.

Compound	Background ($\mu g/m^3$)	Process Contribution ($\mu g/m^3$) Stack 95.8 O.D. Note 1 Maximum Volume Flow In EIS	Process Contribution ($\mu g/m^3$) Stack 95.8 O.D. Maximum Spot Volume Flow	Variation ($\mu g/m^3$)	Limit Value ($\mu g/m^3$)	Variation As A % Of The Ambient Limit
NO_2 (1-Hr)	**40**	27.19	31.48	4.29	200	2.1%
NO2 (Ann)	**20**	0.85	0.942	0.09	40	0.23%
NOX (Ann)	**25**	1.13	1.256	0.12	30	0.40%
SO2 (1-Hr)	**8**	26.47	30.09	3.62	350	1.03%
SO2 (24-Hr)	**4**	2.36	2.710	0.35	125	0.28%
PM10 (24-Hr)	**20**	0.19	0.202	0.01	50	0.03%
PM10 (Ann)	**20**	0.057	0.062	0.01	40	0.01%
PM2.5 (Ann)	**12**	0.057	0.062	0.01	25	0.02%
CO (8-hr)	**400**	20.88	23.79	2.91	10000	0.03%
Benzene (Ann)	**0.7**	0.057	0.062	0.01	5	0.11%
HCl (1-hr)	**0.01**	4.90	5.31	0.41	100	0.41%
HF (1-hr)	**0.005**	0.326	0.354	0.03	3	0.92%
Hg (Ann)	**0.001**	0.00028	0.00032	0.00	1	0.00%
Cd (Ann)	**0.001**	0.00028	0.00032	0.00	0.005	0.80%
As (Ann)	**0.001**	0.00031	0.00034	0.00	0.006	0.60%

Note 1 Results re-run using AERMOD Version 12060 (released 2012) in order to allow a direct comparison.

Table 7.7 Comparison Of Ambient Ground Level Concentrations At A Stack Height of 95.8 O.D. Between The Maximum Volume Flow In The EIS & The 110% Maximum Volume Flow.

Compound	Background (µg/m³)	Process Contribution (µg/m³) Stack 95.8 O.D. [Note 1] Maximum Volume Flow In EIS	Process Contribution (µg/m³) Stack 95.8 O.D. 110% Maximum Volume Flow	Variation (µg/m³)	Limit Value (µg/m³)	Variation As A % Of The Ambient Limit
NO_2 (1-Hr)	**40**	27.19	31.13	3.94	200	1.97%
NO2 (Ann)	**20**	0.85	0.93	0.08	40	0.21%
NOX (Ann)	**25**	1.13	1.25	0.11	30	0.37%
SO2 (1-Hr)	**8**	26.47	29.71	3.24	350	0.93%
SO2 (24-Hr)	**4**	2.36	2.68	0.32	125	0.25%
PM10 (24-Hr)	**20**	0.19	0.20	0.01	50	0.03%
PM10 (Ann)	**20**	0.057	0.062	0.01	40	0.01%
PM2.5 (Ann)	**12**	0.057	0.062	0.01	25	0.02%
CO (8-hr)	**400**	20.88	23.48	2.60	10000	0.03%
Benzene (Ann)	**0.7**	0.057	0.062	0.01	5	0.11%
HCl (1-hr)	**0.01**	4.900	5.294	0.39	100	0.39%
HF (1-hr)	**0.005**	0.326	0.353	0.03	3	0.90%
Hg (Ann)	**0.001**	0.00028	0.00032	0.00	1	0.00%
Cd (Ann)	**0.001**	0.00028	0.00032	0.00	0.005	0.79%
As (Ann)	**0.001**	0.00031	0.00034	0.00	0.006	0.60%

Note 1 Results re-run using AERMOD Version 12060 (released 2012) in order to allow a direct comparison.

Table 7.8 Comparison Of Ambient Ground Level Concentrations At A Stack Height of 95.8 O.D. Between The Average Volume Flow In The EIS & The Actual Average Volume Flow.

