Chapter 07
(Air Quality)
Appendices

AXIS ENVIRONMENTAL SERVICES

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Ambient Air Quality Report Galway City 2021

ARUP

50 Ringsend Rd, Grand Canal Dock, Dublin 4

Unit 3 Westlink Business Park,
Clondrinagh,
Limerick.
V94 K6XK
Email: info@axisenv.ie
Phone 00353 61 324587

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Executive Summary

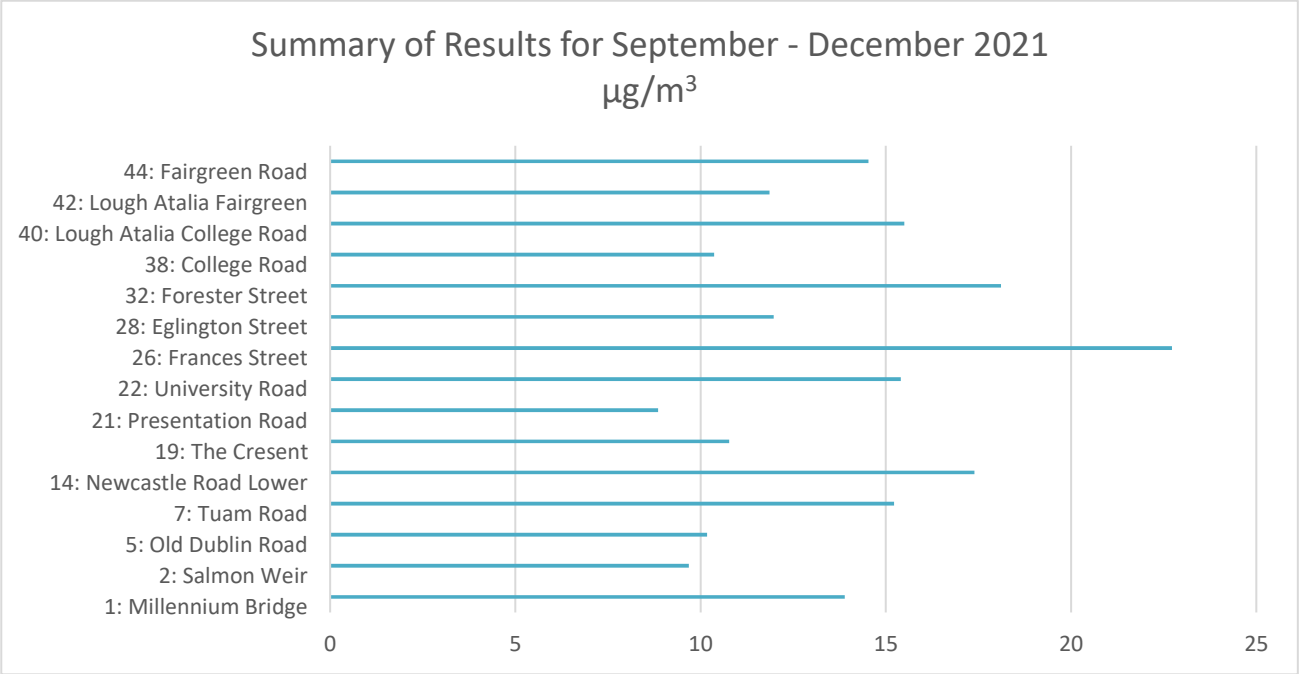
Ambient air quality monitoring was carried out at various locations around Galway City for Nitrogen Dioxide (NO_2). 15 locations were tested on a monthly basis over 3 months and in triplicate to ascertain general NO_2 concentrations around Galway City.

Samples were tested using diffusion tubes (20% TEA / Water) and analysed by SP01 Photometer in an accredited laboratory. The test method used is itself accredited.

Bias for the tubes was determined by assessment against a reference analyser calibrated with ISO 17025 gases. Diffusion tubes were installed beside an analyser owned an operated by AXIS environmental services and used for collation of data under the CAFÉ Directive. Bias was determined in accordance with the AEA_DifTPAB_V04.xls spreadsheet designed by the AEA Energy and Environment to assist Diffusion tubes users in calculating precision and accuracy. It also assists in adjusting diffusion tube results using the bias adjustment calculated.

All 15 monitoring points were tested in triplicate for three months. As the only limits in the CAFÉ Directive are for hourly and annual averages, the monthly averages of each location were compared against the annual limit of 40 µg/m^3. All samples during this assessment were lower than the associated annual limit.

Graph 1-1: Summary of Results (adjusted for Bias)



1. Introduction

AXIS environmental services were commissioned by ARUP Consulting Engineers to complete ambient air quality monitoring at various locations around Galway City for Nitrogen Dioxide (NO_2). 15 locations were tested on a monthly basis over 3 months, each sample in triplicate to ascertain general NO_2 concentrations in Galway City.

2. Main Activities:

All samples were located on roadside lamp or electrical posts approximately 2.5 meters above ground level. The main activities in the predetermined areas were passing traffic, commercial, light industrial and residential activities.

3. Objective:

The objectives of this assessment were to:

- Assess the concentrations of Nitrogen Dioxide at 15 predetermined locations around Galway City;
- Compare the measured concentrations with the current limits applied in the European Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe;
- Undertake visual observations of the practices on site and comment on any deviation from normal practices at each location;
- Summarise the test results and report to our Client, ARUP.

4. Method Summary:

Sampling and analysis of Nitrogen dioxide was carried out by diffusion tube with passive sampling into a 20% TEA / Water tube and analysed in an accredited lab in Switzerland by Photometer.

Samples were collected and transported to the laboratory under controlled chain of custody at the correct temperatures, timeframes and conditions.

