Appendix A.8.3

NPF Traffic Forecast – Air Sensitivity Analysis

A.8.3

1 Introduction

In response to a Request for Further Information (RFI) from An Bord Pleanála, traffic forecasts have been prepared to take account of the National Planning Framework (NPF) and any enhanced population growth in Galway above that assessed within the EIAR. This appendix includes a sensitivity test for potential air quality and climate impacts associated with these traffic forecasts and compares the modelled air quality results against relevant limit values.

In order to assess the potential air quality impacts associated with the NTA NPF traffic forecasts, the air quality models developed for the EIAR were updated to include the NTA NPF Scenario traffic forecasts as follows:

1. NTA NPF – Do-Minimum 2039
2. NTA NPF – Do-Something N6 GCRR 2039
3. NTA NPF – Do-Something N6 GCRR +GTS 2039

The DMRB[1] methodology as described in Section 16.25 of Chapter 16 Air Quality and Climate of the EIAR was followed in the preparation of this assessment.

2 Air Quality Sensitivity Test Results

2.1 Receiving Environment

The receiving environment for air quality and climate is described in Section 16.3 of Chapter 16 Air Quality and Climate of the EIAR with the baseline for the air quality assessment detailed in Table 16.19. All background pollutant concentrations, as presented in Table 16.13 of the EIAR, show good compliance with air quality standards. As outlined in Section 16.3.5 of Chapter 16 Air Quality and Climate of the EIAR, '*in March 2016, the EPA reported that Ireland is unlikely to meet 2020 EU greenhouse gas targets for all sectors including transport. Current projections indicate that Ireland will be 6-11% below 2005 levels by 2020. This falls well short of the target of 20% below 2005 levels by 2020. Transport is predicted to constitute 29% of Ireland's non-Emissions Trading Scheme (ETS) emissions in 2020'.*

2.2 Methodology

Annual Average Daily Traffic (AADT) values for the above scenarios have been used in the assessment of local and regional, ecological and climate impacts presented in this appendix.

Predicted concentrations are compared to the air quality standards (AQS) outlined in Table 16.1 of Chapter 16 Air Quality and Climate of the EIAR and the WHO air quality guideline values in Table 16.2 of the EIAR. As the air quality standards are the statutory limits that apply in Ireland, baseline and predicted values are compared

[1] UK Design Manual for Roads and Bridges (DMRB, Volume 11, Section 3, Annex F, 2007)

to these levels. However, an assessment of compliance with the WHO air quality guideline values is also included for completeness.

Changes in predicted concentrations between the NTA/GCC NPF – Do-Minimum 2039 (DM) and NTA/GCC NPF – Do-Something 2039 (DS) Scenarios are assessed using significance criteria provided in Section 16.2.2.3 of Chapter 16 Air Quality and Climate of the EIAR.

Regional air quality impacts are assessed with reference to Directive (EU) 2016/2284 on the reduction of national emissions of certain atmospheric pollutants.

Directive (EU) 2016/2284 on the reduction of national emissions of certain atmospheric pollutants was published in December 2016. The directive specifies reductions for nitrogen oxides, particulate matter and non-methane volatile organic compounds (NMVOC) for the period from 2020 to 2029 and from 2030 onward compared with 2005 levels. The limits that apply to Ireland are outlined in Table 16.3 of Chapter 16 Air Quality and Climate of the EIAR.

Predicted carbon emissions are compared to Ireland's climatic obligations outlined in Section 16.2.2.2 of Chapter 16 Air Quality and Climate of the EIAR.

2.3 Results

2.3.1 Local Air Quality Impacts

Pollutant concentrations are calculated at the worst-case receptors, i.e. those properties that are closest to the proposed road development.

2.3.1.1 NTA NFP Do Something N6 GCRR Scenario (2039)

Predicted concentrations (including background concentrations) for the NTA/GCC NPF 'Do Minimum (DM)', and NTA/GCC NPF 'Do Something N6 GCRR (DS)' Scenarios are presented in **Table 1** below.

The receptor where the highest concentration of pollutants is predicted (including the background concentrations) as a result of the NTA/GCC NPF DS N6 GCRR Scenario is at Receptor 22 for NO_2, PM_{10}, $PM_{2.5}$, CO and Benzene (refer to Figure 16.1.02 of the EIAR).

At this receptor, annual average concentrations of NO_2 are predicted to be 12.09µg/m³, which still complies with the AQS limit value of 40µg/m³; annual average concentrations of $PM_{2.5}$ are predicted to be 10.78µg/m³, which still complies with the proposed limit value of 20µg/m³ and the annual average concentrations of PM_{10} are predicted to be 19.41µg/m³ which also complies with the limit value of 40µg/m³. The number of annual days which PM_{10} levels is predicted to exceed the limit of 50µg/m³ is <3 days. This complies with the limit of 35 days. Annual average concentrations of benzene are predicted to be 0.51µg/m³, which complies with the AQS limit value of 5µg/m³ and 8-hour concentrations of CO are predicted to be 394.42µg/m³, which complies with the AQS limit value of 10,000µg/m³.

The predicted changes in concentration of all pollutants are rated as negligible or imperceptible impacts at all receptors except at receptors, R21 and R22 where an impact of slight adverse is predicted for NO_2. No impact rating is provided for benzene or CO in the TII Guidance and therefore **Table 1** does not contain an impact rating for these compounds. However, due to the small changes in concentrations and the fact that both of these are well within limit values, a rating of negligible would be expected for benzene and CO. pollutants

Under the NTA/GCC NPF DS N6 GCRR 2039 Scenario, all predicted pollutant concentrations comply with the relevant limit values at all worst-case receptors selected. Following guidance provided in LAQM.TG16[2], '*exceedances of the NO_2 1-hour mean are unlikely to occur where the annual mean is below 60µg/m^3'*,it is unlikely that the hourly mean NO_2 objective would be exceeded as all modelled results predict annual mean concentrations of less than 60µg/m^3.

It should also be noted that predicted concentrations comply with the PM_{10} WHO air quality guideline values at all locations.