Compound	Background (µg/m³)	Process Contribution (µg/m³) Stack 95.8 O.D. Note 1 Average Volume Flow In EIS	Process Contribution (µg/m³) Stack 95.8 O.D. Average Volume Flow	Variation (µg/m³)	Limit Value (µg/m³)	Variation As A % Of The Ambient Limit
NO_2 (1-Hr)	**40**	26.13	29.90	3.77	200	1.88%
NO2 (Ann)	**20**	0.81	0.91	0.10	40	0.24%
NOX (Ann)	**25**	1.09	1.22	0.13	30	0.43%
SO2 (1-Hr)	**8**	25.59	28.81	3.22	350	0.92%
SO2 (24-Hr)	**4**	2.27	2.59	0.32	125	0.26%
PM10 (24-Hr)	**20**	0.19	0.20	0.01	50	0.03%
PM10 (Ann)	**20**	0.054	0.060	0.01	40	0.02%
PM2.5 (Ann)	**12**	0.054	0.060	0.01	25	0.02%
CO (8-hr)	**400**	20.16	22.83	2.67	10000	0.03%
Benzene (Ann)	**0.7**	0.0540	0.060	0.01	5	0.12%
HCl (1-hr)	**0.01**	4.8168	5.176	0.36	100	0.36%
HF (1-hr)	**0.005**	0.3218	0.346	0.02	3	0.82%
Hg (Ann)	**0.001**	0.00028	0.00030	0.00	1	0.00%
Cd (Ann)	**0.001**	0.00028	0.00030	0.00	0.005	0.48%
As (Ann)	**0.001**	0.00029	0.00033	0.00	0.006	0.59%

Note 1 Results re-run using AERMOD Version 12060 (released 2012) in order to allow a direct comparison.

Table 7.9 Comparison Of Ambient Ground Level Concentrations At A Stack Height of 95.8 O.D. Between The Average Volume Flow In The EIS & The Minimum Spot Volume Flow.

Compound	Background (µg/m³)	Process Contribution (µg/m³) Stack 95.8 O.D. Note 1 Average Volume Flow In EIS	Process Contribution (µg/m³) Stack 95.8 O.D. Spot Minimum Volume Flow	Variation (µg/m³)	Limit Value (µg/m³)	Variation As A % Of The Ambient Limit
NO_2 (1-Hr)	**40**	26.13	27.08	0.95	200	0.47%
NO2 (Ann)	**20**	0.81	0.88	0.06	40	0.15%
NOX (Ann)	**25**	1.09	1.17	0.08	30	0.27%
SO2 (1-Hr)	**8**	25.59	26.40	0.81	350	0.23%
SO2 (24-Hr)	**4**	2.27	2.36	0.09	125	0.07%
PM10 (24-Hr)	**20**	0.19	0.19	0.01	50	0.01%
PM10 (Ann)	**20**	0.054	0.06	0.00	40	0.01%
PM2.5 (Ann)	**12**	0.054	0.06	0.00	25	0.01%
CO (8-hr)	**400**	20.16	20.94	0.78	10000	0.01%
Benzene (Ann)	**0.7**	0.0540	0.058	0.00	5	0.07%
HCl (1-hr)	**0.01**	4.8168	5.018	0.20	100	0.20%
HF (1-hr)	**0.005**	0.3218	0.336	0.01	3	0.47%
Hg (Ann)	**0.001**	0.00028	0.00030	0.00	1	0.00%
Cd (Ann)	**0.001**	0.00028	0.00030	0.00	0.005	0.38%
As (Ann)	**0.001**	0.00029	0.00031	0.00	0.006	0.33%

Note 1 Results re-run using AERMOD Version 12060 (released 2012) in order to allow a direct comparison.

Table 7.10 Summary of air quality impact assessment (Typical Speed 80kph)

Background Values	Nitrogen Dioxide (µg/m³)		Particulates (PM_{10}) (µg/m³)		Particulates ($PM_{2.5}$) (µg/m³) Note 1
	Annual	Max 1-Hr (as 99.8th%ile)	Annual	Days > 50 µg/m³	
Do Nothing – Receptor 1	24.0	120	20.6	4	14.6
Do Nothing – Receptor 2	23.7	118	20.5	4	14.5
Do Something – Receptor 1	24.0	120	20.6	4	14.6
Do Something – Receptor 2	23.7	118	20.5	4	14.5
Limit Values Note 2	40	200	40	35	25

Note 1 A ratio of 0.70 has been used for the ratio of $PM_{2.5}$ / PM_{10}.

Note 2 Council Directive 2008/50/EC

Table 7.11 Summary of air quality impact assessment (Worst-case Speed 10kph)

Background Values	Nitrogen Dioxide (µg/m³)		Particulates (PM_{10}) (µg/m³)		Particulates ($PM_{2.5}$) (µg/m³) Note 1
	Annual	Max 1-Hr (as 99.8th%ile)	Annual	Days > 50 µg/m³	
Do Nothing – Receptor 1	27.0	135	21.3	5	15.3
Do Nothing – Receptor 2	26.8	134	21.2	5	15.2
Do Something – Receptor 1	27.0	135	21.3	5	15.3
Do Something – Receptor 2	26.8	134	21.2	5	15.2
Limit Values Note 2	40	200	40	35	25

Note 1 A ratio of 0.70 has been used for the ratio of $PM_{2.5}$ / PM_{10}.

Note 2 Council Directive 2008/50/EC