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5. Monitoring Personnel:

Round 1	Name	Mark McGarry
Sample Out	Date	19th September 2021
Round 1 / Round 2	Name	Mark McGarry
Sample In / Sample Out	Date	17th October 2021
Round 2 / Round 3	Name	Mark McGarry
Sample In / Sample Out	Date	14th November 2021
Round 3	Name	Mark McGarry
Sample In	Date	12th December 2021

6. Results Summary:

Location	Round Number	Average Result µg/m³	Adjusted for BIAS µg/m³	Round 1 - 3 Average µg/m³	CAFÉ Directive Limit for NO_2 Annual Limit µg/m³
1: Millennium Bridge	1	16.6	11.8	13.9	40 µg/m³
	2	18.7	13.3		
	3	23.4	16.6		
2: Salmon Weir	1	11.7	8.3	9.7	
	2	13.0	9.2		
	3	16.2	11.5		
5: Old Dublin Road	1	11.3	8.0	10.2	
	2	13.4	9.5		
	3	18.3	13.0		
7: Tuam Road	1	20.3	14.4	15.2	
	2	21.9	15.5		
	3	22.1	15.7		
14: Newcastle Road Lower	1	30.4	21.6	17.4	
	2	21.7	15.4		
	3	21.4	15.2		
19: The Crescent	1	12.9	9.2	10.8	
	2	15.4	10.9		
	3	17.2	12.2		
21: Presentation Road	1	9.7	6.9	8.9	
	2	11.4	8.1		
	3	16.3	11.6		
22: University Road	1	21.2	15.1	15.4	
	2	21.6	15.3		
	3	22.3	15.8		
26: Frances Street	1	31.2	22.2	22.7	
	2	33.4	23.7		
	3	31.4	22.3		
28: Eglington Street	1	14.8	10.5	12.0	
	2	16.2	11.5		
	3	19.6	13.9		
32: Forester Street	1	22.4	15.9	18.1	
	2	25.4	18.0		
	3	28.7	20.4		
38: College Road	1	12.2	8.7	10.4	
	2	14.3	10.2		
	3	17.3	12.3		
40: Lough Atalia College Road	1	19.4	13.8	15.5	
	2	20.0	14.2		
	3	26.1	18.5		
42: Lough Atalia Fairgreen	1	13.6	9.7	11.9	
	2	16.9	12.0		
	3	19.6	13.9		
44: Fairgreen Road	1	18.6	13.2	14.5	
	2	19.2	13.6		
	3	23.6	16.8		

7. Monitoring Locations – Site Pictures

Location 1: Millennium Bridge
53°16'57.30"N 9° 3'38.04"W

Location 2: Salmon Weir
53°16'32.05"N 9° 3'21.70"W

Location 5: Old Dublin Road
53°16'50.96"N 9° 1'51.67"W

Location 7: Tuam Road
53°17'3.21"N 9° 2'6.48"W

Location 14: Newcastle Road Lower
53°16'47.28"N 9° 3'49.11"W

Location 19: The Crescent
53°16'4.99"N 9° 3'46.99"W

Location 21: Presentation Road
53°16'24.25"N 9° 3'41.48"W

Location 22: University Road
53°16'35.46"N 9° 3'41.80"W

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Location 26: St Frances St
53°16'31.35"N 9° 3'13.04"W

Location 28: Eglington Street
53°16'27.89"N 9° 3'6.94"W

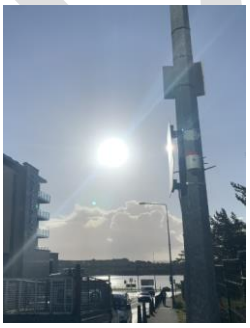
Location 32: Forster Street
53°16'30.34"N 9° 2'46.43"W

Location 38: College Road Central
53°16'37.65"N 9° 2'26.78"W

Location 40: Lough Atalia College Road
53°16'36.52"N 9° 2'22.28"W

Location 42: Lough Atalia Fairgreen
53°16'17.49"N 9° 2'44.55"W

Location 44: Fairgreen Road
53°16'26.78"N 9° 2'41.99"W



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8. Monitoring Locations – Overview Map

9. Target Parameter 2008/50/EC Limits

Ground Level Concentrations	µg.m^{-3}	Notes
NO_2	200	Hourly average not to be exceeded more than 18 times in a calendar year
NO_2	40	Annual mean in a calendar year

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10. Sample Location Details

Location	Millennium Bridge
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Mainly commercial properties
Elevation above GL	2.5
Location	Salmon Weir Bridge
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Church and commercial
Elevation above GL	2.5
Location	Old Dublin Road
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Commercial / Residential
Elevation above GL	2.5
Location	Tuam Road
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Commercial / Light Industrial
Elevation above GL	2.5
Location	Newcastle Road Lower north of University Road
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Mainly residential
Elevation above GL	2.5
Location	The Crescent
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Mainly residential / commercial
Elevation above GL	2.5
Location	Presentation Road
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Mainly residential
Elevation above GL	2.5
Location	University Road
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Mainly residential
Elevation above GL	2.5

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Location	St Francis Street
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Commercial properties
Elevation above GL	2.5
Location	Eglinton Street
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Commercial properties
Elevation above GL	2.5
Location	Forster Street
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Commercial / Residential
Elevation above GL	2.5
Location	College Road Central
Description	Roadside location with high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Residential
Elevation above GL	2.5
Location	Lough Atalia Road south of College Road
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Residential
Elevation above GL	2.5
Location	Lough Atalia Road south of Fairgreen Road
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Mainly residential / commercial
Elevation above GL	2.5
Location	Fairgreen Road
Description	Roadside location with very high volumes of traffic. Monitor on light post c. 2.5m above ground level
Adjacent Roads	Yes
Adjacent Industries	Mainly Commercial
Elevation above GL	2.5

