2021 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

June 2021

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Executive Summary: Air Quality in Our Area

Air Quality in Broadland and South Norfolk

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children, the elderly, and those with existing heart and lung conditions. There is also often a strong correlation with equalities issues because areas with poor air quality are also often less affluent areas[1,2].

The mortality burden of air pollution within the UK is equivalent to 28,000 to 36,000 deaths at typical ages[3], with a total estimated healthcare cost to the NHS and social care of £157 million in 2017[4].

Generally the air quality in both South Norfolk and Broadland is good with no recorded exceedance of air quality objectives. The main pollutant of concern is nitrogen dioxide (NO_2) primarily arising from road traffic. – particularly in the suburb areas surrounding Norwich and in our market towns.

Neither district has any designated Air Quality Management Areas (AQMAs).

Monitoring for NO_2 by diffusion tube takes place at 30 locations in South Norfolk and 29 in Broadland.

We work closely with colleagues in Public Health and the Norfolk Environmental Protection Air Quality sub group. We consider the impact of existing local industrial processes. We also consider new developments to ensure that local air quality is protected and monitored via the planning process.

A detailed assessment is not required for any pollutants and the Council will progress to the next Annual Status report for 2021.

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[1] Public Health England. Air Quality: A Briefing for Directors of Public Health, 2017

[2] Defra. Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

[3] Defra. Air quality appraisal: damage cost guidance, July 2020

[4] Public Health England. Estimation of costs to the NHS and social care due to the health impacts of air pollution: summary report, May 2018

Actions to Improve Air Quality

Whilst air quality has improved significantly in recent decades, and will continue to improve due to national policy decisions, there are some areas where local action is needed to improve air quality further.

The 2019 Clean Air Strategy[5] sets out the case for action, with goals even more ambitious than EU requirements to reduce exposure to harmful pollutants. The Road to Zero[6] sets out the approach to reduce exhaust emissions from road transport through a number of mechanisms; this is extremely important given that the majority of Air Quality Management Areas (AQMAs) are designated due to elevated concentrations heavily influenced by transport emissions.

The councils consider the impact of existing local industrial processes through the LAPPC and LA-IPPC regimes and also consider new developments to ensure that local air quality is considered in the planning process.

The staff also seek to support grant applications from Norfolk County Council for projects that could improve air quality. While these grant applications are mainly focused on Norwich City the proposals may yield improvements within our districts, for example through improved public transport.

Work outside of our statutory duties has been unfortunately been hampered this reporting year due to the Covid-19 pandemic

Conclusions and Priorities

All of our results for both authorities are below the air quality objectives as such a detailed assessment is not required for any pollutants and the Council will progress to the next Annual Status report for 2021.

The levels are reduced significantly compared to previous years, this is due to the reduced vehicle usage as a result of the Covid-19 pandemic. As such this data should be treated with caution.

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[5] Defra. Clean Air Strategy, 2019

[6] DfT. The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy, July 2018

The location of air quality monitoring points is continually being reviewed and tubes will be relocated as appropriate. In addition, further monitoring points will be added if required.

We aim to undertake some proactive education work focussing on burning wood as a secondary heating source over the next 12 months.

Air Quality is also identified in our Council's Environmental Strategies with the following actions identified:

- Proactive work with our partners and other stakeholders aiming to achieve a positive change to air quality, this could include, working with universities, bus, coach and taxi companies, haulage companies, schools and car sharing clubs.
- Raise awareness of air quality amongst our local businesses and residents.
- Pre-planning application support in more applications.
- Develop supplementary planning documents for air quality.

Local Engagement and How to get Involved

For further information on air quality please contact us at:

Environ.protection@broadland.gov.uk or envserv@s-norfolk.gov.uk

If the public would like to find out more about air quality in general there are a number of resources available. These include:

https://uk-air.defra.gov.uk/ (UK government air quality))

www.airqualityengland.co.uk (A quick reference to air quality information for a variety of local authority areas across England)

www.metoffice.gov.uk/guide/weather/air-quality (Met Office air quality web page)

People can help improve air quality by:

- Walking and cycling instead of driving where possible,
- If using a car don't leave the engine running in queues or while waiting for someone.
- Looking for sustainable home energy suppliers who don't use fossil fuel.
- Avoiding burning at home
- Planting more trees and greenery

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1 Local Air Quality Management

This report provides an overview of air quality in Broadland and South Norfolk during 2020. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Broadland and South Norfolk District Councils to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England are presented in Table E.1.

2 Actions to Improve Air Quality

Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority should prepare an Air Quality Action Plan (AQAP) within 12 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

Broadland and South Norfolk District Councils currently do not have any declared AQMAs. For reference, maps of the Broadland and South Norfolk Council monitoring locations are available in Appendix D.

2.1 Progress and Impact of Measures to address Air Quality in Broadland and South Norfolk

Defra's appraisal of last year's ASR concluded:

"On the basis of the evidence provided by the local authority the conclusions reached are acceptable for all sources and pollutants, with the provisos listed in the commentary below. The Council should continue to implement their air quality strategy and continue monitoring. Following the completion of this report, Broadlands and South Norfolk District Council should submit an Annual Status Report in 2021.

Commentary

The report is well structured, detailed, and provides the information specified in the Guidance. The following comments are designed to help inform future reports.

1. The Council have provided a very detailed ASR, with pollutant trends, measures and activity within Broadlands and South Norfolk discussed extensively. In particular the Council's discussion of NO_2 concentrations within their area is to be commended. Not only are trends discussed but the Council attempt to find potential causes for the changes in NO_2 concentrations. This demonstrates the Council's active engagement in trying to understand and tackle air quality issues within their city. The level of detail provided within the ASR is welcomed, and the Council are encouraged to continue their good work in future ASRs.
2. Though there is no formal requirement for the Council to produce a list of air quality measures, due to the absence of an AQMA, the Council are still actively implementing air quality measures within their area. In addition to this the Council also provide updates on the progress of these measures as well as providing a discussion of challenges and barriers they anticipate facing with respects to the implementation of their measures. It is encouraging to see that the Council are taking such an active role in tackling air quality.
3. It is very encouraging to see that the Council have continued to review and update the locations of their monitoring sites; adding a further 5 tubes in the last reporting year. In addition to this the Council have stated that they will implement

further monitoring in response to the increasing NO_2 concentrations seen in areas throughout the district. This is commended and demonstrates the Council's active engagement to understanding and tackling air quality issues within their jurisdiction. The Council are encouraged to continue to review their monitoring network and make amendments where they deem appropriate.

4. The Council are commended on the inclusion of graphs that focus on the comparison of 2018 and 2019 NO_2 concentrations. This is seldom seen in other ASRs and the inclusion of this graph is welcomed and it provides a quick and easy comparison on how NO_2 concentrations have changed since the last reporting year.
5. The Council have a number of measures in place to address $PM_{2.5}$ which demonstrates their commitment to working with Public Health England to address this pollutant. It would be useful if the Council could make reference to the Public Health Outcomes Framework and their relevant local indicator for $PM_{2.5}$ in this section of the report. "

Progress on the following measures has been slower than expected due to the measures put in place to combat the spread of COVID-19.

Table 2.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Classification	Year Measure Introduced	Estimated / Actual Completion Year	Organisations Involved	Funding Source	Defra AQ Grant Funding	Funding Status	Estimated Cost of Measure	Measure Status	Reduction in Pollutant / Emission from Measure	Key Performance Indicator	Progress to Date	Comments / Barriers to Implementation
1	Energy Efficiency of New Build Properties	Policy Guidance and Development Control	Air Quality Planning and Policy Guidance	2005	-	Property Developers	Property Developers				On going	N/A	Reduction of energy bills and energy use	Implemented	Reduction of energy bills and energy use
2	Energy efficiency information for residents	Public Information	Via leaflets	2001	-	Broadland and South Norfolk DC's	Broadland and South Norfolk DC's				On going	N/A	Reducing emissions and energy use	Providing information when requested	Reducing emissions and energy use
3	authority for the E.C.O (Energy Company Obligation) scheme	Public Information	Other	2013	-	Broadland and South Norfolk DC's and All L.A's	Broadland and South Norfolk DC's and All L.A's		-		On going	N/A	Reducing emissions and energy use	Providing information when requested	Reducing emissions and energy use
4	Health Improvement Grants	Other	Other	2018	-	Broadland and South Norfolk DC's	Broadland and South Norfolk DC's				On going	N/A	Reducing emissions and energy use and improving residents health and well being	On going	Reducing emissions and energy use and improving resident's health and well being
5	Warm Homes Fund	Other	Other	2018	-	Broadland District Council and some housing associations	Broadland District Council and some housing associations				On going	N/A	Reducing emissions and energy use and improving residents health and well being	Planning	Reducing emissions and energy use and improving residents health and well being
6	Greater Norwich Air Quality Working Group	Other	Other	2018	-	Broadland District Council, South Norfolk Council, Norwich City Council, Norfolk County Council	Broadland District Council, South Norfolk Council, Norwich City Council, Norfolk County Council				On going	N/A	Collaborative working to improve air quality within the Greater Norwich Area through various projects and initiavtives	Planning	Collaborative working to improve air quality within the Greater Norwich Area through various projects and initiatives
7	Construction of the remaining section of the Norwich Northern Distributor	Traffic Management	Strategic highway improvements, Re-prioritising road space away from cars, including Access	2018	-	Norfolk County Council	Norfolk County Council				On going	N/A	Individual up take	Planning	Re-routing traffic from Norwich outer ring-road and join Norwich Southern by-pass to key routes north of Norwich
8	Community Rail Partnerships	Promoting Travel Alternatives	Promote use of rail and inland waterways	1997	-	Norfolk Community Rail Partnership	Norfolk Community Rail Partnership, Local Rail Operator				On going	N/A	Individual up take	On going	Reducing emissions and congestion
9	Norfolk Bus Charter	Promoting Alternatives to private vehicle use	Low Emissions Strategy	2018	-	Norfolk County Council	Norfolk County Council				On going	N/A	Collaborative working to improve air quality within the Greater Norwich Area through various projects and initiatives	On going	Reducing emissions and congestion, promoting healthier living

$PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Broadland and South Norfolk District Councils are taking the following measures to address $PM_{2.5}$:

- The Councils continue to ensure regular two-way engagement with representatives of Public Health England, and the Director of Public Health at Norfolk County Council.
- The Councils are building stronger working relationships with Public Health England including encouraging active travel (walking, cycling) to reduce local vehicle use.
- We work with local industrial processes as part of our duties under the Integrated Pollution Prevention and Control Regulations to ensure local air quality is safeguarded.
- We review planning applications for new developments to ensure local air quality is considered via the planning regime.

Although there is no legal requirement for Local Authorities to monitor for $PM_{2.5}$ Broadland District Council and South Norfolk District Council have both referred to the DEFRA background concentration data to consider $PM_{2.5}$ levels across the districts. The data has been used to assess if the background concentrations are above the EU threshold. The next step will be to determine whether there is a need to carry out monitoring for $PM_{2.5}$.

There is currently no threshold value for $PM_{2.5}$ in England. The EU directive from which the English Air Quality Regulations are derived gives a threshold of 25ug/m^3 as an annual mean. The background review has not identified any locations where the background concentrations exceed the EU threshold. The Environment Bill is currently passing through Parliament. Air quality is an important part of this bill and a national threshold for $PM_{2.5}$ may be introduced if the Bill is passed.

The Broadland Northway has meant changes in traffic flow in and around the north of Norwich and the urban fringe areas, which form part of the Broadland District Council area. Traffic studies are undertaken by Norfolk County Council and Broadland District Council will review these and the findings to look at whether this may impact local air quality. There continue to be fluctuations in traffic flow along the main routes from the Broadland Northway towards Norwich as drivers find the best route for their journeys or as a consequence of road works and road closures.

Similarly local fluctuations in traffic flow within South Norfolk district may also impact air quality in local areas, and a review of traffic flow levels will also be undertaken to see

where traffic level changes are occurring. This may help to better understand the reason for measured changes in local air quality.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

This section sets out the monitoring undertaken within 2020 by Broadland and South Norfolk District Councils and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2016 and 2020 to allow monitoring trends to be identified and discussed.

Summary of Monitoring Undertaken

3.1.1 Non-Automatic Monitoring Sites

Broadland and South Norfolk District Councils undertook non- automatic (i.e. passive) monitoring of NO_2 at 60 sites (30 in Broadland and 30 in South Norfolk) during 2020. Table A.2 in Appendix A presents the details of the non-automatic sites.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on Quality Assurance/Quality Control (QA/QC) for the diffusion tubes, including bias adjustments and any other adjustments applied (e.g. annualisation and/or distance correction), are included in Appendix C.

Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, annualisation (where the annual mean data capture is below 75% and greater than 25%), and distance correction. Further details on adjustments are provided in Appendix C.

3.1.2 Nitrogen Dioxide (NO_2)

Error! Reference source not found. and Table A. in Appendix A compare the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40µg/m^3. Note that the concentration data presented represents the concentration at the location of the monitoring site, following the application of bias adjustment and annualisation, as required (i.e. the values are exclusive of any consideration to fall-off with distance adjustment).

For diffusion tubes, the full 2020 dataset of monthly mean values is provided in Appendix B. Note that the concentration data presented in Table B.1 includes distance corrected values, only where relevant.

Error! Reference source not found. in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past five years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

There are no exceedances of the air quality objectives.

