

Table A1 Summary statistics for hourly NO₂ concentrations in Ireland in 2018¹

	Winetavern St.	Davitt Road	St. Johns Road	Rathmines	Dun Laoghaire	Ballyfermot	Blanchardstown	Swords	Ringsend	South Link Road	UCC Distillery Fields	Kilkenny Seville Lodge	Portlaoise	Dundalk	Eno Court	Castlebar	Kilcitt
µg/m ²	Zone A									Zone B		Zone C			Zone D		
Annual mean ³	29	26	44	20	19	17	25	16	27	25	11	6	11	14	3	8	3
Median	24	19	40	16	15	12	14	11	18	20	7	4	8	10	3	5	2
% Data Capture	99	11	9	95	96	94	83	91	94	70	95	99	93	86	94	99	99
NO ₂ values >200	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Values >140 (UAT)	6	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0
Values >100 (LAT)	36	18	17	4	8	20	152	3	11	30	0	0	1	0	0	0	0
Hourly max ⁴	165	120	125	138	135	217	149	112	121	132	79	71	119	91	91	92	37

¹ St. John's Road 28/11/2018 – 31/12/2018, Davitt Road 20/11/2018 – 31/12/2018

² NO_x is expressed as µg/m³ NO₂.

³ NO₂ annual mean limit value for the protection of human health: 40 µg/m³ applicable from 2010

⁴ NO₂ hourly limit value for the protection of human health: No more than 18 hrs > 200 µg/m³ applicable from 2010.

Table A2 Summary statistics for hourly NO_x concentrations in Ireland in 2018

	Wintavern St.	Rathmines	Dun Laoghaire	Ballyfermot	Blanchardstown	Swords	Ringsend	South Link Road	UCC Distillery Fields	Kilkenny Seville Lodge	Portlaoise	Dundalk	Emo Court	Castlebar	Kilkit
$\mu\text{g}/\text{m}^5$	Zone A							Zone B		Zone C			Zone D		
Annual mean ⁶	47	33	30	25	62	23	50	61	15	7	16	21	5	11	4
Median	33	22	21	14	24	15	34	36	8	4	11	13	3	6	3
% Data Capture	99	95	96	94	83	91	94	70	95	99	93	86	94	99	99
Hourly max	1144	681	614	704	1032	735	909	747	384	307	480	535	248	613	51

⁵ NO_x is expressed as $\mu\text{g}/\text{m}^3$ NO₂.

⁶ NO_x annual mean limit value for the protection of vegetation: 30 $\mu\text{g}/\text{m}^3$ applicable from 2010. Limit only applies to rural stations in Zone D

Table A3 Summary statistics for hourly SO₂ concentrations in Ireland in 2018

	Winehaven Street	Rathmines	Tallaght	Ringsend	South Link Road	Bishopstown CIT	Ennis	Dundalk	Portlaoise	Kilkit
(µg/m ³)	Zone A				Zone B		Zone C			Zone D
Annual mean ⁷	0.7	2.3	2.2	3.3	2.3	2.1	3.2	3.8	3	2.6
Median	0.5	1.9	2.1	2.4	2.4	1.9	2.1	3.2	2.4	2.4
% data capture	54	95	79	90	100	55	91	76	95	92
Hourly values > 350	0	0	0	0	0	0	0	0	0	0
Hourly max ⁸	21	25	22	51	23	18	67	33	40	16
Daily values > 125	0	0	0	0	0	0	0	0	0	0
Daily max	7	8	9	20	12	6	18	10	18	6

⁷ SO₂ annual mean limit value for the protection of ecosystems: 20 µg/m³ applicable from 2001.

⁸ SO₂ hourly limit value for the protection of human health: No more than 24 hrs > 350 µg/m³ applicable from 2005.

Table A4 Summary statistics for rolling 8-hour CO concentrations in Ireland in 2018

	Wintavern Street	South Link Road	Portlaoise	Dundalk
(mg/m ³)	Zone A	Zone B	Zone C	
Annual mean	0.2	0.4	0.2	0.5
Median	0.2	0.4	0.2	0.4
% data capture	100	89	95	86
Values > 10	0	0	0	0
Max ⁹	1.8	1.3	2.8	1.6

⁹ CO maximum daily 8-hr mean limit value for the protection of human health: 10 mg/m³.