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11. Summary of Test Results

Round 1: 19th September to 17th October 2021

Measuring site	Passive sampler		Measuring period					Result	
			start		end		exp. time	m analyte/ sampler	C NO_2
	label	lot no.	date	time	date	time	[h]	[ug]	[ug/m³]
1: Millennium Bridge	ILA-68	44418	19/09/2021	10:00	17/10/2021	10:00	672.0	0.50	16.9
1: Millennium Bridge	75	44418	19/09/2021	10:00	17/10/2021	10:00	672.0	0.49	16.7
1: Millennium Bridge	87	44418	19/09/2021	10:00	17/10/2021	10:00	672.0	0.48	16.4
2: Salmon Weir	65	44418	19/09/2021	09:50	17/10/2021	09:50	672.0	0.33	11.3
2: Salmon Weir	66	44418	19/09/2021	09:50	17/10/2021	09:50	672.0	0.36	12.2
2: Salmon Weir	83	44418	19/09/2021	09:50	17/10/2021	09:50	672.0	0.35	11.8
5: Old Dublin Road	103	44418	19/09/2021	07:30	17/10/2021	07:30	672.0	0.33	11.0
5: Old Dublin Road	106	44418	19/09/2021	07:30	17/10/2021	07:30	672.0	0.34	11.3
5: Old Dublin Road	113	44418	19/09/2021	07:30	17/10/2021	07:30	672.0	0.34	11.6
7: Tuam Road	93	44418	19/09/2021	07:40	17/10/2021	07:40	672.0	0.60	20.3
7: Tuam Road	94	44418	19/09/2021	07:40	17/10/2021	07:40	672.0	0.59	19.8
7: Tuam Road	95	44418	19/09/2021	07:40	17/10/2021	07:40	672.0	0.62	20.9
14: Newcastle Road Lower	69	44418	19/09/2021	09:40	17/10/2021	09:40	672.0	0.90	30.5
14: Newcastle Road Lower	72	44418	19/09/2021	09:40	17/10/2021	09:40	672.0	0.86	28.9
14: Newcastle Road Lower	208	44418	19/09/2021	09:40	17/10/2021	09:40	672.0	0.94	31.7
19: The Crescent	76	44418	19/09/2021	09:30	17/10/2021	09:30	672.0	0.39	13.3
19: The Crescent	78	44418	19/09/2021	09:30	17/10/2021	09:30	672.0	0.37	12.6
19: The Crescent	79	44418	19/09/2021	09:30	17/10/2021	09:30	672.0	0.38	12.8
21: Presentation Road	64	44418	19/09/2021	09:20	17/10/2021	09:20	672.0	0.27	9.2
21: Presentation Road	77	44418	19/09/2021	09:20	17/10/2021	09:20	672.0	0.30	10.1
21: Presentation Road	92	44418	19/09/2021	09:20	17/10/2021	09:20	672.0	0.29	9.8
22: University Road	74	44418	19/09/2021	09:10	17/10/2021	09:10	672.0	0.65	22.0
22: University Road	96	44418	19/09/2021	09:10	17/10/2021	09:10	672.0	0.60	20.3
22: University Road	97	44418	19/09/2021	09:10	17/10/2021	09:10	672.0	0.63	21.3
26: Frances Street	67	44418	19/09/2021	09:00	17/10/2021	09:00	672.0	0.95	32.1
26: Frances Street	71	44418	19/09/2021	09:00	17/10/2021	09:00	672.0	0.94	31.6
26: Frances Street	86	44418	19/09/2021	09:00	17/10/2021	09:00	672.0	0.88	29.9
28: Eglington Street	70	44418	19/09/2021	08:50	17/10/2021	08:50	672.0	0.44	14.8
28: Eglington Street	81	44418	19/09/2021	08:50	17/10/2021	08:50	672.0	0.44	14.7
28: Eglington Street	110	44418	19/09/2021	08:50	17/10/2021	08:50	672.0	0.44	14.9
32: Forester Street	73	44418	19/09/2021	08:20	17/10/2021	08:20	672.0	0.63	21.2
32: Forester Street	82	44418	19/09/2021	08:20	17/10/2021	08:20	672.0	0.71	24.1
32: Forester Street	85	44418	19/09/2021	08:20	17/10/2021	08:20	672.0	0.65	21.9
38: College Road	88	44418	19/09/2021	08:30	17/10/2021	08:30	672.0	0.38	12.8
38: College Road	100	44418	19/09/2021	08:30	17/10/2021	08:30	672.0	0.34	11.6
38: College Road	101	44418	19/09/2021	08:30	17/10/2021	08:30	672.0	0.36	12.1
40: Lough Atalia College Road	91	44418	19/09/2021	07:50	17/10/2021	07:50	672.0	0.57	19.1
40: Lough Atalia College Road	98	44418	19/09/2021	07:50	17/10/2021	07:50	672.0	0.57	19.4
40: Lough Atalia College Road	112	44418	19/09/2021	07:50	17/10/2021	07:50	672.0	0.58	19.6

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Measuring site	Passive sampler		Measuring period					Result	
			start		end		exp. time	m analyte/ sampler	C NO_2
	label	lot no.	date	time	date	time	[h]	[ug]	[ug/m^3]
42: Lough Atalia Fairgreen	80	44418	19/09/2021	08:00	17/10/2021	08:00	672.0	0.41	13.9
42: Lough Atalia Fairgreen	90	44418	19/09/2021	08:00	17/10/2021	08:00	672.0	0.41	13.7
42: Lough Atalia Fairgreen	99	44418	19/09/2021	08:00	17/10/2021	08:00	672.0	0.39	13.3
44: Fairgreen Road	84	44418	19/09/2021	08:10	17/10/2021	08:10	672.0	0.54	18.1
44: Fairgreen Road	89	44418	19/09/2021	08:10	17/10/2021	08:10	672.0	0.57	19.2
44: Fairgreen Road	102	44418	19/09/2021	08:10	17/10/2021	08:10	672.0	0.55	18.5

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Round 2: 17th October to 14th November