Appendix A: Monitoring Results

Table A.1 – Details of Non-Automatic Monitoring Sites – South Norfolk

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT1	1- 46a OLD NEWMARKET RD,CRING	Suburban	619245	305653	NO2	No	1.0	12.0	No	1.5
DT2	2- 131 LONGWATER LANE,COSTESSEY	Suburban	616934	310462	NO2	No	1.0	23.0	No	1.5
DT3	3- 90 THE STREET,PORINGLAND	Suburban	626790	302088	NO2	No	1.0	9.0	No	1.5
DT4	4-87 DENMARK ST,DISS	Suburban	611943	279567	NO2	No	1.0	2.0	No	1.5
DT5	5-131 VICTORIA RD,DISS	Suburban	636210	298771	NO2	No	1.0	3.0	No	1.8
DT6	6-21 CHURCH PLAIN, LODDON	Suburban	619725	292748	NO2	No	3.0	2.0	No	1.5
DT7	7- A140 LONG STRATTON	Roadside	611100	301436	NO2	No	1.0	1.0	No	2.1
DT8	8- FAIRLAND ST,WYMONDHAM	Kerbside	625438	306163	NO2	No	26.0	1.0	No	2.1
DT9	9- KIRBY BEDON ROAD, BIXLEY	Kerbside	612514	302653	NO2	No	1.0	23.0	No	2.1
DT10	10- 209 NORWICH RD,WYMONDHAM	Suburban	618138	305619	NO2	No	1.0	22.0	No	1.5

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) [1]	Distance to kerb of nearest road (m) [2]	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT11	11- 2 THICKTHORN COTTAGES	Rural	611529	300995	NO2	No	13.0	1.0	No	1.5
DT12	12- RIGHTUP LANE,WYMONDHAM	Suburban	612704	302788	NO2	No	1.0	19.0	No	2.1
DT13	13-233 NORWICH RD,WYMONDHAM	Suburban	611367	301622	NO2	No	1.0	6.0	No	1.5
DT14	14- 28 NORWICH RD,WYMONDHAM	Suburban	624476	283267	NO2	No	1.0	3.0	No	1.5
DT15	15- HARLESTON (HOTEL)	Roadside	614902	278861	NO2	No	17.0	1.0	No	2.1
DT16	16- DISS ROAD,SCOLE	Roadside	616984	311560	NO2	No	18.0	1.0	No	1.8
DT17	17-LONGWATER LANE (NEAR TO SCHOOL)	Roadside	619714	292717	NO2	No	2.0	1.0	No	2.1
DT18	18- LS CHINESE	Roadside	619731	292745	NO2	No	2.0	1.0	No	2.1
DT19	19- LS TRAFFIC LIGHT EAST	Roadside	619643	292348	NO2	No	1.0	8.0	No	2.1
DT20	20- LS FUNERAL DIRECTORS	Suburban	619685	292629	NO2	No	1.0	2.0	No	1.5
DT21	21- LS SOUTHBOUND 60 MTRS	Suburban	619711	292720	NO2	No	3.0	1.0	No	1.5
DT22	22- LS SWAN LANE CO-OP CHEM	Roadside	618991	309891	NO2	No	1.0	15.0	No	2.1
DT23	23- 3 NORWICH ROAD,COSTESSEY	Suburban	611325	301191	NO2	No	1.0	8.0	No	2.1

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
DT24	24- 14 STATION RD,WYMONDHAM	Suburban	619821	293028	NO2	No	8.0	1.0	No	2.1
DT25	25- BUS STOP,NWH RD, STRATTON	Roadside	619772	305851	NO2	No	18.0	1.0	No	2.1
DT26	26- NEWMARKET ROAD,CRINGLEFORD	Roadside	616852	310342	NO2	No	1.0	20.0	No	1.5
DT27	27-THE ROUND HOUSE, COSTESSEY	Roadside	617170	311659	NO2	No	1.0	2.0	No	1.5
DT28	28- 10 WEST END,COSTESSEY	Suburban	624633	283505	NO2	No	1.0	1.0	No	1.5
DT29	29- 25 BROAD ST,HARLESTON	Suburban	611785	279593	NO2	No	1.0	7.0	No	1.5
DT30	30 - Morrisons/Parsons Diss	Roadside	611779	279590	NO2	No			No	1.5

Table A.2 – Details of Non-Automatic Monitoring Sites - Broadland

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
BN4	BN4 Hillside Avenue, Thorpe St Andrew	Suburban	626918	308740	NO2	No	11.0	1.0	No	3.0
BN6	BN6 Breck Road, Sprowston	Suburban	626317	311012	NO2	No	1.0	4.0	No	2.5
BN7	BN7 17 Heath Crescent, Hellsdon	Suburban	621539	312527	NO2	No	1.0	9.0	No	1.5
BN8	BN8 2 Hansell Road, Thorpe St Andrew	Kerbside	627029	309868	NO2	No	1.0	7.0	No	2.0
BN10	BN10 Yarmouth Road, Thorpe St Andrew	Roadside	625369	308438	NO2	No	13.0	1.0	No	3.0
BN11	BN11 Reepham Road, Hellsdon	Suburban	621651	311632	NO2	No	3.0	4.0	No	2.0
BN12	BN12 10 Boundary Road, Hellsdon	Suburban	621698	311569	NO2	No	1.0	6.0	No	2.0
BN13	BN13 214 Milecross Lane, Hellsdon	Suburban	621814	311648	NO2	No	1.0	1.0	No	2.0
BN15	BN15 Norwich Road, Wroxham Library Wroxham	Roadside	630114	318015	NO2	No	16.0	2.0	No	2.0
BN18	BN18 Middletons Lane, Hellsdon	Roadside	620186	311834	NO2	No	4.0	1.0	No	3.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
BN19	BN19 187 Yarmouth Road/Pound Lane, Thorpe St Andrew	Suburban	627490	308775	NO2	No	1.0	6.0	No	2.0
BN20	BN20 The Street, Acle	Kerbside	640166	310354	NO2	No	1.0	1.0	No	3.0
BN21	BN21 Plumstead Road, Thorpe End	Roadside	627743	310905	NO2	No	21.0	1.0	No	2.0
BN22	BN22 Wroxham Road, Sprowston	Suburban	624065	311161	NO2	No	35.0	1.0	No	3.0
BN24	BN24 127 Fifers Lane, Hellsdon	Suburban	621465	312666	NO2	No	15.0	1.0	No	1.5
BN25	BN25 Market Place, Aylsham	Kerbside	619321	326913	NO2	No	1.0	8.0	No	1.5
BN26	BN26 172 Plumstead Road East	Suburban	626308	310096	NO2	No	1.0	19.0	No	1.5
BN27	BN27 300 Wroxam Road, Sprowston	Suburban	625504	312473	NO2	No	1.0	18.0	No	3.0
BN28	BN28 73 Holt Road, Hellsdon	Suburban	621212	312970	NO2	No	1.0	21.0	No	1.5
BN29	BN29 27 High Street, Cawston	Roadside	613459	323916	NO2	No	1.0	1.0	No	2.5
BN30	BN30 Salhouse Road, Sprowston	Roadside	626171	311059	NO2	No	13.0	1.0	No	3.0

Diffusion Tube ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube Co-located with a Continuous Analyser?	Tube Height (m)
BN31	BN31 Chartwell Road, Old Catton	Roadside	623069	311327	NO2	No	8.0	1.0	No	2.0
BN32	BN32 Longfields Road, Thorpe St Andrew	Roadside	627038	309912	NO2	No	7.0	1.0	No	2.0
BN33	BN33 Beighton White House, Beighton	Roadside	637749	309865	NO2	No	21.0	2.0	No	2.0
BN34	BN34 Cromer Road, Hellsdon	Kerbside	621713	311699	NO2	No	6.0	1.0	No	2.0
BN35	BN35 373 Drayton High Road, Hellsdon	Suburban	620205	311723	NO2	No	1.0	8.0	No	2.0
BN36	BN36 Norwch Road, Wroxham	Kerbside	629892	317484	NO2	No	16.0	1.0	No	2.0
BN37	BN37 Vane Close, Thorpe St Andrew	Roadside	627597	309179	NO2	No	5.0	1.0	No	2.0
BN38	BN38 60 HOLT ROAD, HORSFORD	Kerbside	619440	315702	NO2	No	5.0	1.0	No	2.0

Table A.3– Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3) – South Norfolk

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
DT1	619245	305653	Suburban	94.23076923	94.2	20.2	21.2	19.7	19.9	14.0
DT2	616934	310462	Suburban	94.23076923	94.2	21.2	21.6	20.1	19.1	13.9
DT3	626790	302088	Suburban	94.23076923	94.2	19.3	20.0	18.6	18.2	12.6
DT4	611943	279567	Suburban	94.23076923	94.2	29.2	26.7	24.8	21.5	18.7
DT5	636210	298771	Suburban	94.23076923	94.2	30.0	28.2	26.2	26.9	19.5
DT6	619725	292748	Suburban	94.23076923	94.2	13.5	20.2	18.8	19.8	13.2
DT7	611100	301436	Roadside	94.23076923	94.2	33.5	37.2	34.6	35.3	24.6
DT8	625438	306163	Kerbside	94.23076923	94.2	23.3	22.0	20.5	22.9	15.3
DT9	612514	302653	Kerbside	94.23076923	94.2	25.4	24.9	23.2	23.9	17.1
DT10	618138	305619	Suburban	94.23076923	94.2	18.0	16.5	15.3	15.7	10.3
DT11	611529	300995	Rural	94.23076923	94.2	15.8	14.9	13.9	15.0	10.3
DT12	612704	302788	Suburban	94.23076923	94.2	21.9	21.2	19.7	22.7	17.2
DT13	611367	301622	Suburban	94.23076923	94.2	15.9	16.1	15.0	14.2	10.2

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2020 (%) [2]	2016	2017	2018	2019	2020
DT14	624476	283267	Suburban	94.23076923	94.2	17.0	16.2	15.1	15.9	11.9
DT15	614902	278861	Roadside	94.23076923	94.2	27.6	26.2	24.4	29.8	19.8
DT16	616984	311560	Roadside	94.23076923	94.2	21.4	26.2	24.4	20.5	14.0
DT17	619714	292717	Roadside	94.23076923	94.2					21.7
DT18	619731	292745	Roadside	94.23076923	94.2	29.8	26.6	24.7	25.3	18.0
DT19	619643	292348	Roadside	94.23076923	94.2	36.9	34.3	31.9	38.4	23.3
DT20	619685	292629	Suburban	94.23076923	94.2	32.9	31.0	28.8	26.7	19.6
DT21	619711	292720	Suburban	94.23076923	94.2	31.1	28.5	26.5	27.9	21.1
DT22	618991	309891	Roadside	94.23076923	94.2	25.2	20.5	19.1	20.8	15.0
DT23	611325	301191	Suburban	94.23076923	94.2	16.7	15.6	14.5	15.2	10.8
DT24	619821	293028	Suburban	94.23076923	94.2	17.4	16.1	15.0	16.8	11.1
DT25	619772	305851	Roadside	94.23076923	94.2	30.1	29.0	27.0	28.1	19.8
DT26	616852	310342	Roadside	94.23076923	94.2	25.5	24.1	22.4	20.7	14.0
DT27	617170	311659	Roadside	94.23076923	94.2	28.4	25.4	23.6	16.2	10.5

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
DT28	624633	283505	Suburban	94.23076923	94.2					10.1
DT29	611785	279593	Suburban	86.81318681	86.8	27.8	24.2	22.5	35.1	21.8
DT30	611779	279590	Roadside	78.84615385	78.8					15.8

Table A.4– Annual Mean NO_2 Monitoring Results: Non-Automatic Monitoring (µg/m^3) – Broadland

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
BN4	626918	308740	Suburban	92.03296703	92.0	14.9	13.6	14.3	12.9	9.4
BN6	626317	311012	Suburban	92.03296703	92.0	12.5	13.5	13.6	14.4	8.6
BN7	621539	312527	Suburban	92.03296703	92.0	14.0	15.5	14.2	13.5	8.9
BN8	627029	309868	Kerbside	92.03296703	92.0	12.8	14.4	13.4	12.1	8.0
BN10	625369	308438	Roadside	85.71428571	85.7	20.0	19.8	18.7	21.4	16.5
BN11	621651	311632	Suburban	92.03296703	92.0	32.0	34.0	29.6	28.0	21.0
BN12	621698	311569	Suburban	92.03296703	92.0	30.5	30.0	29.4	29.6	19.7
BN13	621814	311648	Suburban	92.03296703	92.0	24.8	23.4	22.8	24.0	15.8

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) [1]	Valid Data Capture 2020 (%) [2]	2016	2017	2018	2019	2020
BN15	630114	318015	Roadside	92.03296703	92.0	17.4	15.6	22.0	22.0	14.3
BN18	620186	311834	Roadside	84.61538462	84.6		18.1	26.0	23.8	12.4
BN19	627490	308775	Suburban	92.03296703	92.0		31.8	27.2	26.3	16.7
BN20	640166	310354	Kerbside	92.03296703	92.0			22.5	21.1	15.5
BN21	627743	310905	Roadside	92.03296703	92.0			18.7	18.2	10.2
BN22	624065	311161	Suburban	92.03296703	92.0			31.7	32.4	21.7
BN24	621465	312666	Suburban	92.03296703	92.0			18.1	18.7	12.2
BN25	619321	326913	Kerbside	92.03296703	92.0			21.7	16.8	9.6
BN26	626308	310096	Suburban	92.03296703	92.0				15.1	10.8
BN27	625504	312473	Suburban	92.03296703	92.0				24.4	19.5
BN28	621212	312970	Suburban	92.03296703	92.0				16.2	9.5
BN29	613459	323916	Roadside	92.03296703	92.0				17.1	12.5
BN30	626171	311059	Roadside	82.69230769	82.7				22.9	15.2
BN31	623069	311327	Roadside	92.03296703	92.0					24.0

Diffusion Tube ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2020 (%) (2)	2016	2017	2018	2019	2020
BN32	627038	309912	Roadside	84.61538462	84.6					8.8
BN33	637749	309865	Roadside	84.61538462	84.6					14.7
BN34	621713	311699	Kerbside	84.61538462	84.6					25.4
BN35	620205	311723	Suburban	84.61538462	84.6					14.3
BN36	629892	317484	Kerbside	84.61538462	84.6					17.8
BN37	627597	309179	Roadside	84.61538462	84.6					10.0
BN38	619440	315702	Kerbside	78.2967033	78.3					13.0

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16**

☒ **Diffusion tube data has been bias adjusted.**

☒ **Reported concentrations are those at the location of the monitoring site (bias adjusted and annualised, as required), i.e. prior to any fall-off with distance correction**

Notes:

The annual mean concentrations are presented as µg/m^3.