Table A5 Summary statistics for rolling 8-hour ozone concentrations in Ireland in 2018¹⁰

	Rathmines	Clonskeagh	Swords	South Link Road	Bishopstown CIT	UCC Distillery Fields	Kilkenny	Bray	Emo Court	Kilkit	Carnsore Point	Mace Head	Castlebar	Valentia	Malin Head
($\mu\text{g}/\text{m}^3$)	Zone A			Zone B			Zone C		Zone D						
Annual mean	47	54	54	40	53	54	56	57	57	59	57	75	58	68	61
Median	48	56	55	38	57	53	56	60	56	59	59	76	59	70	62
% data capture	98	100	92	82	53	90	95	94	93	95	32	99	99	100	26
No. days > 120 ¹¹	0	4	2	2	1	3	8	3	3	4	0	5	3	6	0
Max 8-hr value	107	132	132	129	123	139	139	132	146	159	89	148	150	180	85

¹⁰ Malin Head 26/09/2018 – 31/12/2018 Carnsore Point 26/09/2018 – 31/12/2018 Bishopstown CIT 13/06/2018 – 31/12/2018

¹¹ Max ozone daily 8-hr mean limit: No more than 25 days > 120 $\mu\text{g}/\text{m}^3$.

Table A6 AOT40 values from rural stations (Zone D) in Ireland, 2011 – 2018

($\mu\text{g}/\text{m}^3$).h ¹²	Kilkitt Co. Monaghan	Mace Head Co. Galway	Castlebar Co. Mayo	Valentia Co. Kerry	Emo Court Co. Laois
2012	2046	3606	1757	2417	1375
2013	1482	5064	1366	4436	1017
2014	1316	4091	597	1583	785
2015	747	2521	693	3460	276
2016	5227	7622	2792	4116	1372
2017	3104	5070	1312	1699	4326
2018	7304	13020	5364	4967	3261
Average	3032	5856	1983	3240	1773

¹² AOT40 target value for 2010 is 18,000 $\mu\text{g}/\text{m}^3$.h; long-term objective for 2020 is 6,000 $\mu\text{g}/\text{m}^3$.h. AOT40 is calculated 1 May – 31 July.

Table A7 Summary statistics for daily PM₁₀ concentrations in Ireland in 2018¹³

	Winehaven St	Rathmines	Phoenix Park	Blanchardstown	Dun Laoghaire	Ballyfermot	Tallaght	Ringsend	St. John's Road	St. Anne's Park	Davitt Road	Finglas	Marino	South Link Road	Heatherton Park	Portlaoise	Ennis	Galway Rahoon	Dundalk	Carlow Town	Waterford Browes Road	Castlebar	Cobh	Clarenorris	Kilkit	Roscommon Town
µg/m ³	Zone A													Zone B		Zone C						Zone D				
Annual mean ¹⁴	14	15	11	17	13	16	15	20	14	11	14	11	12	17	11	11	16	15	15	12	15	11	15	12	9	12
Median	13	13	10	14	12	14	12	16	11	10	12	9	11	15	10	10	14	14	13	11	15	10	15	11	7	11
% data capture	96	99	100	100	94	67	98	87	18	32	25	25	37	99	79	92	84	8	82	29	13	93	13	100	95	32
Values > 50 ¹⁵	1	2	0	2	0	0	1	3	0	0	1	1	0	0	0	1	4	0	0	0	0	0	0	0	0	0
Daily Max	60	71	48	53	48	48	53	58	43	26	60	77	32	48	35	53	64	27	42	31	26	38	26	43	35	34

¹³ St. John's Road 26/10/2018 – 31/12/2018, Roscommon 05/09/2018 – 31/12/2018, Waterford 29/11/2018 – 31/12/2018, Carlow 16/09/2018 – 31/12/2018, Cobh 15/11/2018 – 31/12/2018, Heatherton Park 21/02/2018 – 31/12/2018, Marino 15/08/2018 – 31/12/2018, Finglas 02/08/2018 – 31/12/2018, Davitt Road 10/07/2018 – 31/12/2018, St. Anne's Park 05/09/2018 – 31/12/2018

¹⁴ PM₁₀ annual mean limit value for the protection of human health: 40 µg/m³ applicable from 2005.