Measuring site	Passive sampler		Measuring period					Result	
			start		end		exp. time	m analyte/ sampler	C NO_2
	label	lot no.	date	time	date	time	[h]	[ug]	[ug/m^3]
1. Millennium Bridge	ILA-134	44418	17/10/2021	10:00	14/11/2021	09:05	671.1	0.56	19.1
1. Millennium Bridge	130	44418	17/10/2021	10:00	14/11/2021	09:05	671.1	0.56	18.8
1. Millennium Bridge	120	44418	17/10/2021	10:00	14/11/2021	09:05	671.1	0.54	18.2
2. Salmon Weir	115	44418	17/10/2021	09:50	14/11/2021	09:00	671.2	0.38	12.8
2. Salmon Weir	122	44418	17/10/2021	09:50	14/11/2021	09:00	671.2	0.40	13.4
2. Salmon Weir	118	44418	17/10/2021	09:50	14/11/2021	09:00	671.2	0.38	12.7
5: Old Dublin Road	163	44418	17/10/2021	07:30	14/11/2021	07:00	671.5	0.39	13.3
5: Old Dublin Road	158	44418	17/10/2021	07:30	14/11/2021	07:00	671.5	0.41	13.9
5: Old Dublin Road	116	44418	17/10/2021	07:30	14/11/2021	07:00	671.5	0.38	13.0
7: Tuam Road	143	44418	17/10/2021	07:40	14/11/2021	07:10	671.5	0.67	22.8
7: Tuam Road	144	44418	17/10/2021	07:40	14/11/2021	07:10	671.5	0.60	20.4
7: Tuam Road	147	44418	17/10/2021	07:40	14/11/2021	07:10	671.5	0.67	22.7
14: Newcastle Road Lower	119	44418	17/10/2021	09:40	14/11/2021	07:55	670.3	0.64	21.8
14: Newcastle Road Lower	150	44418	17/10/2021	09:40	14/11/2021	07:55	670.3	0.63	21.5
14: Newcastle Road Lower	140	44418	17/10/2021	09:40	14/11/2021	07:55	670.3	0.65	21.9
19: The Crescent	159	44418	17/10/2021	09:30	14/11/2021	08:50	671.3	0.46	15.6
19: The Crescent	146	44418	17/10/2021	09:30	14/11/2021	08:50	671.3	0.45	15.2
19: The Crescent	126	44418	17/10/2021	09:30	14/11/2021	08:50	671.3	0.45	15.3
21: Presentation Road	162	44418	17/10/2021	09:20	14/11/2021	08:40	671.3	0.35	12.0
21: Presentation Road	114	44418	17/10/2021	09:20	14/11/2021	08:40	671.3	0.40	13.5
21: Presentation Road	138	44418	17/10/2021	09:20	14/11/2021	08:40	671.3	0.26	8.6
22: University Road	196	44418	17/10/2021	09:10	14/11/2021	08:30	671.3	0.64	21.4
22: University Road	187	44418	17/10/2021	09:10	14/11/2021	08:30	671.3	0.63	21.5
22: University Road	170	44418	17/10/2021	09:10	14/11/2021	08:30	671.3	0.65	21.8
26: Frances Street	151	44418	17/10/2021	09:00	14/11/2021	08:20	671.3	0.94	31.9
26: Frances Street	148	44418	17/10/2021	09:00	14/11/2021	08:20	671.3	1.00	33.7
26: Frances Street	124	44418	17/10/2021	09:00	14/11/2021	08:20	671.3	1.02	34.7
28: Eglington Street	121	44418	17/10/2021	08:50	14/11/2021	08:10	671.3	0.46	15.7
28: Eglington Street	135	44418	17/10/2021	08:50	14/11/2021	08:10	671.3	0.49	16.5
28: Eglington Street	136	44418	17/10/2021	08:50	14/11/2021	08:10	671.3	0.49	16.5
32: Forester Street	156	44418	17/10/2021	08:20	14/11/2021	07:35	671.3	0.70	23.7
32: Forester Street	142	44418	17/10/2021	08:20	14/11/2021	07:35	671.3	0.78	26.5
32: Forester Street	123	44418	17/10/2021	08:20	14/11/2021	07:35	671.3	0.77	25.9
38: College Road	152	44418	17/10/2021	08:30	14/11/2021	07:45	671.3	0.43	14.5
38: College Road	133	44418	17/10/2021	08:30	14/11/2021	07:45	671.3	0.44	14.9
38: College Road	153	44418	17/10/2021	08:30	14/11/2021	07:45	671.3	0.40	13.5
40: Lough Atalia College Road	155	44418	17/10/2021	07:50	14/11/2021	07:15	671.4	0.59	20.0
40: Lough Atalia College Road	149	44418	17/10/2021	07:50	14/11/2021	07:15	671.4	0.60	20.4
40: Lough Atalia College Road	201	44418	17/10/2021	07:50	14/11/2021	07:15	671.4	0.58	19.5

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Measuring site	Passive sampler		Measuring period					Result	
			start		end		exp. time	m analyte/ sampler	C NO_2
	label	lot no.	date	time	date	time	[h]	[ug]	[ug/m^3]
42: Lough Atalia Fairgreen	139	44418	17/10/2021	08:00	14/11/2021	07:20	671.3	0.52	17.6
42: Lough Atalia Fairgreen	129	44418	17/10/2021	08:00	14/11/2021	07:20	671.3	0.47	15.9
42: Lough Atalia Fairgreen	128	44418	17/10/2021	08:00	14/11/2021	07:20	671.3	0.50	17.1
44: Fairgreen Road	137	44418	17/10/2021	08:10	14/11/2021	07:25	671.3	0.59	19.8
44: Fairgreen Road	141	44418	17/10/2021	08:10	14/11/2021	07:25	671.3	0.57	19.4
44: Fairgreen Road	131	44418	17/10/2021	08:10	14/11/2021	07:25	671.3	0.54	18.3

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Round 3: 14th November to 12th December

Measuring site	Passive sampler		Measuring period					Result	
			start		end		exp. time	m analyte/ sampler	C NO_2
	label	lot no.	date	time	date	time	[h]	[ug]	[ug/m^3]
1: Millennium Bridge	ILA-167	44418	14/11/2021	09:05	12/12/2021	09:05	672.0	0.71	24.0
1: Millennium Bridge	183	44418	14/11/2021	09:05	12/12/2021	09:05	672.0	0.67	22.7
1: Millennium Bridge	190	44418	14/11/2021	09:05	12/12/2021	09:05	672.0	0.69	23.4
2: Salmon Weir	182	44418	14/11/2021	09:00	12/12/2021	09:00	672.0	0.47	15.8
2: Salmon Weir	191	44418	14/11/2021	09:00	12/12/2021	09:00	672.0	0.48	16.3
2: Salmon Weir	194	44418	14/11/2021	09:00	12/12/2021	09:00	672.0	0.49	16.7
5: Old Dublin Road	171	44418	14/11/2021	07:00	12/12/2021	07:00	672.0	0.53	17.9
5: Old Dublin Road	186	44418	14/11/2021	07:00	12/12/2021	07:00	672.0	0.55	18.6
5: Old Dublin Road	216	44411	14/11/2021	07:00	12/12/2021	07:00	672.0	0.55	18.5
7: Tuam Road	176	44418	14/11/2021	07:10	12/12/2021	07:10	672.0	0.67	22.5
7: Tuam Road	188	44418	14/11/2021	07:10	12/12/2021	07:10	672.0	0.63	21.3
7: Tuam Road	205	44418	14/11/2021	07:10	12/12/2021	07:10	672.0	0.67	22.6
14: Newcastle Road Lower	175	44418	14/11/2021	07:55	12/12/2021	07:55	672.0	0.64	21.5
14: Newcastle Road Lower	189	44418	14/11/2021	07:55	12/12/2021	07:55	672.0	0.64	21.8
14: Newcastle Road Lower	193	44418	14/11/2021	07:55	12/12/2021	07:55	672.0	0.62	21.0
19: The Crescent	164	44418	14/11/2021	08:50	12/12/2021	08:50	672.0	0.50	16.9
19: The Crescent	177	44418	14/11/2021	08:50	12/12/2021	08:50	672.0	0.52	17.6
19: The Crescent	181	44418	14/11/2021	08:50	12/12/2021	08:50	672.0	0.51	17.2
21: Presentation Road	168	44418	14/11/2021	08:40	12/12/2021	08:40	672.0	0.49	16.4
21: Presentation Road	202	44418	14/11/2021	08:40	12/12/2021	08:40	672.0	0.45	15.1
21: Presentation Road	206	44418	14/11/2021	08:40	12/12/2021	08:40	672.0	0.52	17.5
22: University Road	117	44418	14/11/2021	08:30	12/12/2021	08:30	672.0	0.64	21.9
22: University Road	127	44418	14/11/2021	08:30	12/12/2021	08:30	672.0	0.67	22.6
22: University Road	132	44418	14/11/2021	08:30	12/12/2021	08:30	672.0	0.67	22.5
26: Frances Street	185	44418	14/11/2021	08:20	12/12/2021	08:20	672.0	0.90	30.3
26: Frances Street	207	44418	14/11/2021	08:20	12/12/2021	08:20	672.0	0.89	30.1
26: Frances Street	209	44411	14/11/2021	08:20	12/12/2021	08:20	672.0	1.00	33.9
28: Eglington Street	165	44418	14/11/2021	08:10	12/12/2021	08:10	672.0	0.62	21.0
28: Eglington Street	173	44418	14/11/2021	08:10	12/12/2021	08:10	672.0	0.60	20.2
28: Eglington Street	180	44418	14/11/2021	08:10	12/12/2021	08:10	672.0	0.53	17.8
32: Forester Street	166	44418	14/11/2021	07:35	12/12/2021	07:35	672.0	0.87	29.4
32: Forester Street	179	44418	14/11/2021	07:35	12/12/2021	07:35	672.0	0.80	27.0
32: Forester Street	195	44418	14/11/2021	07:35	12/12/2021	07:35	672.0	0.88	29.8
38: College Road	196	44418	14/11/2021	07:45	12/12/2021	07:45	672.0	0.54	18.3
38: College Road	200	44418	14/11/2021	07:45	12/12/2021	07:45	672.0	0.50	16.8
38: College Road	203	44418	14/11/2021	07:45	12/12/2021	07:45	672.0	0.50	16.8
40: Lough Atalia College Road	172	44418	14/11/2021	07:15	12/12/2021	07:15	672.0	0.76	25.6
40: Lough Atalia College Road	192	44418	14/11/2021	07:15	12/12/2021	07:15	672.0	0.77	26.1
40: Lough Atalia College Road	197	44418	14/11/2021	07:15	12/12/2021	07:15	672.0	0.78	26.5