As stated above, the highest annual average concentrations of $PM_{2.5}$ are predicted to be 10.78µg/m³, which exceeds the WHO $PM_{2.5}$ annual guideline value of 10 µg/m^3. However, the background value at this location is 9.5 µg/m^3, which is also close to this guideline level. The WHO $PM_{2.5}$ guideline value is exceeded for the DM and DS scenarios at other receptors also as noted in Table 1 below.

Table 1: Predicted Pollutant Concentrations including Background Concentrations for the NTA/GCC NPF Do-Minimum 2039 and NTA/GCC NPF N6 GCRR Scenario in 2039

Receptor	Scenario	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (Days > 50 µg/m³)	CO (µg/m³)	Benzene (µg/m³)
	Limit Values	**40**	**40**	**25**	**35**	**10,000**	**5**
R01	DM	8.27	17.43	9.68	<1	345.75	0.42
	DS	8.43	17.5	9.72	<2	348.9	0.43
	DS – DM	0.16	0.07	0.04	<1	3.15	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R02	DM	9.25	17.78	9.88	<2	374.34	0.47
	DS	9.43	17.85	9.92	<2	379.02	0.49
	DS – DM	0.18	0.07	0.04	<1	4.68	0.02
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R03	DM	8.92	17.71	9.84	<2	371.46	0.44
	DS	9.17	17.81	9.9	<2	378.74	0.45
	DS – DM	0.25	0.1	0.06	<1	7.28	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R04	DM	7.22	17.15	9.53	<1	337.23	0.4

[2] Defra (2016) Local Air Quality Management Technical Guidance TG16

Receptor	Scenario	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (Days > 50 µg/m³)	CO (µg/m³)	Benzene (µg/m³)
	Limit Values	**40**	**40**	**25**	**35**	**10,000**	**5**
	DS	7.4	17.24	9.58	<1	343.76	0.41
	DS – DM	0.18	0.09	0.05	<	6.53	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R05	DM	7.77	17.36	9.64	<1	350.41	0.42
	DS	7.88	17.39	9.66	<1	353.03	0.42
	DS – DM	0.11	0.03	0.02	<1	2.62	0
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R06	DM	9.71	17.89	9.94	<2	379.97	0.45
	DS	10.37	18.3	10.17	<2	396.93	0.49
	DS – DM	0.66	0.41	0.23	<1	16.96	0.04
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R07	DM	10.01	18.12	10.07	<2	370.78	0.44
	DS	10.17	18.22	10.12	<2	374.9	0.45
	DS – DM	0.16	0.1	0.05	<1	4.12	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R08	DM	10.16	18.21	10.12	<2	369.68	0.44
	DS	10.57	18.29	10.16	<2	371.41	0.44
	DS – DM	0.41	0.08	0.04	<1	1.73	0
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R09	DM	9.86	18.1	10.05	<2	365.95	0.44
	DS	10.02	18.18	10.1	<2	370.41	0.45
	DS – DM	0.16	0.08	0.05	<1	4.46	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R10	DM	8.92	17.71	9.84	<2	371.46	0.44
	DS	9.17	17.81	9.9	<2	378.74	0.45
	DS – DM	0.25	0.1	0.06	<1	7.28	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R11	DM	7.19	17.14	9.52	<1	335.76	0.4
	DS	8.41	17.61	9.78	<2	368.05	0.44
	DS – DM	1.22	0.47	0.26	<1	32.29	0.04
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R12	DM	7.2	17.14	9.52	<1	335.99	0.4
	DS	9.9	18.11	10.06	<2	380.92	0.46
	DS – DM	2.7	0.97	0.54	<1	44.93	0.06

Receptor	Scenario	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (Days > 50 µg/m³)	CO (µg/m³)	Benzene (µg/m³)
	Limit Values	**40**	**40**	**25**	**35**	**10,000**	**5**
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R13	DM	7.25	17.16	9.54	<1	337.48	0.41
	DS	10.19	18.22	10.12	<2	388.09	0.47
	DS – DM	2.94	1.06	0.58	<1	50.61	0.06
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R14	DM	9.71	17.89	9.94	<2	379.97	0.45
	DS	10.61	18.42	10.23	<2	401.58	0.5
	DS – DM	0.9	0.53	0.29	<1	21.61	0.05
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R15	DM	9.5	17.89	9.94	<2	381.87	0.46
	DS	9.47	17.9	9.94	<2	383.29	0.47
	DS – DM	-0.03	0.01	0	0	1.42	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R16	DM	9.22	17.79	9.88	<2	375.71	0.46
	DS	7.51	17.22	9.57	<1	340.36	0.41
	DS – DM	-1.71	-0.57	-0.31	<0	-35.35	-0.05
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R17	DM	7.37	17.2	9.56	<1	340.04	0.41
	DS	7.63	17.3	9.61	<1	346.81	0.42
	DS – DM	0.26	0.1	0.05	<1	6.77	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R18	DM	7.37	17.2	9.56	<1	340.04	0.41
	DS	7.75	17.33	9.63	<1	348.24	0.42
	DS – DM	0.38	0.13	0.07	<1	8.2	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R19	DM	7.1	17.1	9.5	0	333	0.4
	DS	10.55	18.22	10.12	<2	381.85	0.49
	DS – DM	3.45	1.12	0.62	<2	48.85	0.09
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R20	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.85	17.67	9.81	<2	356.19	0.45
	DS – DM	1.75	0.57	0.31	<2	23.19	0.05
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R21	DM	7.1	17.1	9.5	0	333	0.4