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

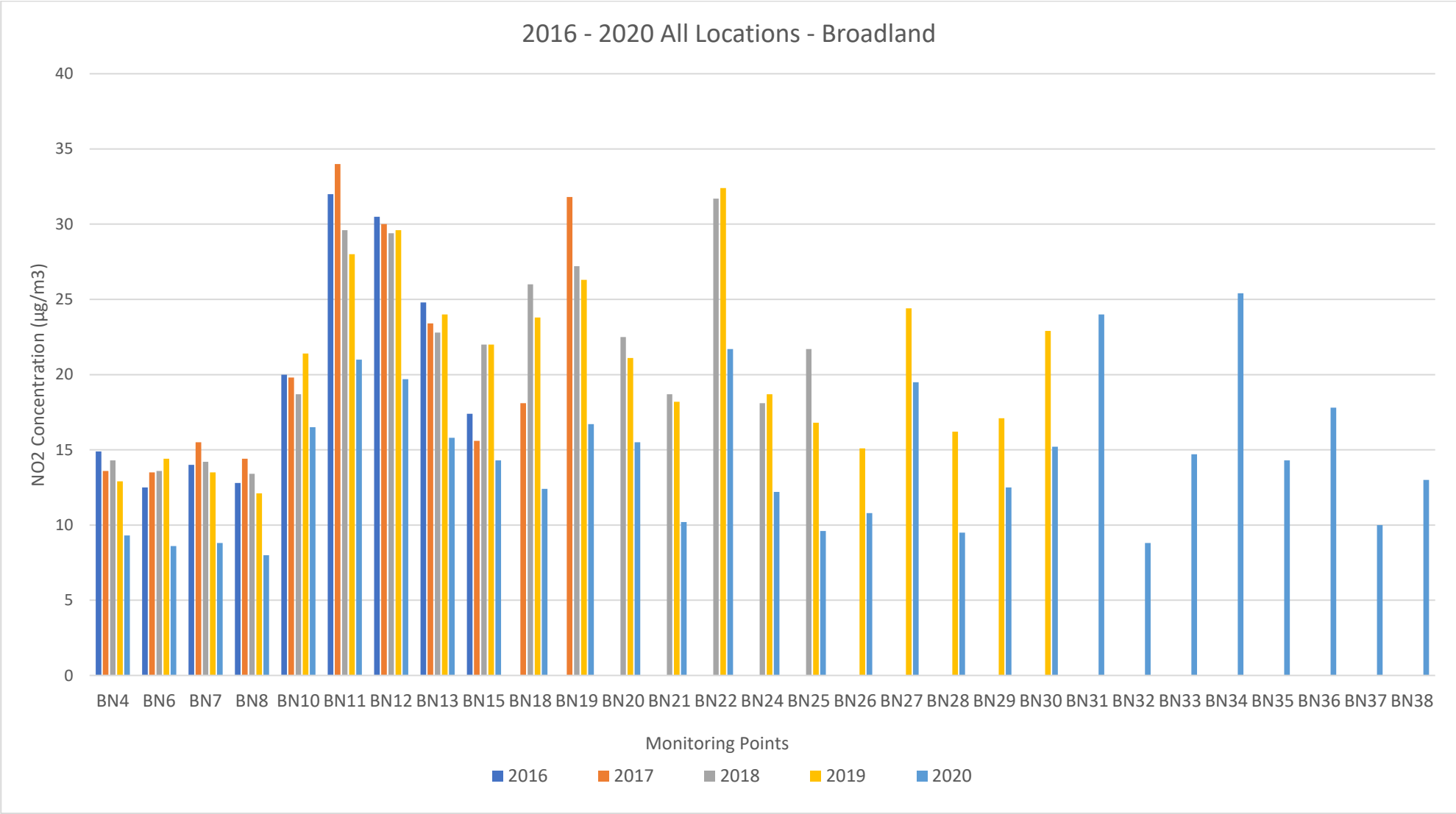
Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

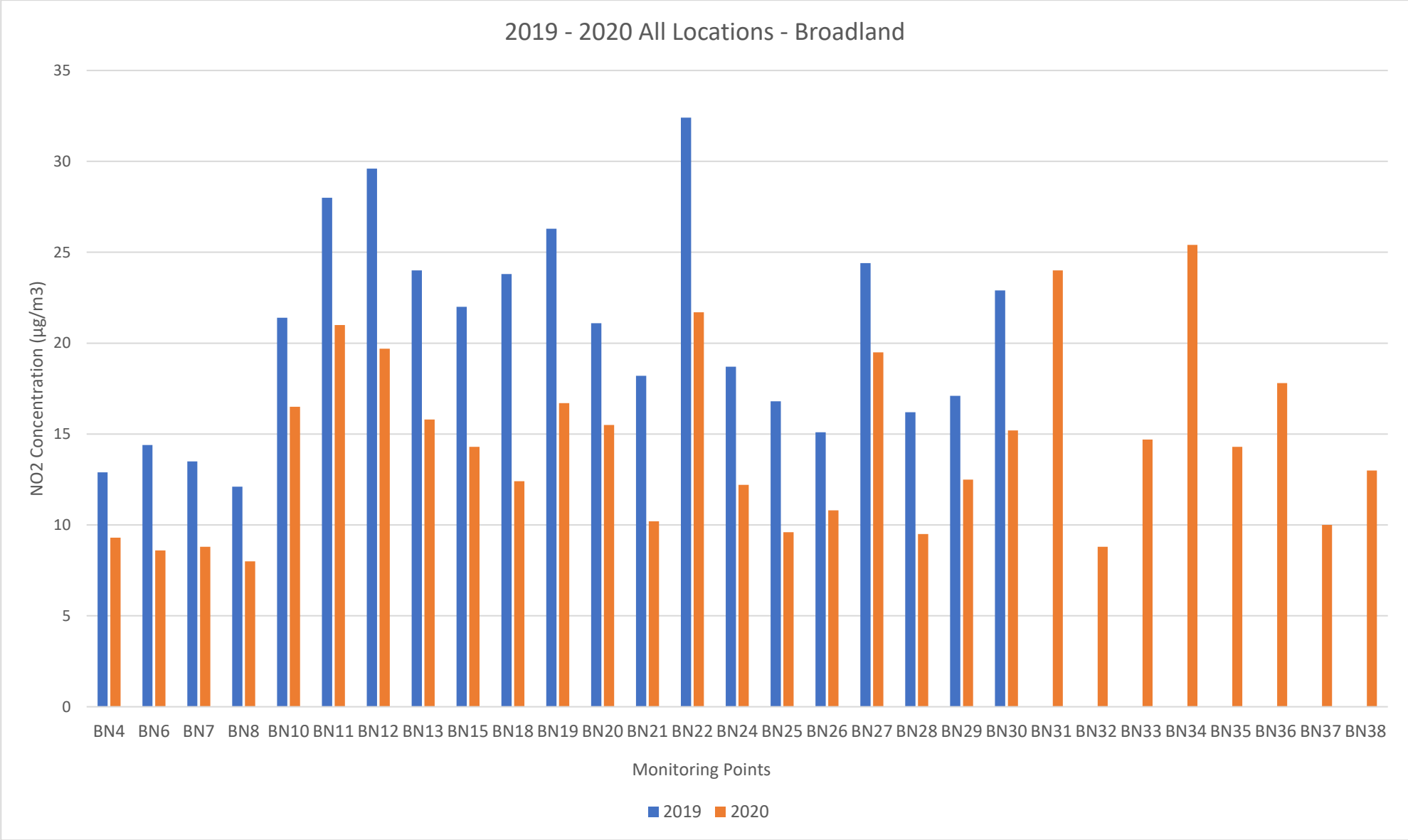
(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

Figure A.1 – Trends in Annual Mean NO_2 Concentrations - Broadland

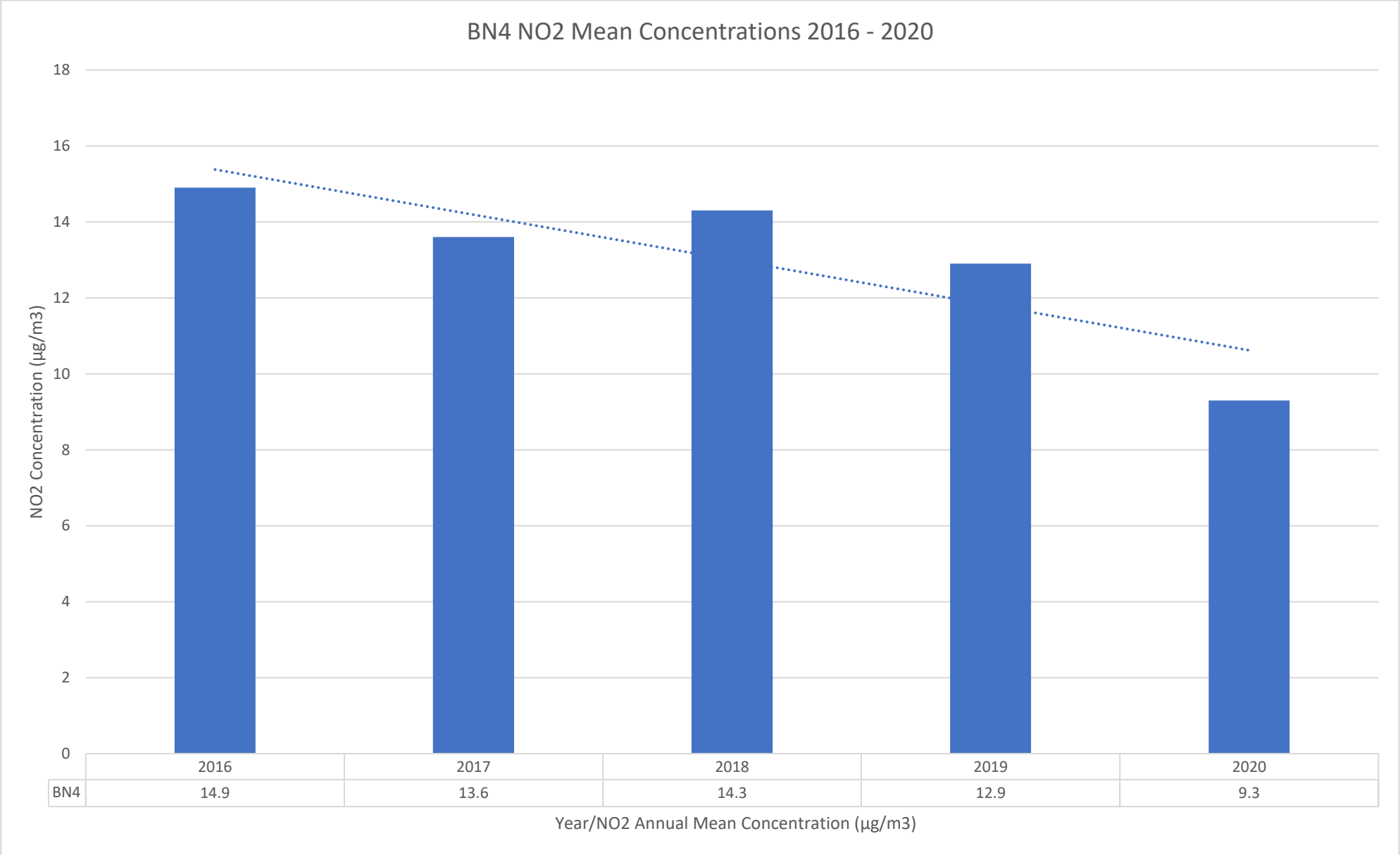
Concentrations recorded at Broadland sites 2016-2020