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Measuring site	Passive sampler		Measuring period					Result	
			start		end		exp. time	m analyte/ sampler	C NO_2
	label	lot no.	date	time	date	time	[h]	[ug]	[ug/m^3]
42: Lough Atalia Fairgreen	174	44418	14/11/2021	07:20	12/12/2021	07:20	672.0	0.62	20.9
42: Lough Atalia Fairgreen	199	44418	14/11/2021	07:20	12/12/2021	07:20	672.0	0.59	19.8
42: Lough Atalia Fairgreen	204	44418	14/11/2021	07:20	12/12/2021	07:20	672.0	0.54	18.2
44: Fairgreen Road	169	44418	14/11/2021	07:25	12/12/2021	07:25	672.0	0.72	24.5
44: Fairgreen Road	178	44418	14/11/2021	07:25	12/12/2021	07:25	672.0	0.66	22.5
44: Fairgreen Road	184	44418	14/11/2021	07:25	12/12/2021	07:25	672.0	0.70	23.7

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12. Monitoring, Equipment & Analytical Methods

Parameter	Standard	Technical Procedure	Analytical Technique	Equipment / Media	Uncertainty
Nitrogen Dioxide	Diffusion Tubes by UV Spectrophotometry	2104	SP01 Photometer in an accredited laboratory.	Diffusion Tubes 20% TEA / Water	<25%

13. Associated Definitions

Uncertainty of Measurement

The expanded uncertainty associated with diffusive sampler method for oxides of nitrogen is included in this report. All analytical measurements have a level of uncertainty around the measured value. The uncertainty is a quantity defining a level of confidence about the result of a measurement that may be expected to encompass a specific fraction of the distribution of values that could reasonably be attributed to a measurand. The uncertainty is calculated by the laboratory which combined and expands uncertainty for equipment, analytical technique and analytical measurement. Directive 2008/50/EC requires the uncertainty of the test below 25% for indicative measurements.

Bias

Where diffusion tubes are used, it is essential that the data are adjusted for 'bias'. This is dependent on the laboratory that prepared the tubes, and the method of preparation that was used. Suitable bias adjustment factors may be derived locally (by collocating tubes with an automatic analyser) or default factors may be obtained from DEFRA. Bias was determined by assessment in close proximity to an EPA registered Air Quality Station for reference. Diffusion tubes were installed beside the Swords Council Depot which has an EPA monitoring station used for collation of data under the CAFÉ Directive. Bias was determined in accordance with the AEA_DifTPAB_V04.xls spreadsheet designed by the AEA Energy and Environment to assist Diffusion tubes users in calculating precision and accuracy. It also assists in adjusting diffusion tube results using the bias adjustment calculated.

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Appendix

7.2 Detailed Modelling Report

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2. Model results for ecological receptors 8

1. Model results for Human Receptors

The model results for human receptors are presented in Table 1 and Table 2 this appendix.

Table 1: 2019 Baseline Model Results for Annual Mean NO_2, PM_{10} and $PM_{2.5}$ Concentrations

Receptor	Height (m)	Annual mean concentrations (µg/m^3)		
		NO_2	PM_{10}	$PM_{2.5}$
R1	1.5	18.0	17.2	12.7
R2	1.5	18.3	17.3	12.8
R3	1.5	17.3	17.2	12.7
R4	1.5	15.7	16.8	12.5
R5	1.5	17.7	17.0	12.6
R6	1.5	17.3	17.0	12.6
R7	1.5	19.9	17.3	12.8
R8	1.5	18.2	17.1	12.7
R9	1.5	16.8	17.0	12.6
R10	1.5	24.5	18.1	13.3
R11	1.5	15.5	16.7	12.5
R12	1.5	17.0	16.9	12.6
R13	1.5	18.2	17.1	12.7
R14	1.5	18.8	17.3	12.8
R15	1.5	18.8	17.2	12.8
R16	1.5	16.2	17.0	12.6
R17	1.5	17.5	17.1	12.7
R18	1.5	17.1	17.0	12.6
R19	1.5	17.3	17.1	12.7
R20	1.5	16.4	16.9	12.6
R21	1.5	14.3	16.6	12.4
R22	1.5	14.1	16.6	12.4
R23	1.5	14.2	16.7	12.4
R24	1.5	13.9	16.6	12.4
R25	1.5	13.7	16.5	12.3
R26	1.5	14.0	16.6	12.4
R27	1.5	13.2	16.5	12.3
R28	1.5	14.2	16.6	12.4
R29	1.5	15.3	16.8	12.5
R30	1.5	16.7	17.1	12.7
R31	1.5	16.0	16.9	12.6
R32	1.5	13.8	16.6	12.4
R33	1.5	15.7	16.9	12.5
R34	1.5	14.5	16.6	12.4