Receptor	Scenario	NO_2 ($\mu g/m^3$)	PM_{10} ($\mu g/m^3$)	$PM_{2.5}$ ($\mu g/m^3$)	PM_{10} (Days > 50 $\mu g/m^3$)	CO ($\mu g/m^3$)	Benzene ($\mu g/m^3$)
	Limit Values	**40**	**40**	**25**	**35**	**10,000**	**5**
	DS	11.48	19.1	10.61	<3	386.18	0.52
	DS – DM	4.38	2	1.11	<3	53.18	0.12
	Impact Rating	Slight Adverse	Negligible	Negligible	Negligible	n/a	n/a
R22	DM	7.1	17.1	9.5	0	333	0.4
	DS	12.09	19.41	10.78	<3	394.42	0.51
	DS – DM	4.99	2.31	1.28	<3	61.42	0.11
	Impact Rating	Slight Adverse	Negligible	Negligible	Negligible	n/a	n/a
R23	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.53	17.53	9.74	<2	358.55	0.43
	DS – DM	1.43	0.43	0.24	<2	25.55	0.03
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R24	DM	7.1	17.1	9.5	0	333	0.4
	DS	7.94	17.43	9.68	1	355.7	0.43
	DS – DM	0.84	0.33	0.18	1	22.7	0.03
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R25	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.84	17.78	9.88	<2	378.77	0.45
	DS – DM	1.74	0.68	0.38	<2	45.77	0.05
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R26	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.14	17.43	9.68	1	346.74	0.42
	DS – DM	1.04	0.33	0.18	1	13.74	0.02
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R27	DM	7.1	17.1	9.5	0	333	0.4
	DS	9.45	17.89	9.94	<2	365.81	0.44
	DS – DM	2.35	0.79	0.44	<2	32.81	0.04
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R28	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.35	17.52	9.73	<2	350.73	0.42
	DS – DM	1.25	0.42	0.23	<2	17.73	0.02
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R29	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.61	17.59	9.77	<2	352.99	0.42
	DS – DM	1.51	0.49	0.27	<2	19.99	0.02

Receptor	Scenario	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (Days > 50 µg/m³)	CO (µg/m³)	Benzene (µg/m³)
	Limit Values	**40**	**40**	**25**	**35**	**10,000**	**5**
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R30	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.81	17.66	9.81	<2	355.77	0.42
	DS – DM	1.71	0.56	0.31	<2	22.77	0.02
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R31	DM	7.8	17.48	9.71	<2	339.92	0.41
	DS	7.86	17.51	9.73	<2	340.49	0.41
	DS – DM	0.06	0.03	0.02	<1	0.57	0
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R32	DM	11.11	19.59	10.89	<3	378.11	0.49
	DS	11.19	19.67	10.93	3	379.43	0.49
	DS – DM	0.08	0.08	0.04	<1	1.32	0
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R33	DM	8.22	17.69	9.83	<2	343.74	0.42
	DS	8.35	17.78	9.88	<2	345.22	0.42
	DS – DM	0.13	0.09	0.05	<1	1.48	0
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a

2.3.1.2 NTA/GCC NPF N6 GCRR + GTS Scenario (2039)

Predicted concentrations (including background concentrations) for the NTA/GCC NPF 'Do Minimum (DM)', and 'Do Something N6 GCRR + GTS (DS)' Scenarios are presented in **Table 2** below.

The receptor where the highest concentration of pollutants are predicted (including the background concentrations) as a result of the NTA/GCC NPF DS N6 GCRR + GTS Scenario is Receptor 22 for NO_2, PM_{10}, $PM_{2.5}$, CO and Benzene (refer to Figure 16.1.1 of the EIAR).

For this receptor, annual average concentrations of NO_2 are predicted to be 12.14µg/m³, which still complies with the AQS limit value of 40µg/m³; annual average concentrations of $PM_{2.5}$ are predicted to be 10.78µg/m³, which complies with the proposed limit value of 25µg/m³ and the annual average concentrations of PM_{10} are predicted to be 19.4µg/m³ which still complies with the limit value of 40µg/m³. The number of annual days which PM_{10} levels is predicted to exceed the limit of 50µg/m³ is <3 days. This complies with the limit of 35 days. Annual average concentrations of Benzene are predicted to be 0.51µg/m³, which complies with the

AQS limit value of 5µg/m³ and 8-hour concentrations of CO are predicted to be 394.1µg/m³, which complies with the AQS limit value of 10,000µg/m³.

The predicted changes in concentration of all pollutants are rated as negligible or imperceptible impacts at all receptors except at receptors, R21 and R22 where an impact of slight adverse is predicted for NO_2. No impact rating is provided for benzene or CO in the TII Guidance and therefore **Table 2** does not contain an impact rating for these compounds. However, due to the small changes in concentrations and the easy compliance with limit values, a rating of negligible would be expected for benzene and CO. The increase in magnitude of change in PM_{10} daily values is also considered negligible.

Under the NTA/GCC NPF N6 GCRR + GTS 2039 Scenario, all predicted pollutant concentrations comply with the relevant limit values at all receptors selected. Following guidance provided in LAQM.TG16[3], '*exceedances of the NO_2 1-hour mean are unlikely to occur where the annual mean is below 60µg/m³*, it is unlikely that the hourly mean NO_2 objective would be exceeded, as all modelled results predict annual mean concentrations of less than 60µg/m³.

It should also be noted that predicted concentrations comply with the PM_{10} WHO guideline values at all locations.

As stated above, the highest annual average concentrations of $PM_{2.5}$ are predicted to be 10.78µg/m³, which exceeds the WHO $PM_{2.5}$ annual guideline value of 10 µg/m³. However, the background value at this location is 9.5 µg/m³ which is also close to this guideline level. The WHO $PM_{2.5}$ guideline value is exceeded for the DM and DS scenarios at other receptors also.

Table 2: Predicted Pollutant Concentrations including Background Concentrations for the NTA/GCC NPF Do-Minimum 2039 and NTA/GCC NPF N6 GCRR + GTS Scenario in 2039

Receptor	Scenario	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (Days > 50 µg/m³)	CO (µg/m³)	Benzene (µg/m³)
	Limit Values	**40**	**40**	**25**	**35**	**10,000**	**5**
R01	DM	8.27	17.43	9.68	<1	345.75	0.42
	DS	8.44	17.5	9.72	<2	348.8	0.43
	DS – DM	0.17	0.07	0.04	<1	3.05	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R02	DM	9.25	17.78	9.88	<2	374.34	0.47
	DS	9.45	17.85	9.92	<2	379.21	0.49
	DS – DM	0.2	0.07	0.04	<1	4.87	0.02
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R03	DM	8.92	17.71	9.84	<2	371.46	0.44
	DS	9.15	17.8	9.89	<2	377.99	0.45