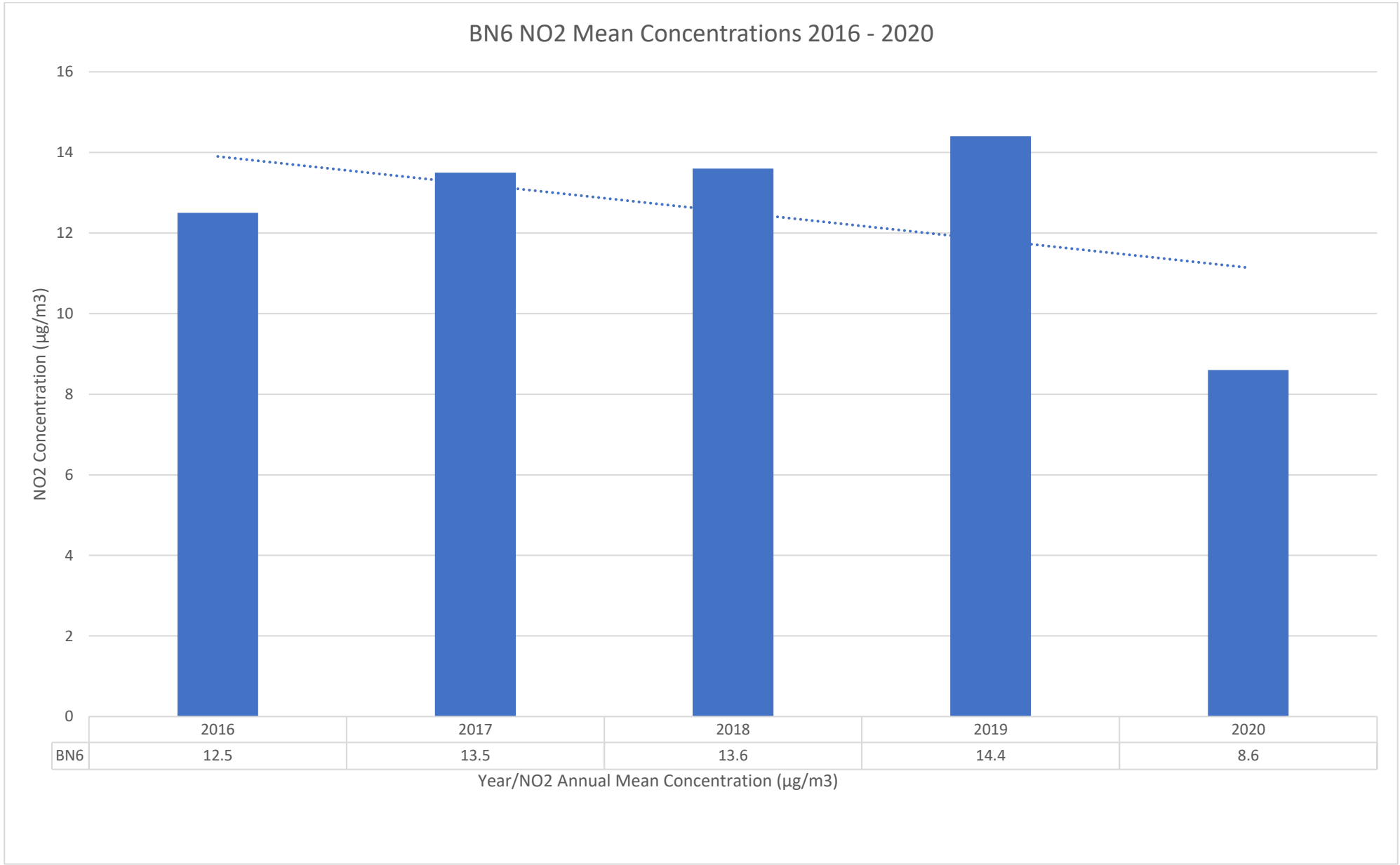
Comparison of results for 2019 and 2020



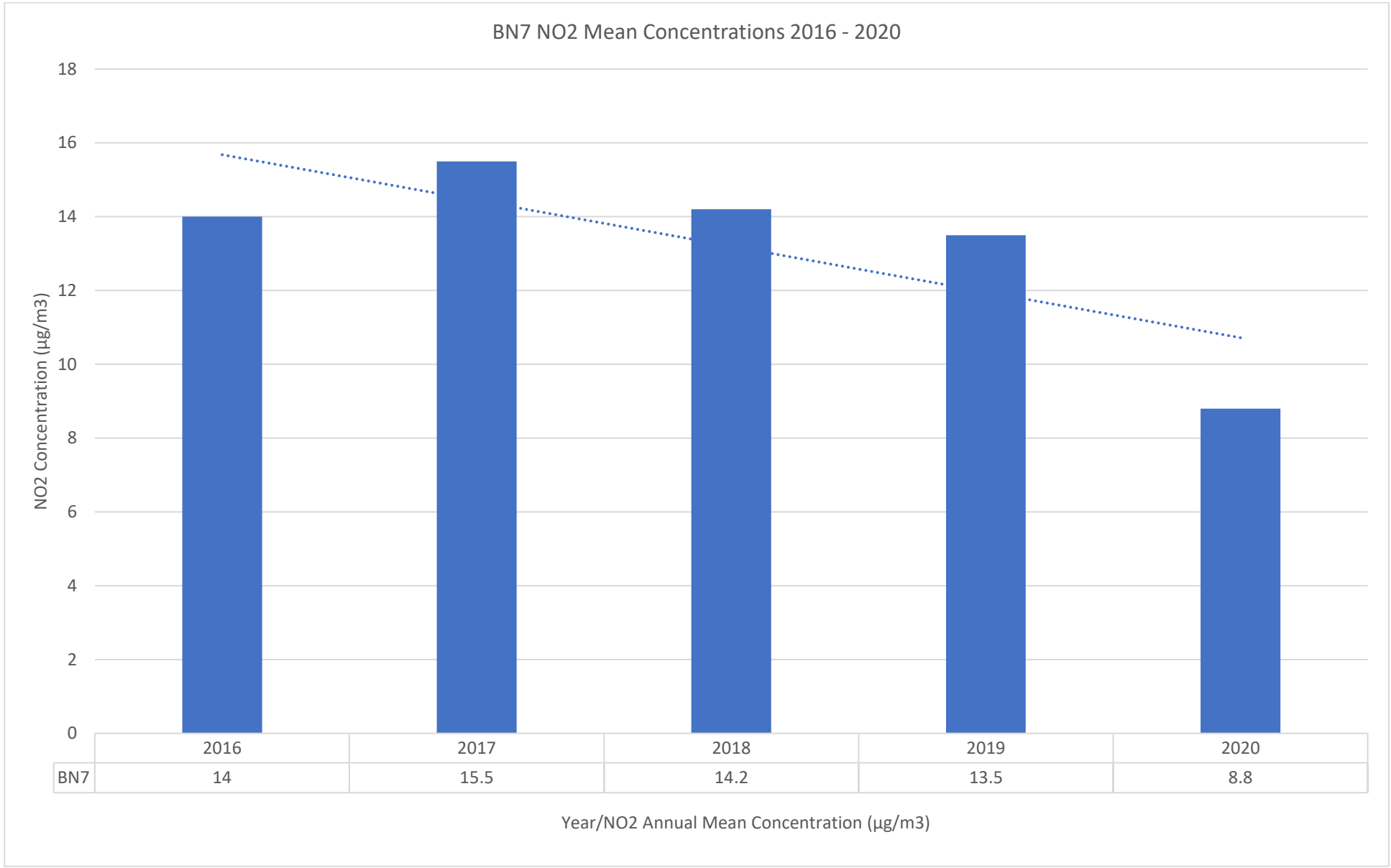
BN4


BN4 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
18
16
14
12
10
8
6
4
2
0
2016
2017
2018
2019
2020
BN4
14.9
13.6
14.3
12.9
9.3
Year/NO2 Annual Mean Concentration (µg/m3)

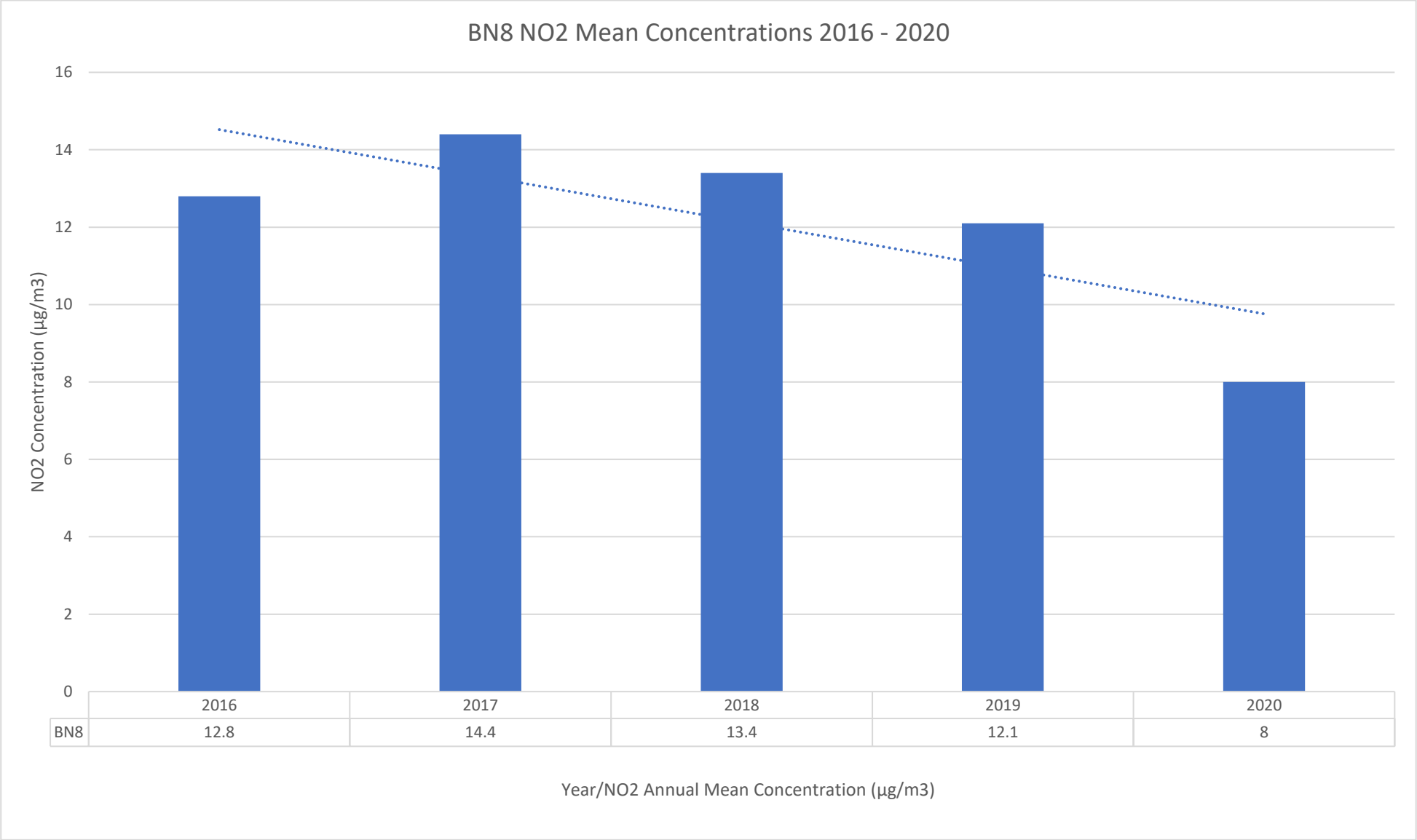
BN6


BN6 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
16
14
12
10
8
6
4
2
0
2016
2017
2018
2019
2020
BN6
12.5
13.5
13.6
14.4
8.6
Year/NO2 Annual Mean Concentration (µg/m3)

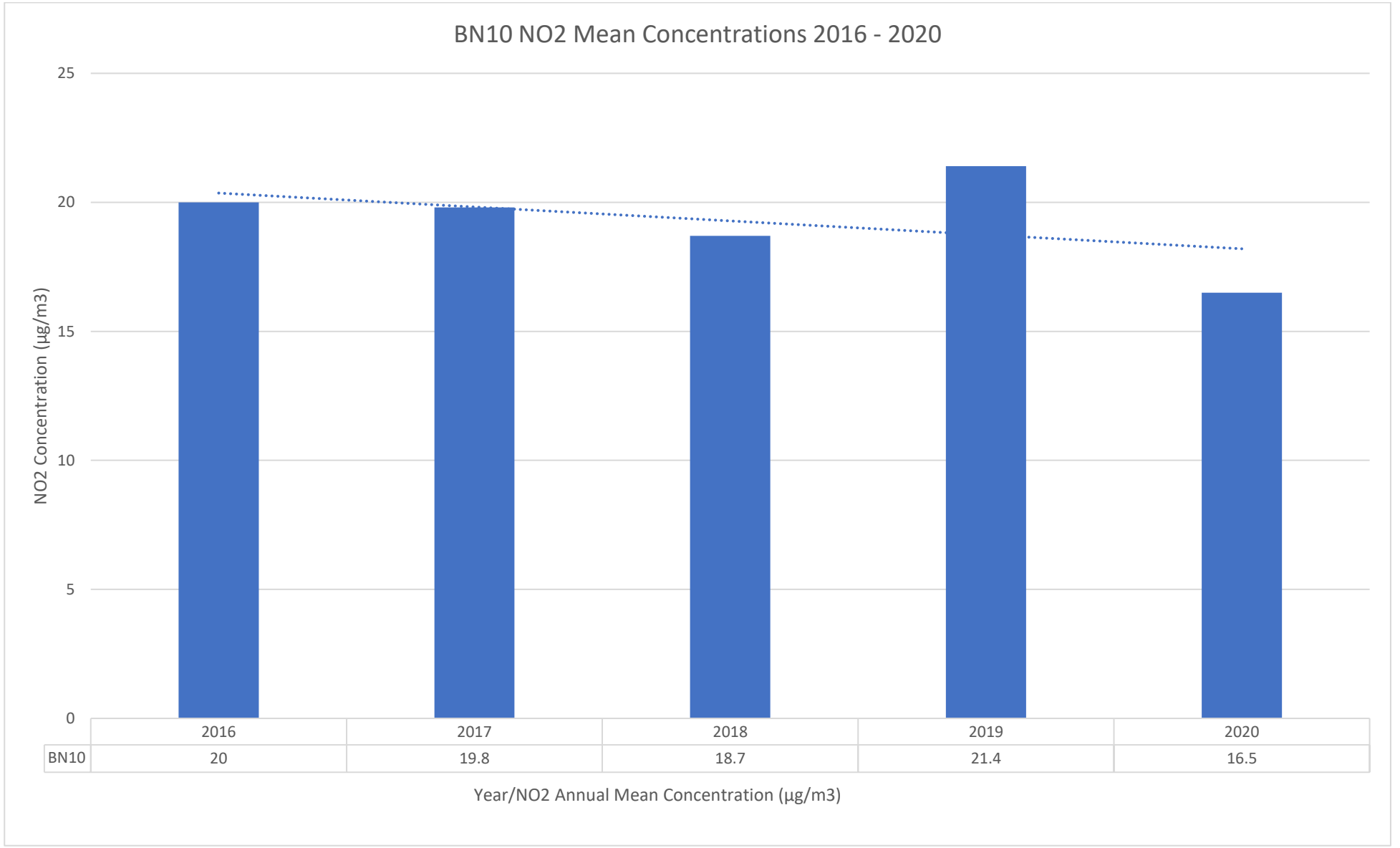
BN7


BN7 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
18
16
14
12
10
8
6
4
2
0
2016
2017
2018
2019
2020
BN7
14
15.5
14.2
13.5
8.8
Year/NO2 Annual Mean Concentration (µg/m3)

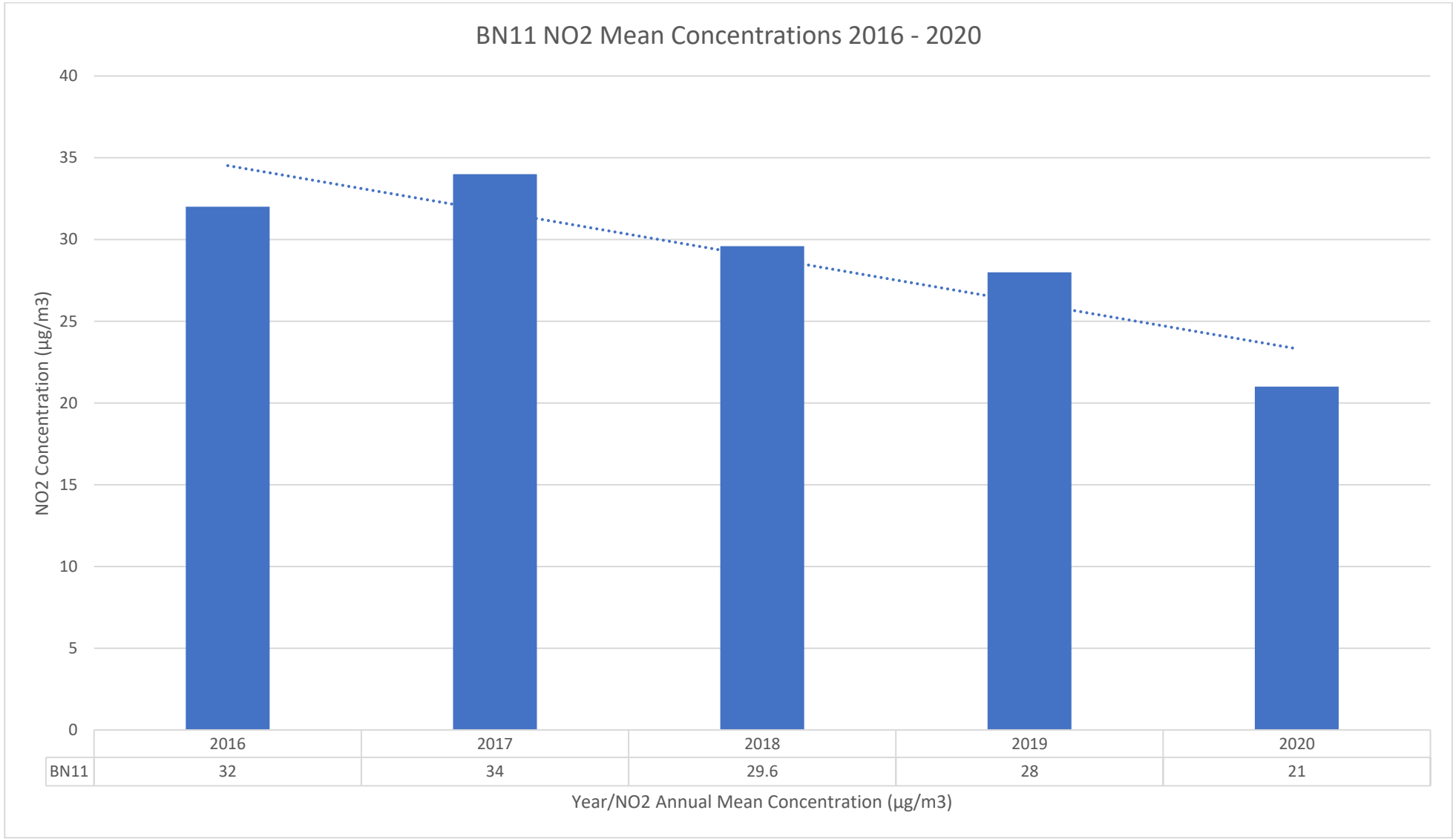
BN8


BN8 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
16
14
12
10
8
6
4
2
0
2016
2017
2018
2019
2020
BN8
12.8
14.4
13.4
12.1
8
Year/NO2 Annual Mean Concentration (µg/m3)