Receptor	Height (m)	Annual mean concentrations (µg/m^3)		
		NO_2	PM_{10}	$PM_{2.5}$
R35	1.5	15.2	16.8	12.5
R36	1.5	16.6	17.0	12.6
R37	1.5	16.9	17.0	12.6
R38	1.5	17.1	17.0	12.6
R39	1.5	20.5	17.5	12.9
R40	1.5	15.9	16.8	12.5
R41	1.5	15.8	16.8	12.5
R42	1.5	14.7	16.6	12.4
R43	1.5	13.6	16.5	12.3
R44	1.5	14.2	16.6	12.4
R45	4.5	19.5	17.2	12.8
R46	1.5	18.6	17.1	12.7
R47	4.5	15.2	16.7	12.5
R48	1.5	16.8	16.9	12.6
R49	1.5	13.5	16.5	12.3
R50	1.5	15.4	16.8	12.5
R51	1.5	13.3	16.5	12.3
R52	1.5	13.2	16.5	12.3
R53	1.5	13.7	16.6	12.4
R54	1.5	13.2	16.5	12.3
R55	1.5	14.3	16.6	12.4
R56	1.5	14.1	16.6	12.4
R57	1.5	16.8	16.9	12.6
R58	1.5	17.9	17.0	12.6
R59	1.5	23.6	17.4	12.9
R60	1.5	16.4	16.8	12.5
R61	1.5	15.2	16.7	12.4
R62	1.5	18.3	17.1	12.7
R63	4.5	14.6	16.6	12.4
R64	1.5	17.0	16.9	12.6
R65	4.5	16.5	16.8	12.5
R66	4.5	15.9	16.7	12.5
R67	1.5	16.2	16.8	12.5
R68	4.5	17.1	16.9	12.6
R69	4.5	17.0	16.9	12.5
R70	4.5	16.9	16.9	12.6
R71	4.5	15.2	16.7	12.4
R72	1.5	17.0	16.9	12.6
R73	4.5	15.5	16.8	12.5
R74	4.5	15.3	16.7	12.5
R75	4.5	16.3	16.8	12.5
R76	1.5	21.3	17.5	12.9

Receptor	Height (m)	Annual mean concentrations (µg/m^3)		
		NO_2	PM_{10}	$PM_{2.5}$
R77	4.5	15.3	16.7	12.5
R78	1.5	17.8	17.0	12.6
R79	1.5	18.3	17.1	12.7
R80	1.5	22.1	17.7	13.0
R81	4.5	16.2	16.8	12.5
R82	1.5	24.8	18.1	13.3
R83	1.5	17.9	17.0	12.6
R84	1.5	34.5	19.1	13.9
R85	1.5	15.6	16.7	12.5
R86	1.5	14.9	16.7	12.4
R87	1.5	16.0	16.8	12.5
R88	4.5	15.7	16.8	12.5
R89	1.5	18.0	17.1	12.7
R90	1.5	15.2	16.7	12.5
R91	4.5	14.5	16.6	12.4
R92	4.5	14.8	16.7	12.4
R93	1.5	19.5	17.2	12.8
R94	1.5	19.5	17.3	12.8
R95	4.5	18.6	17.1	12.7
R96	1.5	15.3	16.7	12.4
R97	1.5	14.2	16.6	12.4
R98	1.5	14.4	16.6	12.4
R99	4.5	16.1	16.8	12.5
R100	1.5	21.6	17.5	12.9
R101	1.5	15.2	16.7	12.4
R102	1.5	18.3	17.1	12.7
R103	1.5	15.6	16.7	12.5
R104	1.5	18.9	17.2	12.7
R105	1.5	18.2	17.1	12.7
R106	1.5	20.1	17.4	12.8
R107	4.5	17.2	16.9	12.6
R108	4.5	14.3	16.6	12.4
R109	1.5	16.8	17.0	12.6
R110	1.5	14.7	16.7	12.5
R111	1.5	19.4	17.4	12.8
R112	1.5	19.2	17.5	12.9
R113	1.5	18.7	17.2	12.7
R114	1.5	14.4	16.7	12.4
R115	1.5	14.8	16.7	12.4
R116	1.5	19.5	17.3	12.8
R117	1.5	22.7	17.6	13.0
R118	1.5	21.8	17.5	12.9

Receptor	Height (m)	Annual mean concentrations (µg/m^3)		
		NO_2	PM_{10}	$PM_{2.5}$
R119	1.5	19.5	17.3	12.8
R120	1.5	19.3	17.3	12.8
R121	1.5	19.1	17.5	12.9
R122	1.5	15.0	16.8	12.5
R123	1.5	13.1	16.5	12.3
R124	1.5	13.1	16.5	12.3
R125	1.5	16.7	17.0	12.6
R126	1.5	14.7	16.7	12.4
R127	1.5	19.5	17.4	12.9
R128	1.5	15.2	16.8	12.5
R129	1.5	15.2	16.8	12.5
R130	1.5	15.3	16.9	12.6
R131	1.5	19.2	17.4	12.8
R132	1.5	14.8	16.8	12.5
R133	1.5	13.6	16.5	12.3
R134	1.5	13.3	16.5	12.3
R135	1.5	15.1	16.8	12.5
R136	1.5	14.6	16.7	12.4
R137	1.5	15.3	16.8	12.5
R138	1.5	15.6	16.8	12.5
R139	1.5	13.2	16.5	12.3
R140	1.5	13.2	16.5	12.3
R141	1.5	14.8	16.7	12.4
R142	1.5	15.9	16.9	12.5
R143	1.5	15.8	16.9	12.6
R144	1.5	17.6	17.2	12.7
R145	1.5	15.1	16.7	12.5
R146	1.5	16.5	17.0	12.6
R147	1.5	15.0	16.8	12.5
R148	1.5	14.2	16.7	12.4
R149	1.5	14.0	16.7	12.4
R150	1.5	13.9	16.6	12.4
R151	1.5	13.9	16.6	12.4
R152	1.5	14.1	16.6	12.4
R153	1.5	13.2	16.5	12.3
R154	1.5	14.9	16.9	12.5