¹⁵ PM₁₀ daily limit for the protection of human health: No more than 35 days >50 µg/m³ applicable from 2005.

Table A8 Summary statistics for daily PM_{2.5} concentrations for Ireland in 2018¹⁶

	Ballyfermot	Rathmines	Phoenix Park	Finglas	Davitt Road	Marino	St. Johns Road	St. Annes Park	Ringsend	Heatherton Park	UCC Distillery Fields	Bray	Waterford Browne's Road	Ennis	Carlow Town	Longford	Cobh	Claremorris	Enniscorthy	Roscommon Town
µg/m ³	Zone A									Zone B		Zone C				Zone D				
Annual mean ¹⁷	7	9	6	8	8	6	9	7	8	8	9	6	9	10	8	9	10	6	13	9
Median	5	7	5	7	6	5	7	6	6	6	8	5	8	8	7	7	9	5	11	8
% data capture	29	99	40	88	24	90	18	32	58	28	89	86	9	87	19	94	13	100	43	32
Daily max	42	70	27	97	60	30	40	23	49	28	29	34	25	55	29	54	18	36	54	30

¹⁶ Carlow 16/09/2018 – 31/12/2018, Enniscorthy 18/06/2018 – 31/12/2018, Ringsend 01/06/2018 – 31/12/2018, St. John's Road 26/10/2018 – 31/12/2018, St. Anne's Park 05/09/2018 – 31/12/2018, Phoenix Park 03/08/2018 – 31/12/2018, Davitt Road 04/08/2018 – 31/12/2018, Ballyfermot 10/08/2018 – 31/12/2018, Heatherton Park 21/02/2018 – 31/12/2018, Cobh 15/11/2018 – 31/12/2018, Waterford Browne's Road 29/11/2018 – 31/12/2018

¹⁷ Annual mean limit value 25 µg/m³.

Table A9 Summary statistics for chemical composition of PM_{2.5} in 2019

Chemical Species	Claremorris, Co. Mayo
Annual Mean (ug/m ²) ¹⁸	Zone D
Elemental Carbon (Transmittance Correction) ¹⁹	0.15
Organic Carbon (Transmittance Correction)	1.06
Total Carbon	1.21
Chloride (Cl ⁻)	0.29
Nitrate (NO ₃ ⁻)	0.38
Sulphate (SO ₄ ²⁻)	0.25
Ammonium (NH ₄ ⁺)	0.25
Calcium (Ca ⁺)	0.02
Magnesium (Mg ²⁺)	0.03
Potassium (K ⁺)	0.03
Sodium (Na ⁺)	0.25
% data capture	100

¹⁸ There are no limit values for chemical composition of PM_{2.5}.

Table A10 Summary statistics for daily benzene concentrations in Ireland in 2018

	Rathmines	Kilkenny Seville Lodge
($\mu\text{g}/\text{m}^3$)	Zone A	Zone C
Annual mean ²⁰	0.3	0.16
Median	0.08	0.13
% data capture	92	81
Daily Max	4.40	0.98

Table A11 Summary statistics for daily ozone precursor VOCs concentrations at Rathmines in 2018

	Benzene	Toluene	Ethylbenzene	m- and p-Xylene	o-Xylene
($\mu\text{g}/\text{m}^3$)	Zone A				
Annual mean ²¹	0.3	0.59	0.06	0.27	0.15
Median	0.08	0.05	0.00	0.03	0.03
% data capture	92	92	92	92	92
Hourly max	4.40	5.59	2.86	4.60	6.76

²⁰ Annual mean limit value for benzene is $5\mu\text{g}/\text{m}^3$.

²¹ No limit values for toluene, ethylbenzene, m-and-p-xylene and o-xylene.

Table A12 Summary statistics for daily ozone precursor VOCs concentrations at Kilkenny in 2018

	Benzene	Toluene	Ethylbenzene	m- and p-Xylene	o-Xylene
($\mu\text{g}/\text{m}^3$)	Zone C				
Annual mean ²²	0.16	0.14	0.02	0.04	0.14
Median	0.13	0.08	0.00	0.00	0.00
% data capture	81	81	81	81	81
Hourly max	0.98	1.42	0.37	0.74	2.72

Table A 13 Summary statistics for daily ozone precursor VOCs concentrations at Longford in 2018

	Benzene	Toluene	Ethylbenzene	m- and p-Xylene	o-Xylene
($\mu\text{g}/\text{m}^3$)	Zone C				
Annual mean ²³	0.21	0.36	0.08	0.20	0.28
Median	0.10	0.21	0.04	0.12	0.07
% data capture	83	83	83	83	83
Hourly max	2.38	5.85	2.93	6.22	5.23

²² No limit values for toluene, ethylbenzene, m-and-p-xylene and o-xylene.