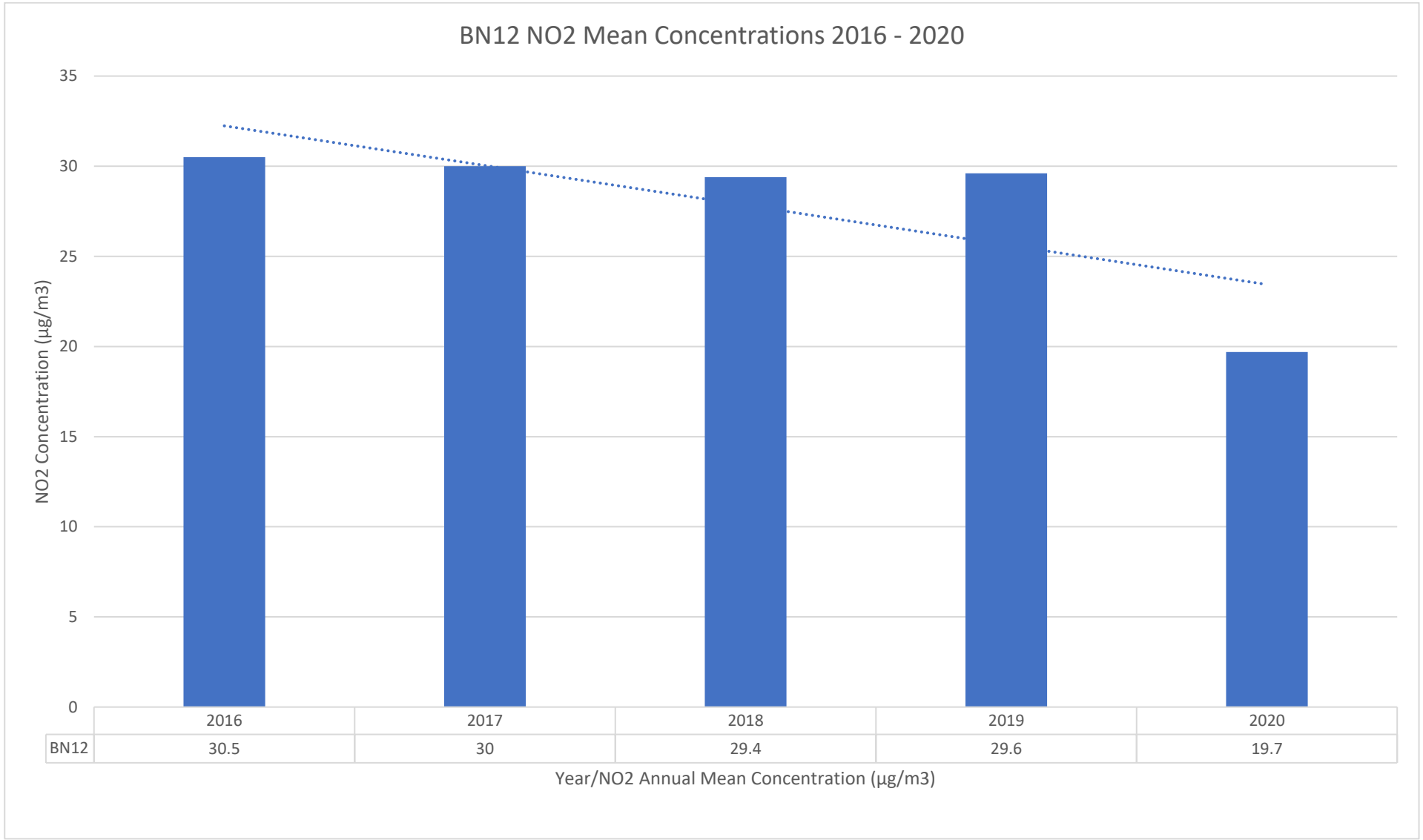
BN10


BN10 NO2 Mean Concentrations 2016 - 2020
25
20
15
10
5
0
NO2 Concentration (µg/m3)
2016
2017
2018
2019
2020
BN10
20
19.8
18.7
21.4
16.5
Year/NO2 Annual Mean Concentration (µg/m3)

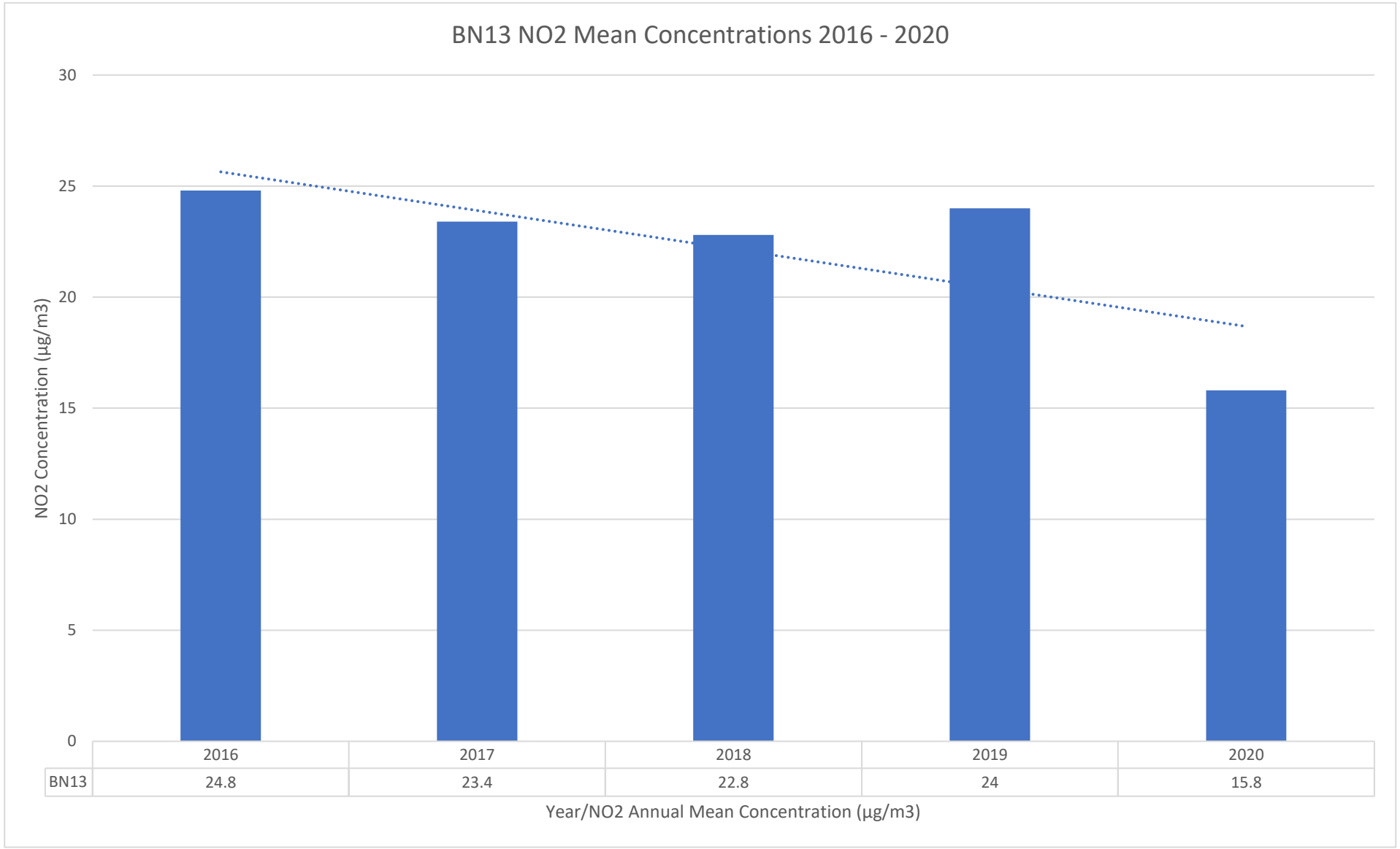
BN11


BN11 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
40
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
BN11
32
34
29.6
28
21
Year/NO2 Annual Mean Concentration (µg/m3)

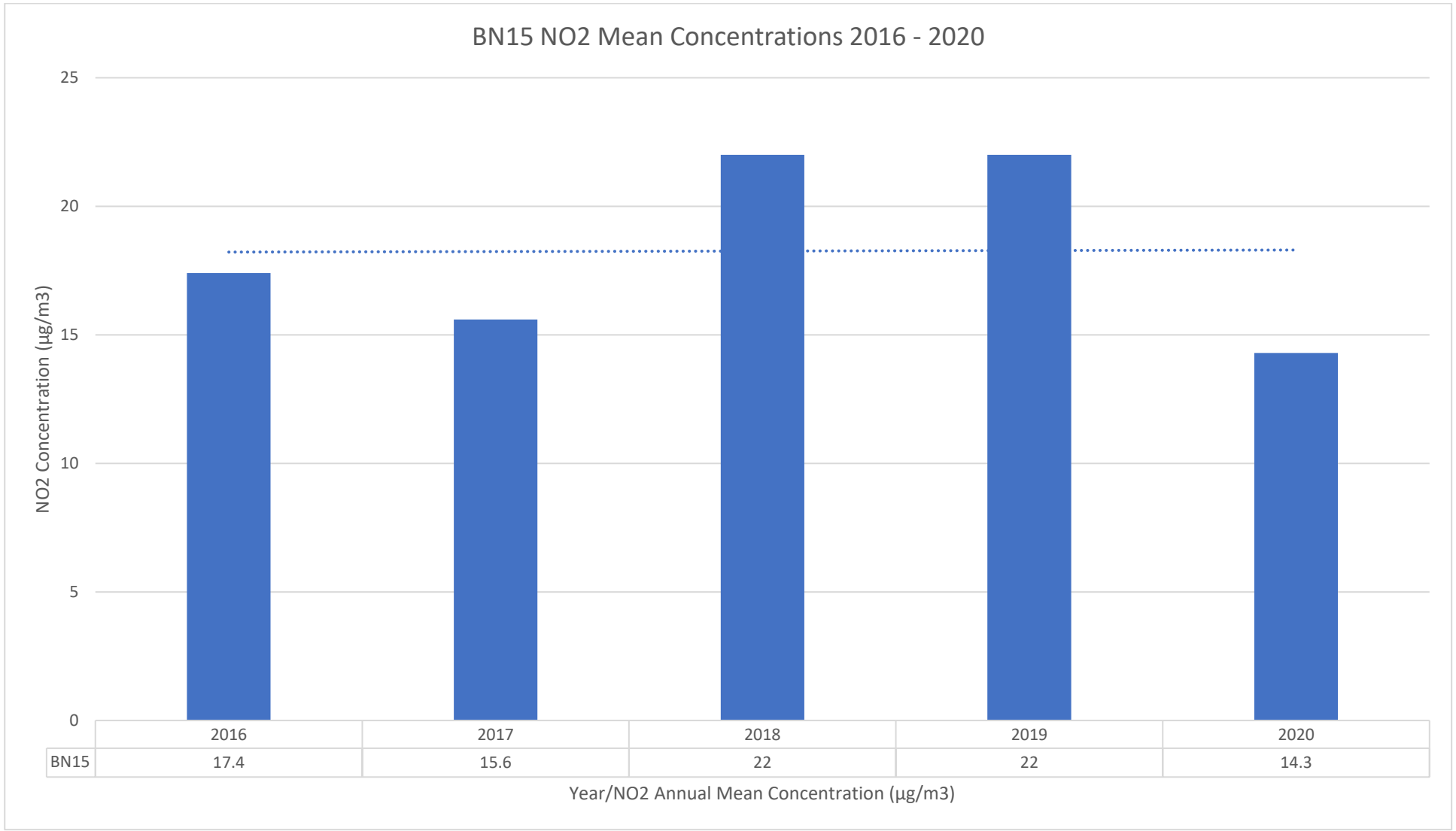
BN12


BN12 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
BN12
30.5
30
29.4
29.6
19.7
Year/NO2 Annual Mean Concentration (µg/m3)

BN13


BN13 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
BN13
24.8
23.4
22.8
24
15.8
Year/NO2 Annual Mean Concentration (µg/m3)

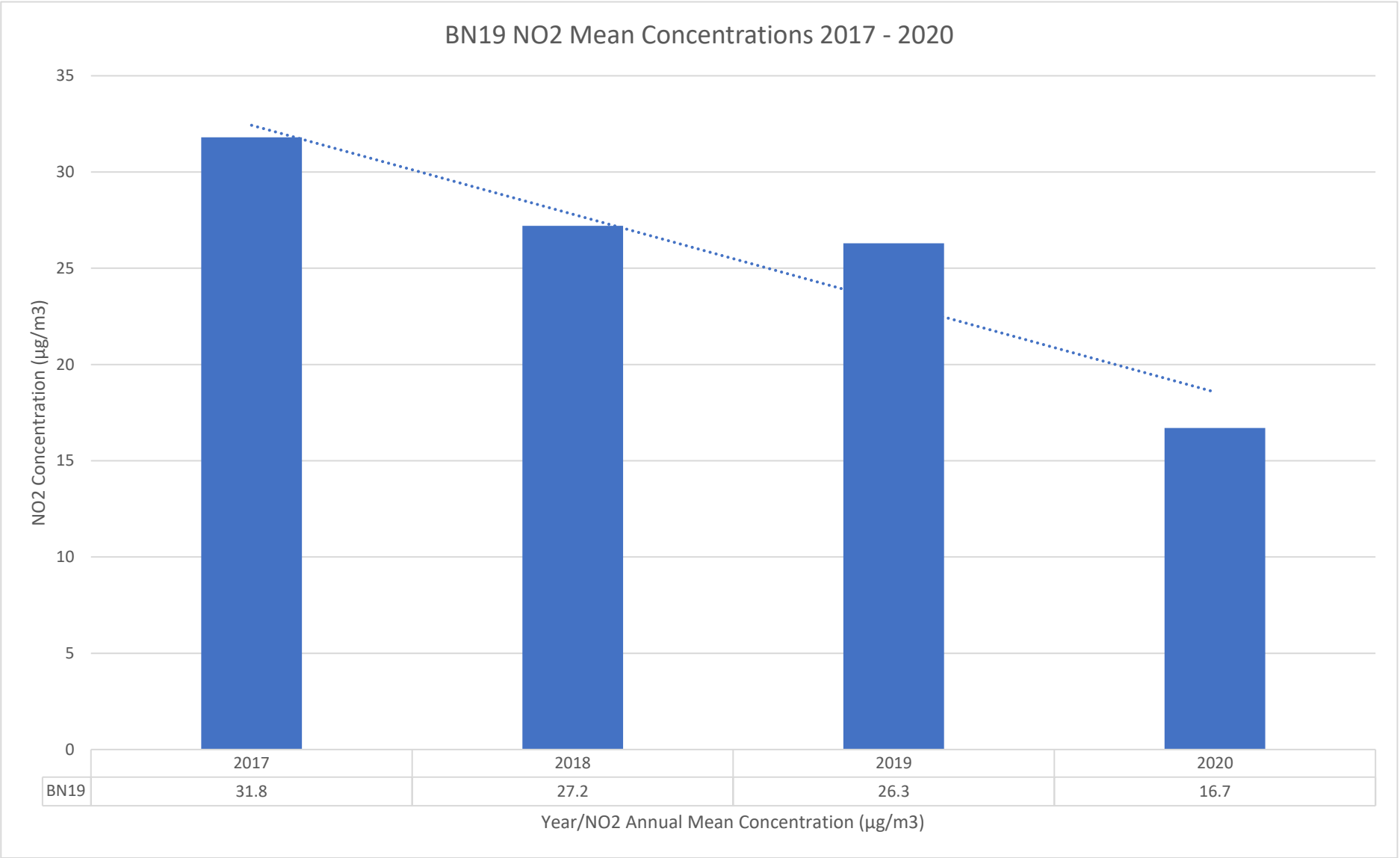
BN15


BN15 NO2 Mean Concentrations 2016 - 2020
25
20
15
10
5
0
NO2 Concentration (µg/m3)
2016
2017
2018
2019
2020
BN15
17.4
15.6
22
22
14.3
Year/NO2 Annual Mean Concentration (µg/m3)