Table 2: 2023 Model Results for Annual Mean NO_2 Concentrations

Receptor	Height (m)	Annual mean NO_2 concentrations (µg/m^3)		Impact
		2023 DM	2023 DS	
R1	1.5	18.5	15.9	Negligible

Receptor	Height (m)	Annual mean NO_2 concentrations ($\mu g/m^3$)		Impact
		2023 DM	2023 DS	
R2	1.5	18.6	17.8	Negligible
R3	1.5	17.6	16.8	Negligible
R4	1.5	15.9	16.1	Negligible
R5	1.5	20.9	22.2	Negligible
R6	1.5	16.1	17.6	Negligible
R7	1.5	17.9	20.1	Negligible
R8	1.5	16.9	18.1	Negligible
R9	1.5	15.8	16.7	Negligible
R10	1.5	22.4	23.9	Negligible
R11	1.5	15.1	13.7	Negligible
R12	1.5	16.4	15.1	Negligible
R13	1.5	16.9	18.0	Negligible
R14	1.5	18.0	19.2	Negligible
R15	1.5	18.1	19.4	Negligible
R16	1.5	15.9	16.2	Negligible
R17	1.5	16.9	17.6	Negligible
R18	1.5	16.8	18.0	Negligible
R19	1.5	16.4	16.4	Negligible
R20	1.5	15.6	15.8	Negligible
R21	1.5	13.9	14.1	Negligible
R22	1.5	13.7	14.0	Negligible
R23	1.5	14.0	14.2	Negligible
R24	1.5	13.9	14.3	Negligible
R25	1.5	13.7	14.0	Negligible
R26	1.5	13.8	14.0	Negligible
R27	1.5	13.1	13.2	Negligible
R28	1.5	13.8	13.9	Negligible
R29	1.5	14.8	14.9	Negligible
R30	1.5	15.9	16.6	Negligible
R31	1.5	15.2	15.6	Negligible
R32	1.5	13.4	13.6	Negligible
R33	1.5	15.0	15.2	Negligible
R34	1.5	15.1	15.6	Negligible
R35	1.5	15.0	15.9	Negligible
R36	1.5	16.3	17.5	Negligible
R37	1.5	16.7	18.0	Negligible
R38	1.5	17.1	18.4	Negligible
R39	1.5	20.6	21.6	Negligible
R40	1.5	16.2	16.5	Negligible
R41	1.5	15.7	16.2	Negligible
R42	1.5	14.3	14.8	Negligible

Receptor	Height (m)	Annual mean NO_2 concentrations ($\mu g/m^3$)		Impact
		2023 DM	2023 DS	
R43	1.5	13.6	15.0	Negligible
R44	1.5	14.1	15.5	Negligible
R45	4.5	18.4	16.4	Negligible
R46	1.5	17.6	16.3	Negligible
R47	4.5	14.7	14.6	Negligible
R48	1.5	15.8	15.8	Negligible
R49	1.5	15.4	15.5	Negligible
R50	1.5	14.8	14.6	Negligible
R51	1.5	13.1	12.9	Negligible
R52	1.5	13.0	12.9	Negligible
R53	1.5	13.4	13.2	Negligible
R54	1.5	13.0	12.9	Negligible
R55	1.5	14.3	14.1	Negligible
R56	1.5	13.6	13.7	Negligible
R57	1.5	17.0	14.4	Negligible
R58	1.5	16.9	16.8	Negligible
R59	1.5	25.5	24.1	Negligible
R60	1.5	16.8	16.8	Negligible
R61	1.5	14.8	13.7	Negligible
R62	1.5	17.5	17.0	Negligible
R63	4.5	14.3	14.0	Negligible
R64	1.5	16.2	15.4	Negligible
R65	4.5	16.8	16.3	Negligible
R66	4.5	16.3	15.5	Negligible
R67	1.5	16.8	15.7	Negligible
R68	4.5	18.2	16.0	Negligible
R69	4.5	18.1	16.0	Negligible
R70	4.5	17.3	17.2	Negligible
R71	4.5	14.9	14.3	Negligible
R72	1.5	17.1	15.7	Negligible
R73	4.5	15.1	14.6	Negligible
R74	4.5	15.0	14.5	Negligible
R75	4.5	15.7	16.4	Negligible
R76	1.5	20.1	22.5	Slight adverse
R77	4.5	15.0	14.5	Negligible
R78	1.5	16.8	18.0	Negligible
R79	1.5	17.2	18.6	Negligible
R80	1.5	20.2	22.3	Negligible
R81	4.5	15.5	16.0	Negligible
R82	1.5	22.4	21.9	Negligible
R83	1.5	16.9	16.8	Negligible

Receptor	Height (m)	Annual mean NO_2 concentrations ($\mu g/m^3$)		Impact
		2023 DM	2023 DS	
R84	1.5	30.5	33.9	Slight adverse
R85	1.5	15.0	16.5	Negligible
R86	1.5	14.4	14.3	Negligible
R87	1.5	15.3	15.6	Negligible
R88	4.5	15.1	15.4	Negligible
R89	1.5	17.3	21.6	Slight adverse
R90	1.5	14.8	14.6	Negligible
R91	4.5	14.2	14.2	Negligible
R92	4.5	14.3	14.2	Negligible
R93	1.5	18.2	16.8	Negligible
R94	1.5	19.8	20.9	Negligible
R95	4.5	18.5	16.2	Negligible
R96	1.5	15.4	17.2	Negligible
R97	1.5	14.3	15.0	Negligible
R98	1.5	14.5	14.9	Negligible
R99	4.5	16.4	15.6	Negligible
R100	1.5	21.3	18.6	Negligible
R101	1.5	15.1	15.0	Negligible
R102	1.5	18.0	16.3	Negligible
R103	1.5	15.6	15.6	Negligible
R104	1.5	18.4	15.9	Negligible
R105	1.5	17.7	16.4	Negligible
R106	1.5	19.5	17.2	Negligible
R107	4.5	17.5	16.5	Negligible
R108	4.5	14.4	16.7	Negligible
R109	1.5	16.5	20.3	Negligible
R110	1.5	14.5	15.2	Negligible
R111	1.5	19.4	23.5	Slight adverse
R112	1.5	19.1	18.5	Negligible
R113	1.5	19.4	23.8	Slight adverse
R114	1.5	14.8	15.0	Negligible
R115	1.5	15.3	14.6	Negligible
R116	1.5	20.8	16.7	Slight beneficial
R117	1.5	24.3	20.3	Slight beneficial
R118	1.5	20.9	20.8	Negligible
R119	1.5	18.5	18.4	Negligible
R120	1.5	18.2	18.3	Negligible
R121	1.5	18.2	18.3	Negligible
R122	1.5	15.1	15.4	Negligible
R123	1.5	13.3	13.2	Negligible
R124	1.5	13.4	13.1	Negligible