[3] Defra (2016) Local Air Quality Management Technical Guidance TG16

Receptor	Scenario	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (Days > 50 µg/m³)	CO (µg/m³)	Benzene (µg/m³)
	Limit Values	**40**	**40**	**25**	**35**	**10,000**	**5**
	DS – DM	0.23	0.09	0.05	<1	6.53	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R04	DM	7.22	17.15	9.53	<1	337.23	0.4
	DS	7.41	17.24	9.58	<1	343.92	0.41
	DS – DM	0.19	0.09	0.05	<1	6.69	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R05	DM	7.77	17.36	9.64	<1	350.41	0.42
	DS	8.15	17.5	9.72	<2	360.38	0.43
	DS – DM	0.38	0.14	0.08	<1	9.97	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R06	DM	9.71	17.89	9.94	<2	379.97	0.45
	DS	9.72	17.98	9.99	<2	388	0.47
	DS – DM	0.01	0.09	0.05	<1	8.03	0.02
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R07	DM	10.01	18.12	10.07	<2	370.78	0.44
	DS	10.16	18.22	10.12	<2	374.66	0.45
	DS – DM	0.15	0.1	0.05	<1	3.88	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R08	DM	10.16	18.21	10.12	<2	369.68	0.44
	DS	10.54	18.29	10.16	<2	371.39	0.44
	DS – DM	0.38	0.08	0.04	<1	1.71	0
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R09	DM	9.86	18.1	10.05	<2	365.95	0.44
	DS	9.96	18.17	10.09	<2	370.12	0.45
	DS – DM	0.1	0.07	0.04	<1	4.17	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R10	DM	8.92	17.71	9.84	<2	371.46	0.44
	DS	9.15	17.8	9.89	<2	377.99	0.45
	DS – DM	0.23	0.09	0.05	<1	6.53	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R11	DM	7.19	17.14	9.52	<1	335.76	0.4
	DS	8.51	17.63	9.8	<2	368.7	0.44
	DS – DM	1.32	0.49	0.28	<1	32.94	0.04
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a

Receptor	Scenario	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (Days > 50 µg/m³)	CO (µg/m³)	Benzene (µg/m³)
	Limit Values	**40**	**40**	**25**	**35**	**10,000**	**5**
R12	DM	7.2	17.14	9.52	<1	335.99	0.4
	DS	9.98	18.14	10.08	<2	383.09	0.47
	DS – DM	2.78	1	0.56	<1	47.1	0.07
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R13	DM	7.25	17.16	9.54	<1	337.48	0.41
	DS	10.12	18.21	10.11	<2	386.84	0.47
	DS – DM	2.87	1.05	0.57	<1	49.36	0.06
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R14	DM	9.71	17.89	9.94	<2	379.97	0.45
	DS	10.65	18.43	10.24	<2	402.1	0.51
	DS – DM	0.94	0.54	0.3	<1	22.13	0.06
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R15	DM	9.5	17.89	9.94	<2	381.87	0.46
	DS	9.41	17.89	9.94	<2	383.02	0.47
	DS – DM	-0.09	0	0	<1	1.15	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R16	DM	9.22	17.79	9.88	<2	375.71	0.46
	DS	7.5	17.22	9.57	<1	340.3	0.41
	DS – DM	-1.72	-0.57	-0.31	<0	-35.41	-0.05
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R17	DM	7.37	17.2	9.56	<1	340.04	0.41
	DS	7.64	17.31	9.61	<1	347.08	0.42
	DS – DM	0.27	0.11	0.05	<1	7.04	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R18	DM	7.37	17.2	9.56	<1	340.04	0.41
	DS	7.74	17.33	9.63	<1	347.98	0.42
	DS – DM	0.37	0.13	0.07	<1	7.94	0.01
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R19	DM	7.1	17.1	9.5	0	333	0.4
	DS	10.56	18.21	10.12	<2	381.32	0.49
	DS – DM	3.46	1.11	0.62	<2	48.32	0.09
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R20	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.87	17.67	9.81	<2	356.05	0.45

Receptor	Scenario	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (Days > 50 µg/m³)	CO (µg/m³)	Benzene (µg/m³)
	Limit Values	**40**	**40**	**25**	**35**	**10,000**	**5**
	DS – DM	1.77	0.57	0.31	<2	23.05	0.05
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R21	DM	7.1	17.1	9.5	0	333	0.4
	DS	11.49	19.07	10.6	<3	385.45	0.51
	DS – DM	4.39	1.97	1.1	<3	52.45	0.11
	Impact Rating	Slight Adverse	Negligible	Negligible	Negligible	n/a	n/a
R22	DM	7.1	17.1	9.5	0	333	0.4
	DS	12.14	19.4	10.78	<3	394.1	0.51
	DS – DM	5.04	2.3	1.28	<3	61.1	0.11
	Impact Rating	Slight Adverse	Negligible	Negligible	Negligible	n/a	n/a
R23	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.54	17.53	9.74	<2	358.55	0.43
	DS – DM	1.44	0.43	0.24	<2	25.55	0.03
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R24	DM	7.1	17.1	9.5	0	333	0.4
	DS	7.87	17.41	9.67	<1	354.7	0.43
	DS – DM	0.77	0.31	0.17	<1	21.7	0.03
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R25	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.9	17.79	9.88	<2	379.33	0.45
	DS – DM	1.8	0.69	0.38	<2	46.33	0.05
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R26	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.14	17.43	9.68	1	346.67	0.42
	DS – DM	1.04	0.33	0.18	1	13.67	0.02
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R27	DM	7.1	17.1	9.5	0	333	0.4
	DS	9.52	17.92	9.96	<2	366.9	0.44
	DS – DM	2.42	0.82	0.46	<2	33.9	0.04
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R28	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.34	17.52	9.73	<2	350.51	0.42
	DS – DM	1.24	0.42	0.23	<2	17.51	0.02
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a