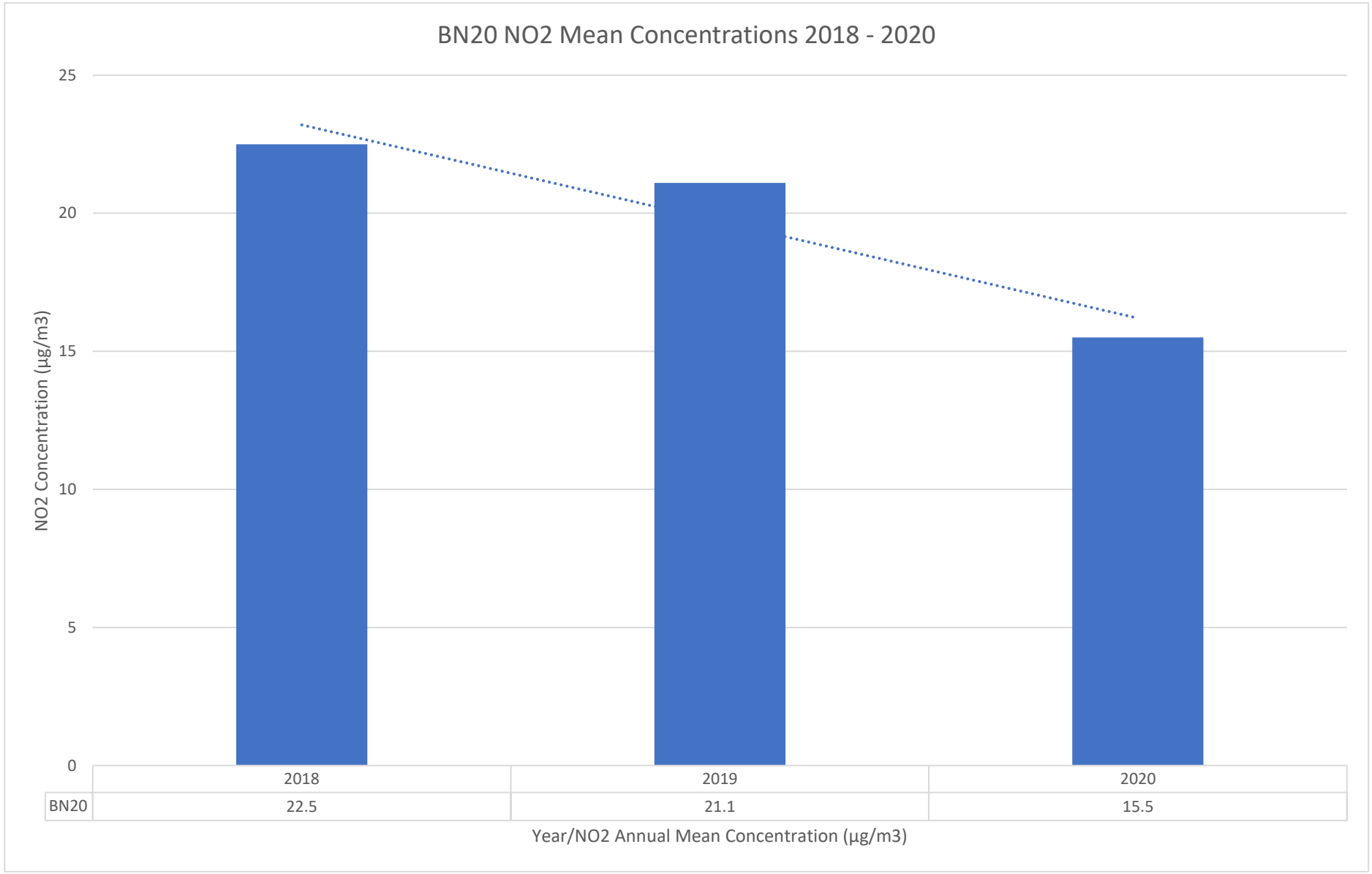
BN18


BN18 NO2 Mean Concentrations 2017 - 2020
30
25
20
15
10
5
0
NO2 Concentration (µg/m3)
2017
2018
2019
2020
BN18
18.1
26
23.8
12.4
Year/NO2 Annual Mean Concentration (µg/m3)

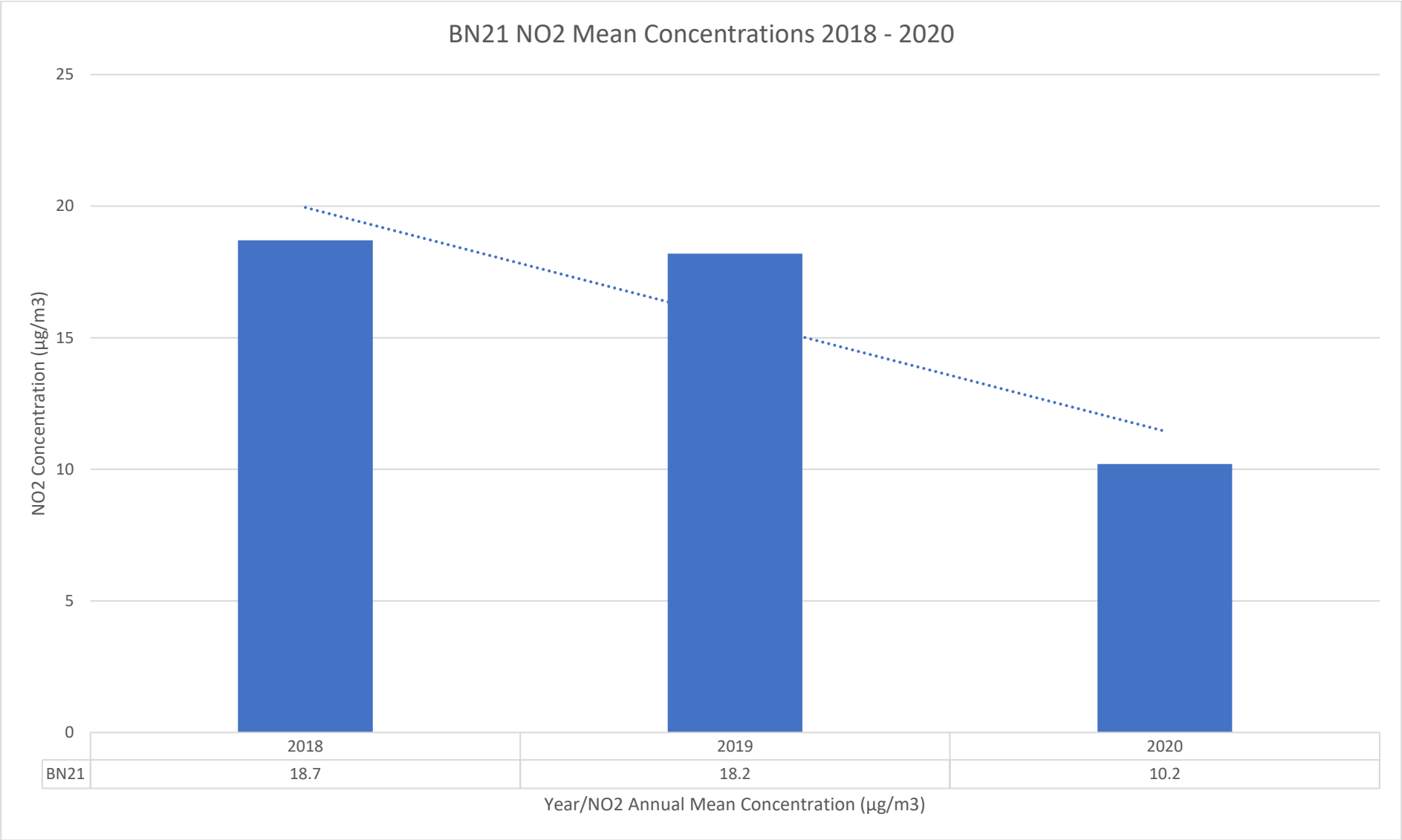
BN19


BN19 NO2 Mean Concentrations 2017 - 2020
NO2 Concentration (µg/m3)
35
30
25
20
15
10
5
0
2017
2018
2019
2020
BN19
31.8
27.2
26.3
16.7
Year/NO2 Annual Mean Concentration (µg/m3)

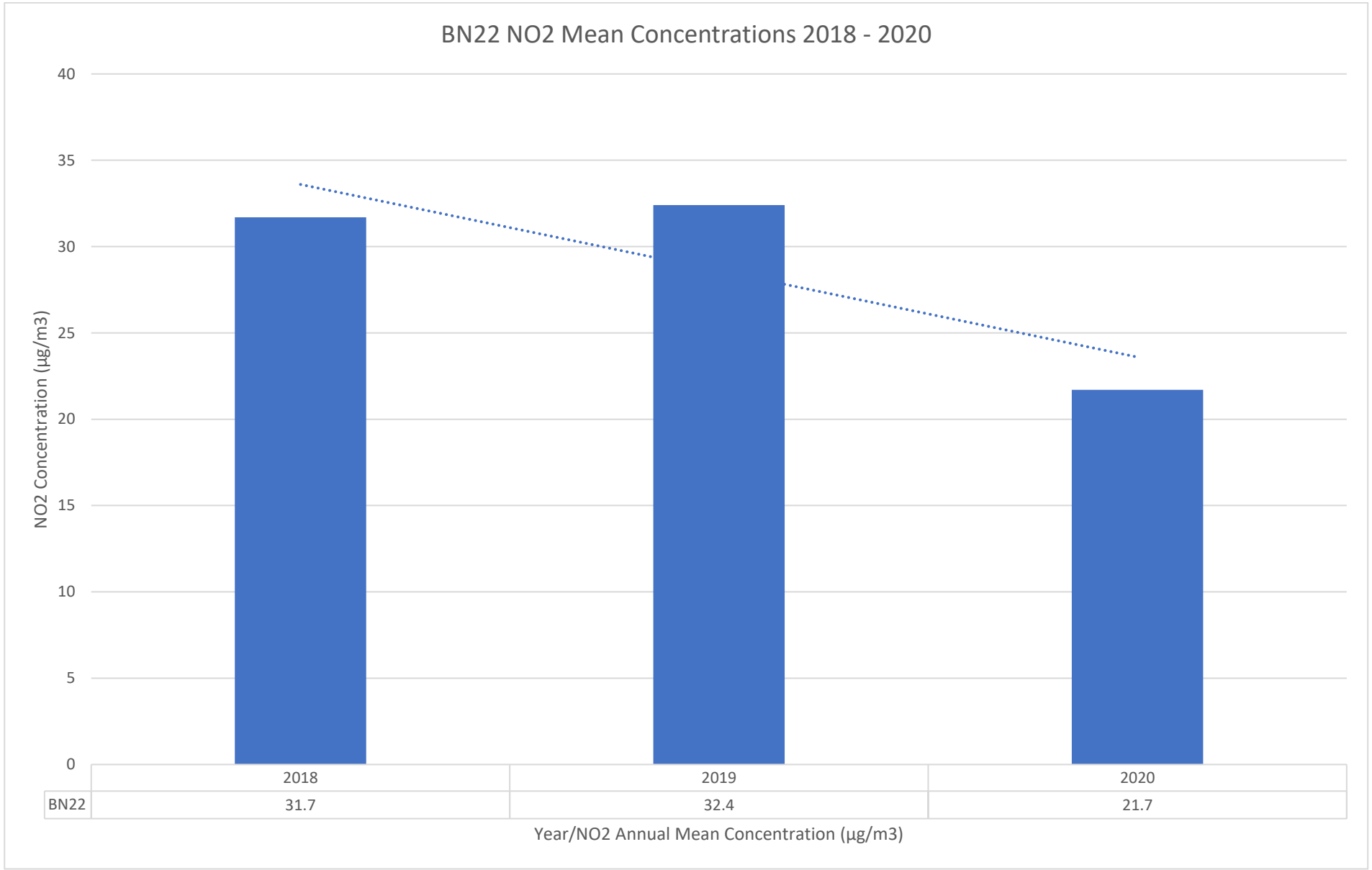
BN20


BN20 NO2 Mean Concentrations 2018 - 2020
25
20
15
10
5
0
NO2 Concentration (µg/m3)
2018
2019
2020
BN20
22.5
21.1
15.5
Year/NO2 Annual Mean Concentration (µg/m3)

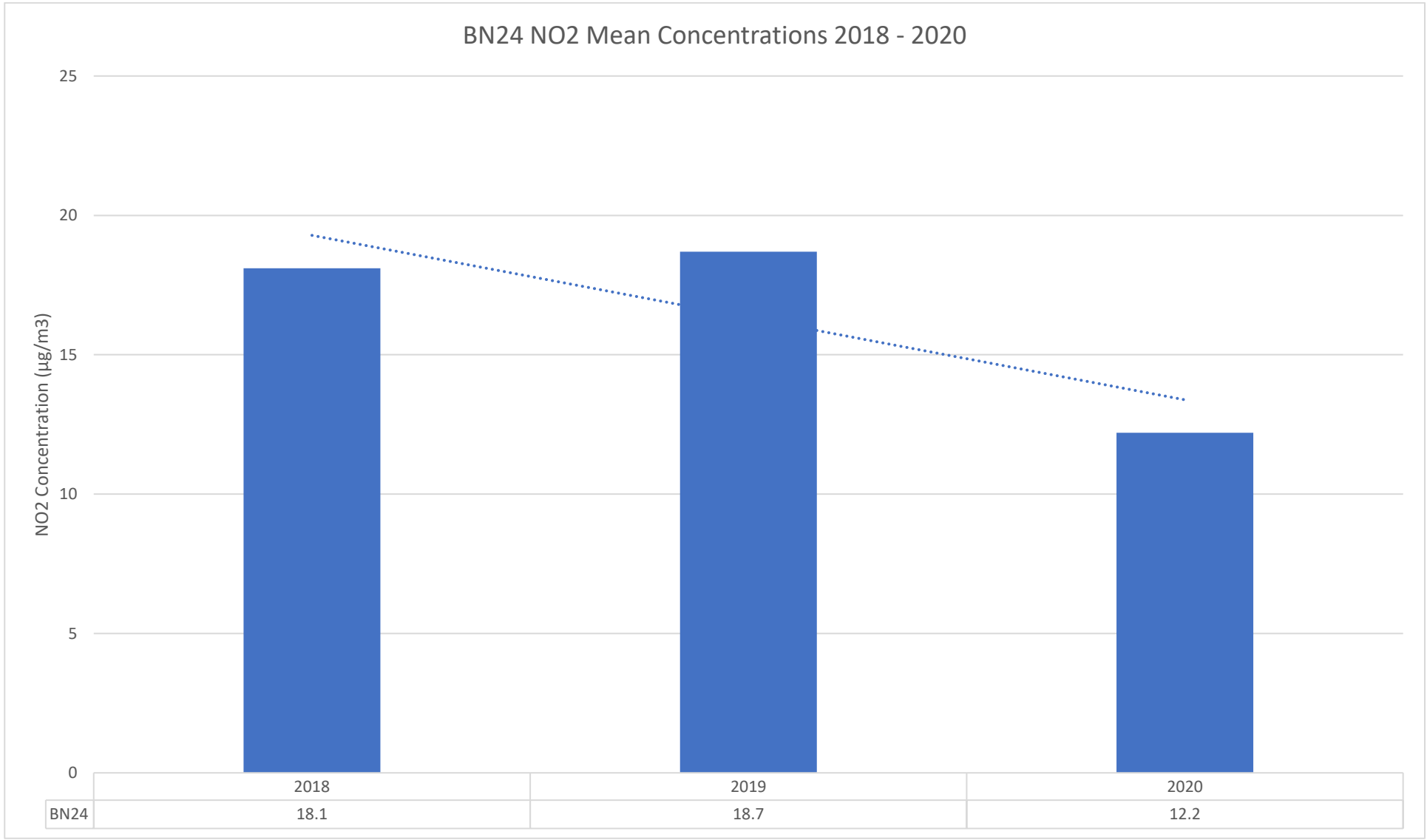
BN21


BN21 NO2 Mean Concentrations 2018 - 2020
25
20
15
10
5
0
NO2 Concentration (µg/m3)
2018
2019
2020
BN21
18.7
18.2
10.2
Year/NO2 Annual Mean Concentration (µg/m3)