²³ No limit values for toluene, ethylbenzene, m-and-p-xylene and o-xylene.

Table A14 Summary statistics for monthly lead, arsenic, cadmium and nickel concentrations in Ireland in 2018

	Rathmines				Heatherton Park				Castlebar				Kilkitt			
	Zone A				Zone B				Zone D							
(ng/m ³)	Pb	As	Cd	Ni	Pb	As	Cd	Ni	Pb	As	Cd	Ni	Pb	As	Cd	Ni
Annual mean ²⁴	5.9	1.0	0.2	0.9	2.8	0.1	0.1	0.4	1.9	0.1	0.1	0.2	2.2	0.2	0.1	0.3
Median	5.53	0.9	0.2	0.7	1.9	0	0.1	0.4	1.0	0	0	0.2	1.8	0	0.1	0.3
% data capture	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Monthly average max	13.2	2.9	0.5	2.4	8.7	0.3	0.2	1.1	8.6	0.7	0.7	0.6	8.3	1.2	0.2	0.9

²⁴ Annual mean limit value for lead is 500 ng/m³. Target values for remaining heavy metals are applicable from 2013: arsenic 6ng/m³, cadmium 5ng/m³, nickel 20ng/m³.

Table A15 Summary statistics for monthly mercury concentrations in 2018

	Mace Head
(ng/m ³)	Zone D
Annual mean ²⁵	1.247
Median	1.246
% data capture	83
Monthly average max	1.368

²⁵ No limit values for mercury.

Table A16 Summary statistics for monthly metal deposition concentrations in 2018

Metal ²⁶	Rosemount, UCD	Shannon Estuary, Co. Limerick	Valentia, Co. Kerry
	Zone A	Zone D	
Arsenic *	0.53	0.37	0.19
Cadmium *	0.70	0.59	0.36
Nickel *	0.00	0.62	0.36
Lead *	0.00	0.60	0.75
Mercury *	0.00	0.01	0.00
Aluminium	94.94	24.83	6.85
Chromium	0.43	0.68	0.43
Cobalt	0.43	0.59	0.36
Copper	3.62	0.81	12.67
Manganese	32.78	3.15	2.16
Antimony	2.36	0.59	0.06
Thallium	0.05	0.25	0.04
Vanadium	0.72	0.59	0.37
Zinc	12.69	3.89	38.14
Barium	3.15	0.66	0.52
Uranium	0.43	1.02	0.36
% data capture	66	100	100

²⁶ The metals marked * require monitoring under the legislation. The remainder are reported for information purposes.

²⁷ There are no limit values for metal deposition.

Table A17 Summary statistics for monthly PAH concentrations in 2018

Polycyclic Aromatic Hydrocarbon	Rathmines	Heatherton Park	Kilkitt	Castlebar
Annual Mean (ng/m ³)	Zone A	Zone B	Zone D	Zone D
Benzo[a]Pyrene ²⁸	0.31	0.21	0.08	0.21
Naphthalene	0.05	0.05	0.06	0.05
Acenaphthylene	0.03	0.01	0.01	0.01
Acenaphthene	0.02	0.01	0.02	0.01
Fluorene	0.07	0.05	0.05	0.05
Phenanthrene	0.08	0.05	0.04	0.05
Anthracene	0.03	0.02	0.02	0.02
Fluoranthene	0.11	0.08	0.06	0.08
Pyrene	0.11	0.07	0.06	0.07
Chrysene	0.15	0.09	0.07	0.09
Benz[a]Anthracene	0.14	0.10	0.06	0.10
Benzo[b+k+j]Fluoranthene	0.52	0.35	0.14	0.35
Benzo[g,h,i]Perylene	0.47	0.25	0.13	0.25
Dibenzo[a,h]Anthracene	0.24	0.19	0.11	0.19
Indeno[1,2,3-c,d]Pyrene	0.52	0.37	0.13	0.37
% data capture	100	100	100	100

²⁸ Annual mean limit value for benzo(a)pyrene is 1ng/m³. There are no limit values for any other PAH.