Receptor	Scenario	NO_2 (µg/m³)	PM_{10} (µg/m³)	$PM_{2.5}$ (µg/m³)	PM_{10} (Days > 50 µg/m³)	CO (µg/m³)	Benzene (µg/m³)
	Limit Values	**40**	**40**	**25**	**35**	**10,000**	**5**
R29	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.58	17.57	9.76	<2	352.25	0.42
	DS – DM	1.48	0.47	0.26	<2	19.25	0.02
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R30	DM	7.1	17.1	9.5	0	333	0.4
	DS	8.77	17.64	9.8	<2	354.92	0.42
	DS – DM	1.67	0.54	0.3	<2	21.92	0.02
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R31	DM	7.8	17.48	9.71	<2	339.92	0.41
	DS	7.86	17.51	9.73	<2	340.44	0.41
	DS – DM	0.06	0.03	0.02	<1	0.52	0
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R32	DM	11.11	19.59	10.89	<3	378.11	0.49
	DS	11.18	19.65	10.92	<3	379.17	0.49
	DS – DM	0.07	0.06	0.03	<1	1.06	0
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a
R33	DM	8.22	17.69	9.83	<2	343.74	0.42
	DS	8.34	17.77	9.87	<2	345.06	0.42
	DS – DM	0.12	0.08	0.04	<1	1.32	0
	Impact Rating	Negligible	Negligible	Negligible	Negligible	n/a	n/a

2.3.2 Ecological Assessment

2.3.2.1 Lough Corrib cSAC

NO_x

The following section assesses the potential for nitrogen compound pollution due to the proposed road development under the NTA/GCC NPF Do Something N6 GCRR (DS)2039 and the NTA/GCC NPF Do-Something N6 GCRR+GTS 2039 scenarios to affect the Lough Corrib cSAC, during the operational phase. The results of this assessment are presented in **Table 3** below. The potential impact of NOx concentration and deposition was assessed at various distances from the edge of the proposed road development. The assessment was carried out in accordance with TII Guidelines using the DMRB Screening Model. Background concentrations are as outlined in Table 16.19 of the Chapter 16 Air Quality and Climate of the EIAR.

Ambient NOx concentrations predicted along a transect of up to 200m from the edge of the proposed road development is given in **Table 3** in accordance with TII guidance. The contribution of the proposed road development to NOx deposition is also given and was calculated using the TII guidance methodology.

The annual average NO_x concentration at various distances from the edge of the proposed road development complies with the limit value of 30 µg/m^3 for the NTA/GCC NPF Scenarios, with NO_x concentrations reaching 48% of this limit in both scenarios and the limit values are complied with at all distances.

The potential impact of the proposed road development results in an increase in NO_x concentrations of a maximum of 14.5µg/m^3 for the NTA/GCC NPF N6 GCRR + GTS 2039 Scenario and 14.34µg/m^3 for the NTA/GCC NPF N6 GCRR 2039 Scenario, at 10m from the edge of the proposed road development. All predicted concentrations are in compliance with the Air Quality Standard for the protection of vegetation.

The proposed road development contribution to the NO_2 dry deposition rate along the 200m transect from the proposed road edge is also detailed in **Table 3**. The maximum increase in the NO_2 dry deposition rate is 1.15kg(N)/ha/yr in the NTA/GCC NPF N6 GCRR 2039 Scenario and 1.16kg(N)/ha/yr in the NTA/GCC NPF N6 GCRR + GTS 2039 Scenario. This is well below the lower boundary limits of inland and surface water habitats of 5-10kg(N)/ha/yr (TII 2011).

As outlined in Section 16.3.2 of Chapter 16, Air Quality and Climate of the EIAR, background nitrogen deposition levels are likely in the range of 1 to 2.5kg(N)/ha/yr. Even with the addition of these background levels the NO_2 deposition results remain in compliance with the lower boundary of the critical load limit values.

Table 3: Predicted Nitrogen concentrations including Background and Deposition at the Lough Corrib cSAC for the NTA /GCC NPF Do Something N6 GCRR (DS)2039 and the NTA /GCC NPF Do-Something N6 GCRR+GTS 2039 scenarios

Distance from edge of the Proposed Road Development (m)	Background ($\mu g/m^3$)	NO_x Concentration ($\mu g/m^3$)			NO_x Concentration ($\mu g/m^3$)			NO_2 Dry Deposition Rate Impact (kg(N)/ha/yr)	
		NTA/GCC NPF N6 GCRR 2039			NTA/GCC NPF N6 GCRR+ GTS 2039				
		Do-Minimum	Do-Something	Increase	Do-Minimum	Do-Something	Increase	NTA/GCC NPF N6 GCRR 2039	NTA/GCC NPF N6 GCRR+ GTS 2039
10	11.2	11.2	25.54	14.34	11.2	25.7	14.5	1.15	1.16
20	11.2	11.2	22.2	11	11.2	22.33	11.13	1.06	1.06
30	11.2	11.2	19.77	8.57	11.2	19.87	8.67	0.99	0.99
40	11.2	11.2	17.93	6.73	11.2	18.01	6.81	0.93	0.94
50	11.2	11.2	16.5	5.3	11.2	16.56	5.36	0.89	0.89
60	11.2	11.2	15.38	4.18	11.2	15.43	4.23	0.85	0.85
70	11.2	11.2	14.49	3.29	11.2	14.52	3.32	0.82	0.83
80	11.2	11.2	13.78	2.58	11.2	13.81	2.61	0.8	0.8
90	11.2	11.2	13.21	2.01	11.2	13.23	2.03	0.78	0.78
100	11.2	11.2	12.77	1.57	11.2	12.78	1.58	0.77	0.77
110	11.2	11.2	12.42	1.22	11.2	12.44	1.24	0.75	0.75
120	11.2	11.2	12.17	0.97	11.2	12.18	0.98	0.74	0.75
130	11.2	11.2	11.98	0.78	11.2	11.99	0.79	0.74	0.74
140	11.2	11.2	11.86	0.66	11.2	11.87	0.67	0.73	0.73
150	11.2	11.2	11.8	0.6	11.2	11.81	0.61	0.73	0.73
160	11.2	11.2	11.77	0.57	11.2	11.77	0.57	0.73	0.73
170	11.2	11.2	11.67	0.47	11.2	11.68	0.48	0.73	0.73
180	11.2	11.2	11.58	0.38	11.2	11.59	0.39	0.72	0.72
190	11.2	11.2	11.49	0.29	11.2	11.5	0.3	0.72	0.72

Distance from edge of the Proposed Road Development (m)	Background ($\mu g/m^3$)	NO_x Concentration ($\mu g/m^3$)			NO_x Concentration ($\mu g/m^3$)			NO_2 Dry Deposition Rate Impact (kg(N)/ha/yr)	
		NTA/GCC NPF N6 GCRR 2039			NTA/GCC NPF N6 GCRR+ GTS 2039				
		Do-Minimum	Do-Something	Increase	Do-Minimum	Do-Something	Increase	NTA/GCC NPF N6 GCRR 2039	NTA/GCC NPF N6 GCRR+ GTS 2039
200	11.2	11.2	11.4	0.2	11.2	11.4	0.2	0.72	0.72
Standards	$30\mu g/m^3$	$30\mu g/m^3$	$30\mu g/m^3$		$30\mu g/m^3$	$30\mu g/m^3$		5-10kg(N)/ha/yr	

VOC – Benzene

No critical load limits exist for VOCs for the protection of vegetation.