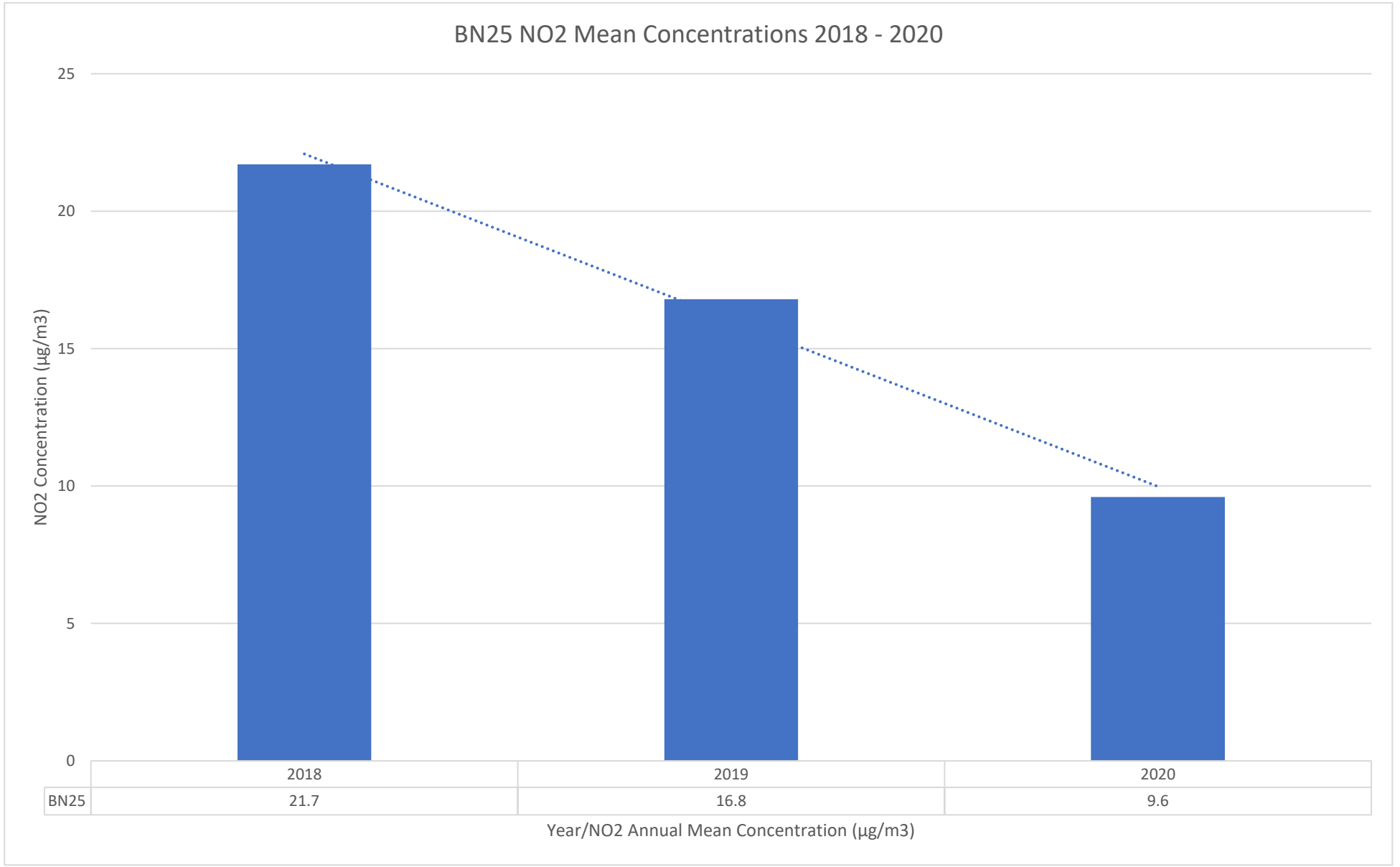
BN22


BN22 NO2 Mean Concentrations 2018 - 2020
NO2 Concentration (µg/m3)
40
35
30
25
20
15
10
5
0
2018
2019
2020
BN22
31.7
32.4
21.7
Year/NO2 Annual Mean Concentration (µg/m3)

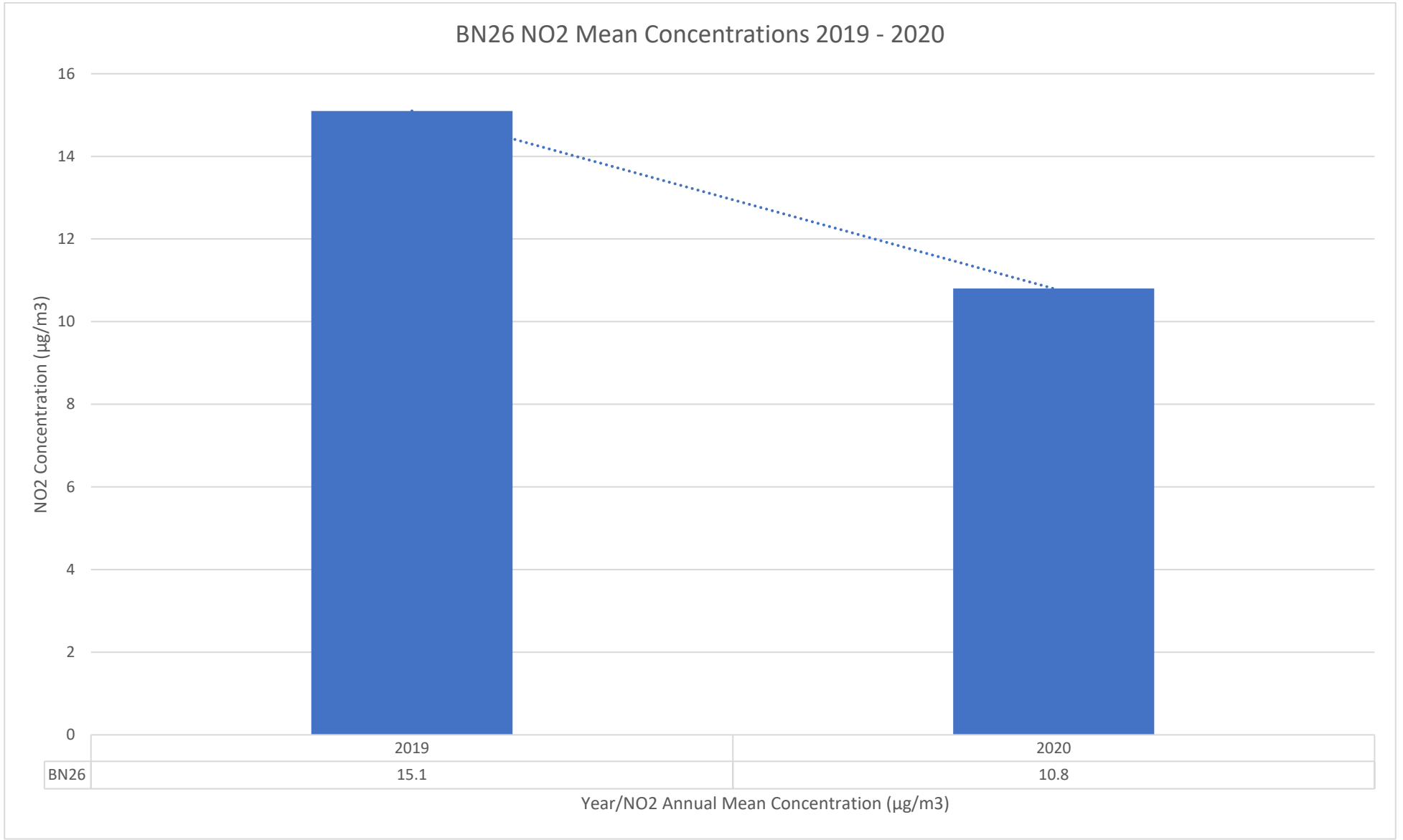
BN24


BN24 NO2 Mean Concentrations 2018 - 2020
NO2 Concentration (µg/m3)
25
20
15
10
5
0
2018
2019
2020
BN24
18.1
18.7
12.2

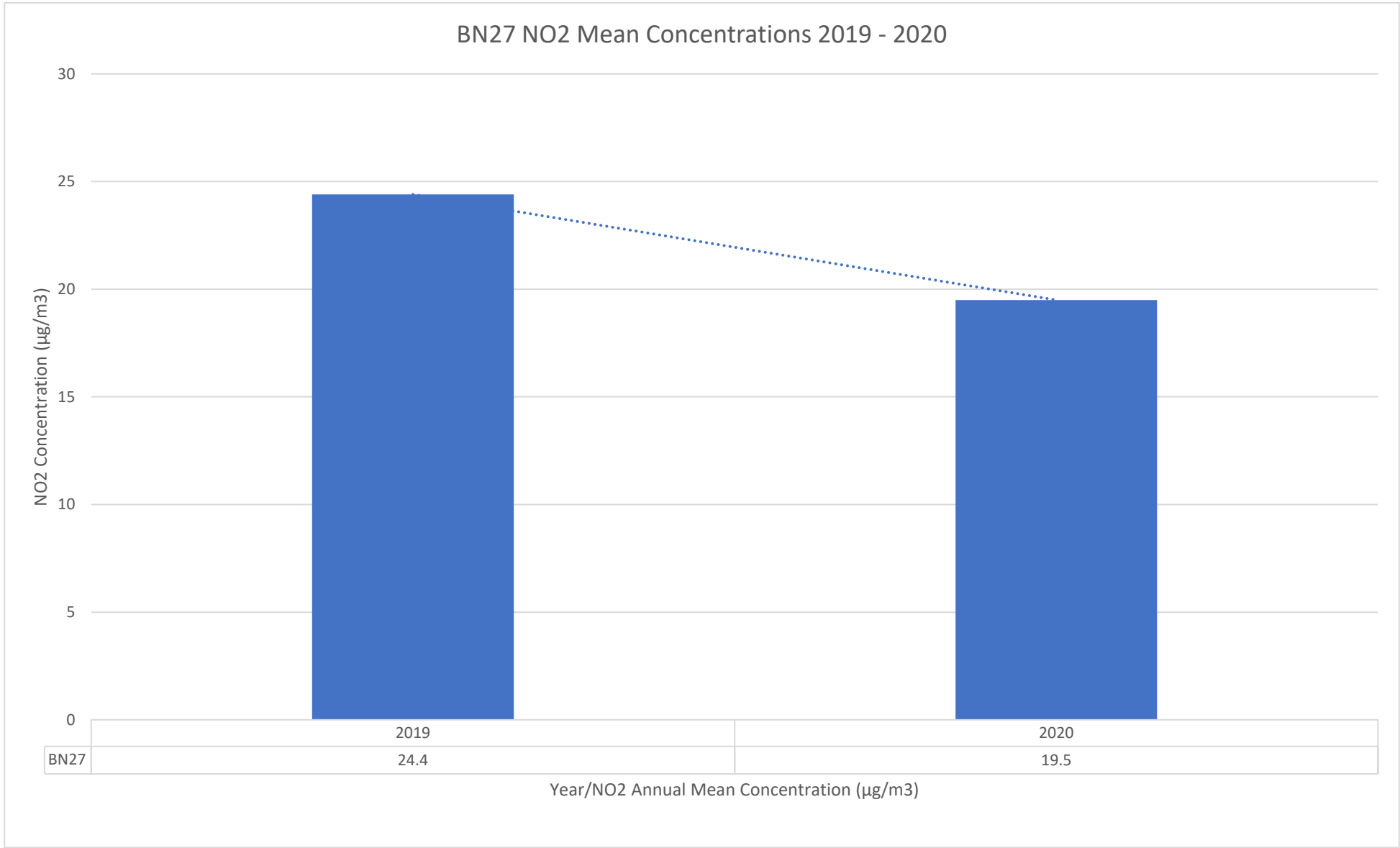
BN25


BN25 NO2 Mean Concentrations 2018 - 2020
25
20
15
10
5
0
NO2 Concentration (µg/m3)
2018
2019
2020
BN25
21.7
16.8
9.6
Year/NO2 Annual Mean Concentration (µg/m3)