Receptor	Height (m)	Annual mean NO_2 concentrations ($\mu g/m^3$)		Impact
		2023 DM	2023 DS	
R125	1.5	15.5	15.6	Negligible
R126	1.5	15.3	15.5	Negligible
R127	1.5	18.6	18.8	Negligible
R128	1.5	14.8	14.5	Negligible
R129	1.5	14.8	14.4	Negligible
R130	1.5	14.8	14.4	Negligible
R131	1.5	18.1	17.8	Negligible
R132	1.5	14.6	14.3	Negligible
R133	1.5	13.5	13.4	Negligible
R134	1.5	13.2	13.2	Negligible
R135	1.5	14.8	14.8	Negligible
R136	1.5	14.3	14.4	Negligible
R137	1.5	15.0	15.3	Negligible
R138	1.5	15.3	15.6	Negligible
R139	1.5	13.2	13.1	Negligible
R140	1.5	13.2	13.0	Negligible
R141	1.5	14.7	14.3	Negligible
R142	1.5	15.4	14.9	Negligible
R143	1.5	15.3	15.7	Negligible
R144	1.5	17.1	17.4	Negligible
R145	1.5	14.7	15.1	Negligible
R146	1.5	16.0	16.5	Negligible
R147	1.5	14.7	14.9	Negligible
R148	1.5	13.9	13.8	Negligible
R149	1.5	13.7	13.6	Negligible
R150	1.5	13.4	13.3	Negligible
R151	1.5	13.3	13.2	Negligible
R152	1.5	13.7	13.8	Negligible
R153	1.5	13.1	13.1	Negligible
R154	1.5	14.5	14.6	Negligible

2. Model results for ecological receptors

The model results for ecological receptors are presented in Table 3 this appendix.

Table 3: 2022 Model Results for Annual Mean NO_2 Concentrations (modelled at 0 m)

Receptor	Annual mean NO_2 concentrations ($\mu g/m^3$)		DS-DS
	2023 DM	2023 DS	
Galway Bay Complex SAC/Inner Galway Bay SPA_1_1	13.3	13.1	-0.2

Receptor	Annual mean NO_2 concentrations ($\mu g/m^3$)		DS-DS
	2023 DM	2023 DS	
Galway Bay complex SAC/Inner Galway Bay SPA _1_2	12.7	12.7	-0.1
Galway Bay complex SAC/Inner Galway Bay SPA _1_3	12.6	12.5	-0.1
Galway Bay complex SAC/Inner Galway Bay SPA _1_4	12.5	12.5	0.0
Galway Bay complex SAC/Inner Galway Bay SPA _1_5	12.4	12.4	0.0
Galway Bay complex SAC/Inner Galway Bay SPA _1_6	12.4	12.4	0.0
Galway Bay complex SAC/Inner Galway Bay SPA _1_7	12.4	12.3	0.0
Galway Bay complex SAC/Inner Galway Bay SPA _1_8	12.3	12.3	0.0
Galway Bay complex SAC/Inner Galway Bay SPA _1_9	12.3	12.3	0.0
Galway Bay complex SAC/Inner Galway Bay SPA _1_10	12.3	12.3	0.0
Galway Bay Complex SAC/Inner Galway Bay SPA _2_1	13.5	13.3	-0.1
Galway Bay Complex SAC/Inner Galway Bay SPA _2_2	12.7	12.6	-0.1
Galway Bay Complex SAC/Inner Galway Bay SPA _2_3	12.5	12.5	0.0
Galway Bay Complex SAC/Inner Galway Bay SPA _2_4	12.4	12.4	0.0
Galway Bay Complex SAC/Inner Galway Bay SPA _2_5	12.3	12.3	0.0
Galway Bay Complex SAC/Inner Galway Bay SPA _2_6	12.3	12.3	0.0
Galway Bay Complex SAC/Inner Galway Bay SPA _2_7	12.3	12.2	0.0
Galway Bay Complex SAC/Inner Galway Bay SPA _2_8	12.2	12.2	0.0
Galway Bay Complex SAC/Inner Galway Bay SPA _2_9	12.2	12.2	0.0
Galway Bay Complex SAC/Inner Galway Bay SPA _2_10	12.2	12.2	0.0
Lough Corrib SAC_1_1	13.7	13.5	-0.2
Lough Corrib SAC_1_2	13.3	13.3	0.0
Lough Corrib SAC_1_3	13.2	13.2	0.0
Lough Corrib SAC_1_4	13.1	13.1	0.0
Lough Corrib SAC_1_5	13.1	13.1	0.0
Lough Corrib SAC_1_6	13.0	13.0	0.0
Lough Corrib SAC_1_7	13.0	13.0	0.0
Lough Corrib SAC_1_8	13.0	13.0	0.0

Receptor	Annual mean NO_2 concentrations ($\mu g/m^3$)		DS-DS
	2023 DM	2023 DS	
Lough Corrib SAC_1_9	13.0	13.0	0.0
Lough Corrib SAC_1_10	13.0	13.0	0.0
Lough Corrib SAC_2_1	14.0	13.4	-0.6
Lough Corrib SAC_2_2	13.9	13.4	-0.6
Lough Corrib SAC_2_3	13.9	13.4	-0.5
Lough Corrib SAC_3_1	14.8	14.3	-0.5
Lough Corrib SAC_3_2	13.5	13.5	0.0
Lough Corrib SAC_3_3	13.2	13.3	0.1
Lough Corrib SAC_3_4	13.1	13.2	0.1
Lough Corrib SAC_3_5	13.1	13.2	0.1
Lough Corrib SAC_3_6	13.0	13.1	0.1
Lough Corrib SAC_3_7	13.0	13.1	0.1
Lough Corrib SAC_3_8	12.9	13.1	0.1
Lough Corrib SAC_3_9	12.9	13.1	0.1
Lough Corrib SAC_3_10	12.9	13.0	0.1

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