An assessment of emissions of benzene was carried out for the proposed road development, in accordance with TII methodology using the DMRB Modelling Spreadsheet. Predicted concentrations were compared to the air quality standard of 5µg/m^3 for the protection of human health.

Benzene concentrations were predicted for the NTA /GCC NPF Do Something N6 GCRR (DS) 2039 and the NTA /GCC NPF Do-Something N6 GCRR+GTS 2039 scenarios. Benzene concentrations along a transect of up to 200m from the edge of the proposed road development are given in **Table 4**.

The maximum predicted concentration for the Do-Something scenario was 10% of the standard including background concentrations of 5µg/m^3. As stated previously, these limits have been developed to protect the environment as a whole.

Table 4: Predicted Benzene concentrations including Background and Deposition at the Lough Corrib cSAC for the NTA/GCC NPF Do Something N6 GCRR (DS)2039 and the NTA/GCC NPF Do-Something N6 GCRR+GTS 2039 scenarios

Distance from edge of the Proposed Road Development (m)	Benzene Concentration (µg/m^3) NTA/GCC NPF N6 GCRR 2039			Benzene Concentration (µg/m^3) NTA/GCC NPF N6 GCRR + GTS 2039		
	Do-Minimum	Do-Something	Increase	Do-Minimum	Do-Something	Increase
10	0.4	0.5	0.1	0.4	0.5	0.1
20	0.4	0.48	0.08	0.4	0.47	0.07
30	0.4	0.46	0.06	0.4	0.46	0.06
40	0.4	0.45	0.05	0.4	0.45	0.05
50	0.4	0.44	0.04	0.4	0.44	0.04
60	0.4	0.43	0.03	0.4	0.43	0.03
70	0.4	0.42	0.02	0.4	0.42	0.02
80	0.4	0.42	0.02	0.4	0.42	0.02
90	0.4	0.41	0.01	0.4	0.41	0.01
100	0.4	0.41	0.01	0.4	0.41	0.01
110	0.4	0.41	0.01	0.4	0.41	0.01
120	0.4	0.41	0.01	0.4	0.41	0.01
130	0.4	0.41	0.01	0.4	0.41	0.01
140	0.4	0.4	0	0.4	0.4	0
150	0.4	0.4	0	0.4	0.4	0
160	0.4	0.4	0	0.4	0.4	0
170	0.4	0.4	0	0.4	0.4	0
180	0.4	0.4	0	0.4	0.4	0
190	0.4	0.4	0	0.4	0.4	0
200	0.4	0.4	0	0.4	0.4	0

Ethylene

As discussed in Section 16.2.5 of Chapter 16 Air Quality and Climate of the EIAR, the Natural England report states that *levels of ethylene likely to be found in the vicinity of roads may be high enough to adversely affect sensitive species*. On this basis, comparisons of emission factors of VOCs (mg/vehicle/km) have been examined in order to estimate an appropriate ratio of ethylene to benzene. The five studies examined[4]; various types of vehicles, over a ten-year period, across three countries. The highest ratio of ethylene to benzene determined was 3:1, for vehicles which were primarily diesel emissions. Increases in ethylene from the proposed road development have been predicted using this ratio and results presented in **Table 3** above.

No background data or relevant limit values are available for ethylene.

At 10m from the edge of the proposed road development a 0.30µg/m^3 increase is predicted for the NTA/GCC NPF Do Something N6 GCRR (DS)2039 and the NTA/GCC NPF Do-Something N6 GCRR+GTS 2039 scenarios.

Table 5: Predicted Ethylene concentrations including Background and Deposition at the Lough Corrib cSAC for the NTA/GCC NPF Do Something N6 GCRR (DS)2039 and the NTA/GCC NPF Do-Something N6 GCRR+GTS 2039 scenarios

Distance from edge of the Proposed Road Development (m)	Ethylene Concentration (µg/m^3) NTA/GCC NPF N6 GCRR 2039	Ethylene Concentration (µg/m^3) NTA/GCC NPF N6 GCRR + GTS 2039
	Increase	Increase
10	0.3	0.29
20	0.23	0.22
30	0.18	0.17
40	0.14	0.14
50	0.11	0.11
60	0.09	0.08
70	0.07	0.07
80	0.05	0.05
90	0.04	0.04
100	0.03	0.03
110	0.03	0.02
120	0.02	0.02
130	0.02	0.02
140	0.01	0.01
150	0.01	0.01

[4] Atmospheric Chemistry and Physics, 2009. *Vehicular emission of volatile organic compounds (VOCs) from a tunnel in Hong Kong*). Available at http://www.klacp.ac.cn/kycg/scilw/201506/W020150612344767439939.pdf

Distance from edge of the Proposed Road Development (m)	Ethylene Concentration (µg/m^3) NTA/GCC NPF N6 GCRR 2039	Ethylene Concentration (µg/m^3) NTA/GCC NPF N6 GCRR + GTS 2039
	Increase	Increase
160	0.01	0.01
170	0.01	0.01
180	0.01	0.01
190	0.01	0.01
200	0	0

Metals/Dust

No critical load limits exist for metals or dust for the protection of vegetation.

As outlined in the Environmental Protection Agency Air Quality in Ireland report 2015, high levels of heavy metals are usually observed in areas with a lot of heavy industry such as smelting and mining. Ireland as a country which has few heavy industries such as these, and as a consequence, the concentration of heavy metals is likely to remain low in the future. No reference is made to high levels of metals due to traffic emissions.