Table A18 Summary statistics for monthly PAH deposition concentrations in 2018

Polycyclic Aromatic Hydrocarbon	Rosemount, UCD	Shannon Estuary, Co. Limerick
Annual Mean (ng/m ² /day) ²⁹	Zone A	Zone D
Benzo(a)Pyrene	7.4	3.4
Benz[a]Anthracene	10.7	11.6
Benzo(b)Fluoranthene	0.8	1.1
Benzo(k)Fluoranthene	0.8	1.1
Dibenzo(a,h)Anthracene	4.1	5.7
Indeno(1,2,3-c,d)Pyrene	4.1	5.7
% data capture	66	100

²⁹ There are no limit values for metal deposition.

Table A19 Milk fat related PCDD/F and PCB-TEQ values determined in the background samples A1 - A25

Sample	Milk supply area	Dioxins	PCBs	Dioxins & PCBs Total
		<i>pg/g milk fat</i>	<i>pg/g milk fat</i>	<i>pg/g milk fat</i>
A1	Mitchelstown Area	0.17	0.26	0.43
A2	Co. Waterford	0.17	0.26	0.43
A3	Dublin South.Co./North Wicklow Area	0.18	0.28	0.46
A4	North Co. Wexford	0.18	0.29	0.47
A5	Charleville, Co Cork Area	0.19	0.27	0.46
A6	Ballyragget, Co Kilkenny Area	0.17	0.25	0.42
A7	Renmore, Co Galway Area	0.16	0.23	0.39
A8	Moate, Co Westmeath Area	0.16	0.23	0.39
A9	Tipperary Town/Thurles Areas	0.18	0.28	0.46
A10	Nenagh, Co. Tipperary Area	0.17	0.25	0.42
A11	Cavan/Longford/Leitrim	0.18	0.27	0.45
A12	Drinagh, Co Cork	0.2	0.29	0.49
A13	Bandon Area	0.17	0.27	0.44
A14	North Kerry Area	0.29	0.37	0.66
A15	Co Sligo	0.16	0.22	0.38
A16	Roscommon/East Galway	0.16	0.22	0.38
A18	Roscommon/Leitrim	0.16	0.23	0.39
A19	Co Monaghan	0.18	0.31	0.49
A20	Co Louth	0.22	0.39	0.61
A21	North Kildare/West Dublin	0.17	0.28	0.45
A22	So Kerry (Cahirciveen area)	0.23	0.31	0.54
A23	South Wexford	0.21	0.36	0.57
A24	SE Co. Mayo	0.16	0.24	0.4
A25	Co. Donegal	0.18	0.29	0.47

Table A20 Milk fat related PCDD/F and PCB-TEQ values determined in the potential impact samples B1 - B19

Sample	Milk supply area	Dioxins	PCBs	Dioxins & PCBs Total
		WHO-TEQ incl. LOQ	WHO-TEQ incl. LOQ	WHO-TEQ incl. LOQ
		pg/g milk fat	pg/g milk fat	pg/g milk fat
B1	Carrigtwohill/Cobh/Great Island	0.42	0.55	0.97
B2	Aghada/East Cork Harbour	0.29	0.38	0.67
B3	Askeaton area	0.23	0.31	0.54
B4	Tarbert Co. Kerry	0.18	0.27	0.45
B5	Clarecastle, Co.Clare	0.49	0.58	1.07
B6	Cooraclare Co.Clare	0.21	0.27	0.48
B7	Ballydine, So. Tipperary	0.21	0.32	0.53
B8	Swords/Mulhuddart. Co.Dublin	0.2	0.33	0.53
B9	Grannagh, So.Kilkenny	0.2	0.32	0.52
B13	Kinsale (Dunderow, Co.Cork	0.23	0.34	0.57
B14	Ringaskiddy area, Co.Cork	0.17	0.28	0.45
B15	Crossakiel (nr Kells) Co.Meath	0.16	0.48	0.64
B17	Carranstown, Co.Meath	0.17	0.33	0.5
B18	Kinnegad, Co Westmeath	0.17	0.3	0.47
B19	Mungret, Co Limerick	0.16	0.26	0.42