Heavy metals are continually monitored by the EPA for Zone C, at the heavily trafficked Bodkin Junction, Galway. Since 2015 measured heavy metals (Lead, Arsenic, Cadmium and Nickel) are all well below target values i.e. Lead 0.7%, Arsenic 15%, Cadmium 6%, Nickel 3% of the target values (Directive 2004/107/EC). These limits were developed to protect the environment as a whole.

PM_{10} concentrations have been predicted at the Lough Corrib cSAC for the NTA/GCC NPF Do Something N6 GCRR (DS) 2039 and the NTA/GCC NPF Do-Something N6 GCRR+GTS 2039 scenarios along a transect of up to 200m from the proposed road development. These predicted concentrations are given in **Table 6** below. Values include background concentrations of 17.1µg/m^3.

All predicted concentrations are in compliance with the air quality standard for PM_{10} of 40µg/m^3. A maximum increase of 2.01µg/m^3 is predicted to occur under the NTA/GCC NPF Do Something N6 GCRR (DS) 2039 scenario and a maximum increase of 2.00 µg/m^3 is predicted to occur under the NPF Do-Something N6 GCRR+GTS 2039 scenario. These maximum concentrations are predicted to occur 10m from the edge of the proposed road development.

Table 6: Predicted PM_{10} concentrations including Background and Deposition at the Lough Corrib cSAC for the NTA/GCC NPF Do Something N6 GCRR (DS)2039 and the NTA/GCC NPF Do-Something N6 GCRR+GTS 2039 scenarios

Distance from edge of the Proposed Road Development (m)	PM_{10} Concentration (µg/m^3) NTA NPF N6 GCRR 2039			PM_{10} Concentration (µg/m^3) NTA NPF N6 GCRR + GTS 2039		
	Do-Minimum	Do-Something	Increase	Do-Minimum	Do-Something	Increase
10	17.1	19.11	2.01	17.1	19.1	2
20	17.1	18.64	1.54	17.1	18.64	1.54
30	17.1	18.3	1.2	17.1	18.3	1.2
40	17.1	18.04	0.94	17.1	18.04	0.94
50	17.1	17.84	0.74	17.1	17.84	0.74
60	17.1	17.69	0.59	17.1	17.68	0.58
70	17.1	17.56	0.46	17.1	17.56	0.46
80	17.1	17.46	0.36	17.1	17.46	0.36
90	17.1	17.38	0.28	17.1	17.38	0.28
100	17.1	17.32	0.22	17.1	17.32	0.22
110	17.1	17.27	0.17	17.1	17.27	0.17
120	17.1	17.24	0.14	17.1	17.23	0.13
130	17.1	17.21	0.11	17.1	17.21	0.11
140	17.1	17.19	0.09	17.1	17.19	0.09
150	17.1	17.18	0.08	17.1	17.18	0.08
160	17.1	17.18	0.08	17.1	17.18	0.08
170	17.1	17.17	0.07	17.1	17.17	0.07
180	17.1	17.15	0.05	17.1	17.15	0.05
190	17.1	17.14	0.04	17.1	17.14	0.04
200	17.1	17.13	0.03	17.1	17.13	0.03

Ammonia

As discussed in Section 16.2.5 of Chapter 16 Air Quality and Climate of the EIAR, ammonia is emitted in small amounts by vehicles with catalytic converters and *roadside atmospheric concentrations are well below critical levels* for this pollutant. The Natural England report states that it is *unlikely to be a key issue, and effects on vegetation are more likely to arise from enhanced deposition of nitrogen to the soil environment*. The potential impact of nitrogen deposition on ecological sites has been assessed earlier in this Section.

2.3.2.2 Other ecological sensitive sites

NOx

The following section assesses the potential for nitrogen compound pollution due to the proposed road development under the NTA/GCC NPF Do Something N6 GCRR (DS)2039 and the NTA/GCC NPF Do-Something N6 GCRR+GTS 2039 scenarios. The link road between the N83 Tuam Road and the N84 Headford Road was assessed, during the operational phase and the results of this assessment are presented in **Table 7** below. The potential impact of NOx concentration and deposition was assessed at various distances from the edge of the proposed road development. The assessment was carried out in accordance with TII Guidelines using the DMRB Screening Model. Background concentrations are as outlined in Table 16.19 of the Chapter 16 Air Quality and Climate of the EIAR.

The potential impact of the proposed road development results in an increase in NO_x concentrations of a maximum of 16.23µg/m^3 for the NTA/GCC NPF N6 GCRR 2039 Scenario and 16.29µg/m^3 for the NTA/GCC NPF N6 GCRR + GTS 2039 Scenario, at 10m from the proposed road edge. All predicted concentrations are in compliance with the Air Quality Standard for the protection of vegetation.

The proposed road development contribution to the NO_2 dry deposition rate along the 200m transect from the proposed road edge is also detailed in **Table 7**. The maximum increase in the NO_2 dry deposition rate is 1.2kg(N)/ha/yr in the NTA/GCC NPF N6 GCRR 2039 Scenario and 1.2kg(N)/ha/yr in the NTA/GCC NPF N6 GCRR + GTS 2039 Scenario. This is well below the lower boundary limits of inland and surface water habitats of 5-10kg(N)/ha/yr (TII 2011).

As outlined in Section 16.3.2 of Chapter 16, Air Quality and Climate of the EIAR, background nitrogen deposition levels are likely in the range of 1 to 2.5kg(N)/ha/yr. Even with the addition of these background levels the NO_2 deposition results remain in compliance with the lower boundary of the critical load limit values.

Table 7: Predicted Nitrogen Concentration including Background and Deposition between the N83 and N84 for the NTA/GCC NPF Do Something N6 GCRR (DS)2039 and the NTA/GCC NPF Do-Something N6 GCRR+GTS 2039 scenarios

Distance from edge of the Proposed Road Development (m)	Background ($\mu g/m^3$)	NO_x Concentration ($\mu g/m^3$) NTA/GCC NPF N6 GCRR 2039			NO_x Concentration ($\mu g/m^3$) NTA/GCC NPF N6 GCRR+ GTS 2039			NO_2 Dry Deposition Rate Impact (kg(N)/ha/yr)	
		Do-Minimum	Do-Something	Increase	Do-Minimum	Do-Something	Increase	NTA/GCC NPF N6 GCRR 2039	NTA/GCC NPF N6 GCRR+ GTS 2039
10	11.2	11.2	27.43	16.23	11.2	27.49	16.29	1.2	1.2
20	11.2	11.2	23.65	12.45	11.2	23.7	12.5	1.1	1.1
30	11.2	11.2	20.9	9.7	11.2	20.93	9.73	1.02	1.02
40	11.2	11.2	18.82	7.62	11.2	18.84	7.64	0.96	0.96
50	11.2	11.2	17.2	6	11.2	17.22	6.02	0.91	0.91
60	11.2	11.2	15.93	4.73	11.2	15.95	4.75	0.87	0.87
70	11.2	11.2	14.92	3.72	11.2	14.93	3.73	0.84	0.84
80	11.2	11.2	14.12	2.92	11.2	14.13	2.93	0.81	0.81
90	11.2	11.2	13.48	2.28	11.2	13.48	2.28	0.79	0.79
100	11.2	11.2	12.97	1.77	11.2	12.98	1.78	0.77	0.77
110	11.2	11.2	12.58	1.38	11.2	12.59	1.39	0.76	0.76
120	11.2	11.2	12.29	1.09	11.2	12.3	1.1	0.75	0.75
130	11.2	11.2	12.08	0.88	11.2	12.09	0.89	0.74	0.74
140	11.2	11.2	11.95	0.75	11.2	11.95	0.75	0.74	0.74
150	11.2	11.2	11.88	0.68	11.2	11.88	0.68	0.73	0.73
160	11.2	11.2	11.84	0.64	11.2	11.84	0.64	0.73	0.73
170	11.2	11.2	11.74	0.54	11.2	11.74	0.54	0.73	0.73
180	11.2	11.2	11.63	0.43	11.2	11.64	0.44	0.73	0.73
190	11.2	11.2	11.53	0.33	11.2	11.53	0.33	0.72	0.72

Distance from edge of the Proposed Road Development (m)	Background ($\mu g/m^3$)	NO_x Concentration ($\mu g/m^3$) NTA/GCC NPF N6 GCRR 2039			NO_x Concentration ($\mu g/m^3$) NTA/GCC NPF N6 GCRR+ GTS 2039			NO_2 Dry Deposition Rate Impact (kg(N)/ha/yr)	
		Do-Minimum	Do-Something	Increase	Do-Minimum	Do-Something	Increase	NTA/GCC NPF N6 GCRR 2039	NTA/GCC NPF N6 GCRR+ GTS 2039
200	11.2	11.2	11.43	0.23	11.2	11.43	0.23	0.72	0.72
Standards	30µg/m^3	30µg/m^3	30µg/m^3		30µg/m^3	30µg/m^3		5-10kg(N)/ha/yr	

2.3.3 Regional Air Quality Impacts

The DMRB regional approach was used to estimate total emissions from the existing road network. The assessment focuses on the change in emissions of nitrogen oxides (NO_x), total hydrocarbons (THC) and particulate matter (PM_{10}) in the NTA NPF Do Something Scenarios. **Table 4** presents the predicted pollutant emissions at regional level.

As there is no national reporting of particulate matter levels and no Directive limits exist, no comparison of annual particulate matter emissions can be made.

Annual nitrogen oxides are predicted to increase by 0.002% of the Directive 2016/2284 limit for NO_x in 2039. THC are predicted to increase by 0.0004% of the Directive limit for VOC in 2030, refer to Section 16.2.2.1 of Chapter 16, Air Quality and Climate of the EIAR.

Table 4: Predicted NO_x, THC and PM_{10} Emissions at Regional Level for NTA NPF N6 GCRR 2039 and NTA NPF N6 GCRR + GTS 2039 (Tonnes per Annum)

	Scenario	NO_x (t/a)	THC (t/a)	PM_{10} (t/a)
NTA NPF N6 GCRR 2039	DM	100	18	4.8
	DS	209	39	9.1
	DS - DM	109	21	4.3
	% of change (2039) relative to Directive Limits	0.0017%	0.0004%*	n/a
NTA NPF N6 GCRR + GTS 2039	DM	100	18	4.8
	DS	207	39	8.9
	DS - DM	107	21	4.1
	% of change (2039) relative to Directive Limits	0.0016%	0.0004%	n/a

*Note: * limit for VOC*

2.3.4 Potential Operational Impacts on Climate

2.3.4.1 Macro Climate

Table 5 describes the predicted CO_2 produced as a result of the proposed road development. based on the NTA NPF traffic forecasts.

The results are based on traffic data for the proposed road development and include the design speed for each the existing roads and the proposed road development. Ireland has committed to achieve a 20% reduction in non-ETS greenhouse gas emissions by 2020 (relative to 2005 levels). Predicted changes in levels of CO_2 due to the proposed road development are compared to Ireland's non-ETS commitments under the EU Climate Change and Renewable Energy Package.

It should be noted that the calculations include for a worst-case scenario which considers traffic within the city centre travelling at the speed limits. In reality, these speeds are likely to be significantly slower particularly during peak times.

The projected increase of CO_2 under the NTA NPF N6 GCRR 2039 Scenario is 0.15% of Ireland's non-ETS commitment and the projected increase of CO_2 under the NTA NPF N6 GCRR + GTS 2039 Scenario is 0.14% of Ireland's non-ETS commitment.

Table 5: Total Estimated CO_2 Produced as a result of the operation of the proposed road development

Scenario	Tonnes/year
Ireland's non-ETS CO_2 Commitment limit for 2020	38,000,000
Total CO_2 as a result of NTA NPF N6 GCRR 2039 (DM-DS) [1]	55,783
Change relative to CO_2 commitment	0.15%
Total CO_2 as a result of scheme NTA NPF N6 GCRR + GTS 2039 (DM-DS) [1]	54,402
Change relative to CO_2 commitment	0.14%

Note:[1] Total C converted to total CO_2 using a factor of 44/12

2.3.4.2 Micro Climate

The proposed road development will result in changes to the shape of the existing terrain. Such changes may modify airflow and temperature profiles in the area. These modifications will not be significant from a climatic perspective and are unlikely to result in any adverse significant impact on local flora and fauna and residential populations.