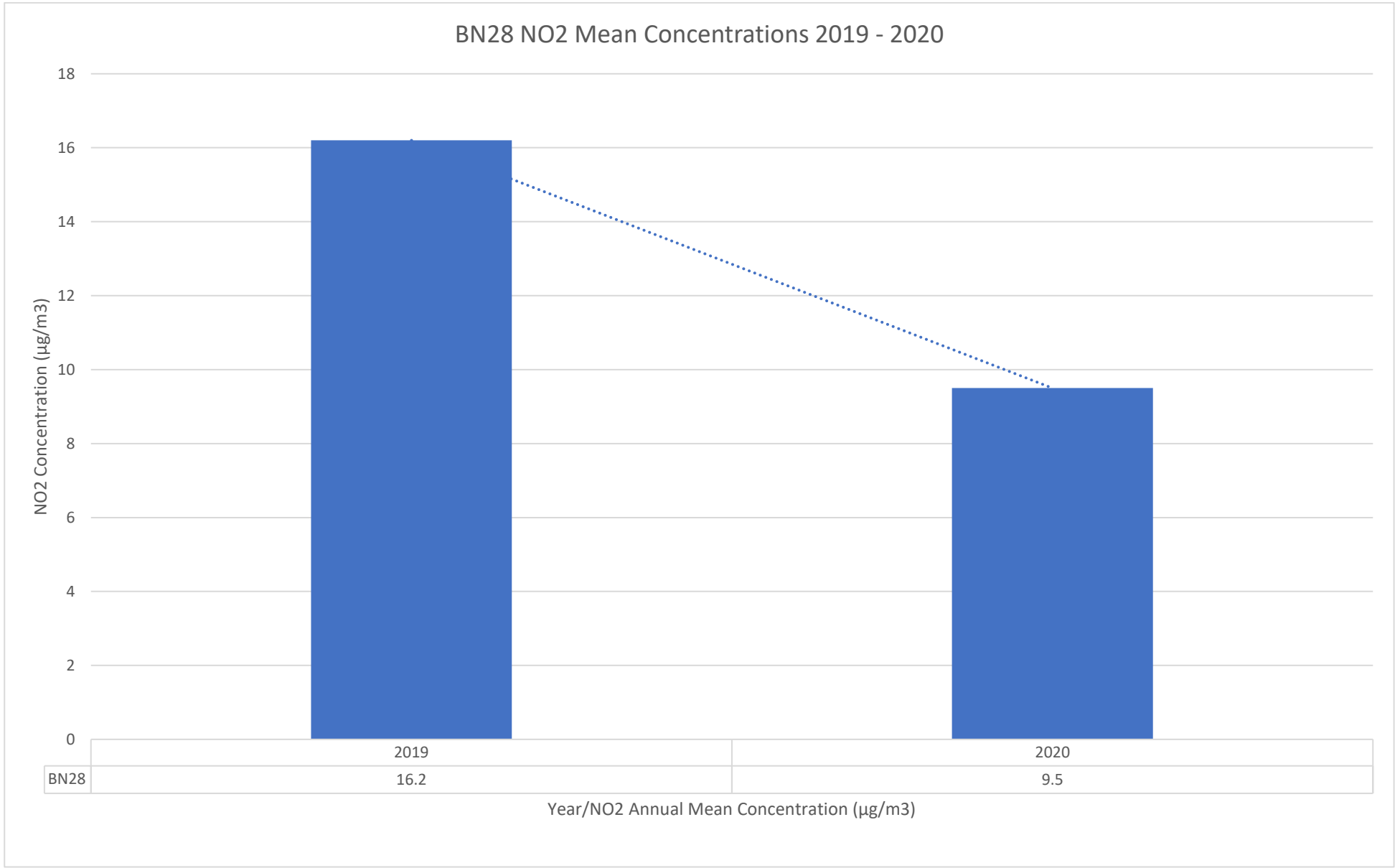
BN26


BN26 NO2 Mean Concentrations 2019 - 2020
NO2 Concentration (µg/m3)
16
14
12
10
8
6
4
2
0
2019
2020
BN26
15.1
10.8
Year/NO2 Annual Mean Concentration (µg/m3)

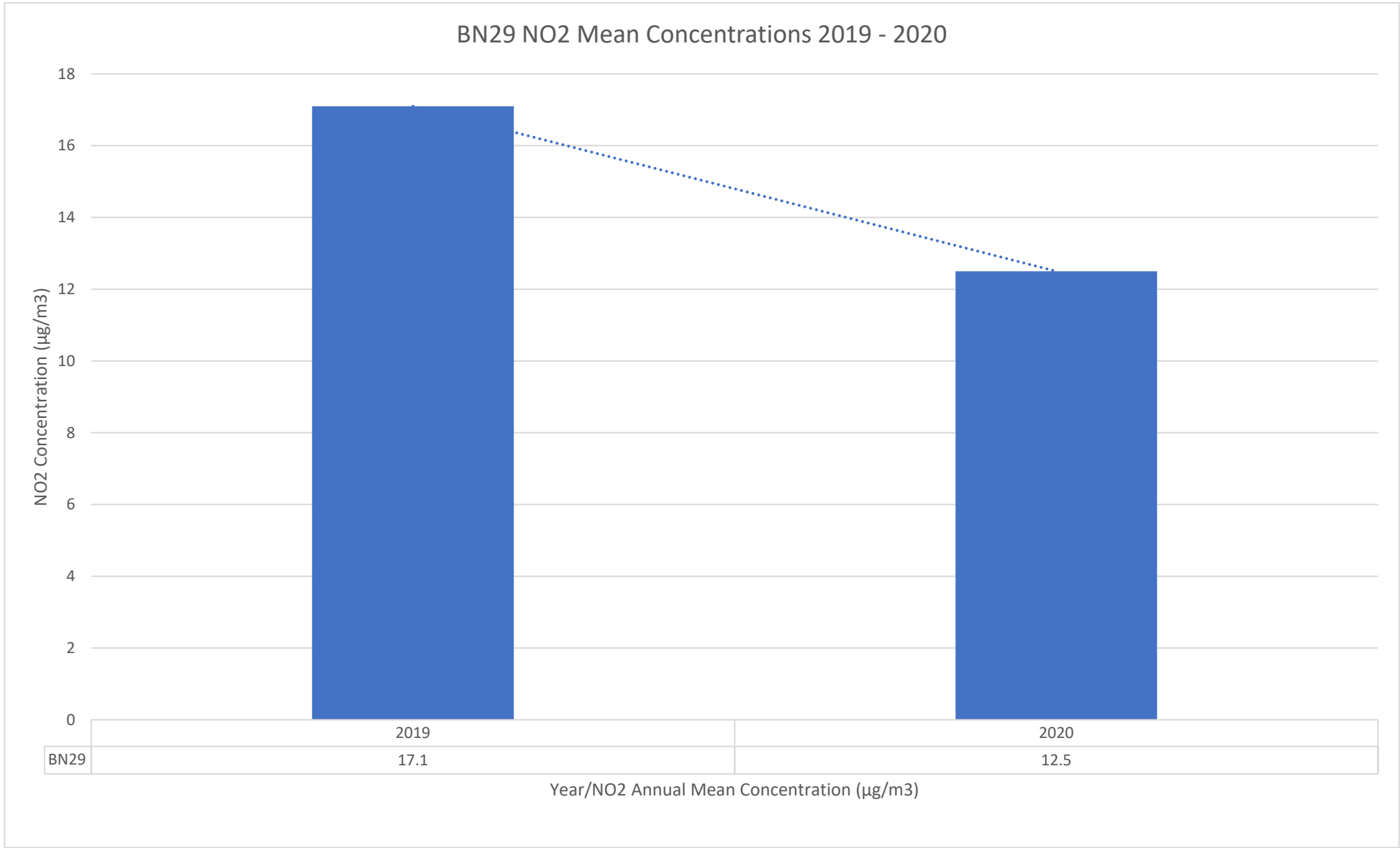
BN27


BN27 NO2 Mean Concentrations 2019 - 2020
30
25
20
15
10
5
0
NO2 Concentration (µg/m3)
2019
2020
BN27
24.4
19.5
Year/NO2 Annual Mean Concentration (µg/m3)

BN28


BN28 NO2 Mean Concentrations 2019 - 2020
NO2 Concentration (µg/m3)
18
16
14
12
10
8
6
4
2
0
2019
2020
BN28
16.2
9.5
Year/NO2 Annual Mean Concentration (µg/m3)

BN29


BN29 NO2 Mean Concentrations 2019 - 2020
NO2 Concentration (µg/m3)
18
16
14
12
10
8
6
4
2
0
2019
2020
BN29
17.1
12.5
Year/NO2 Annual Mean Concentration (µg/m3)

BN30

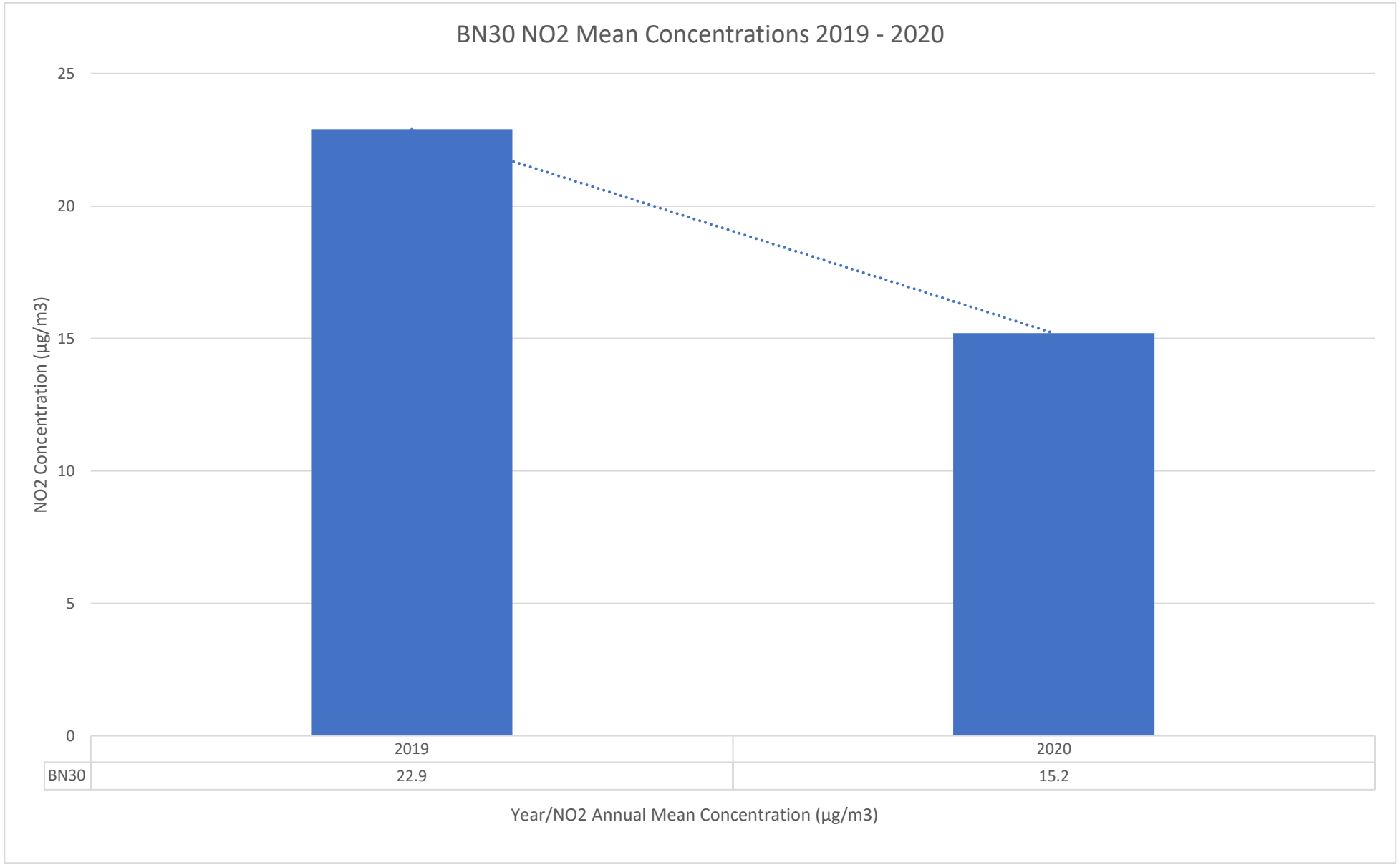
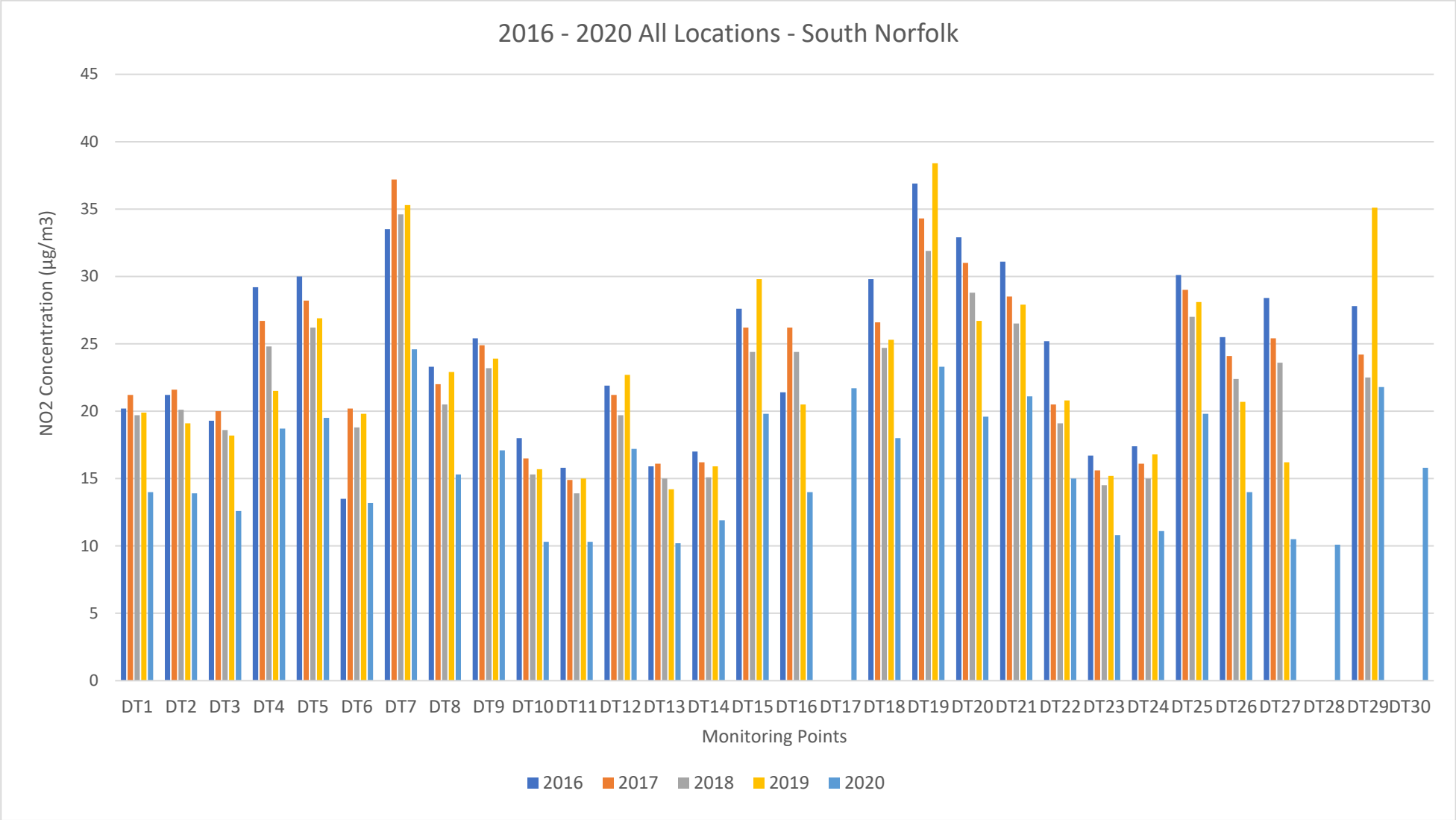
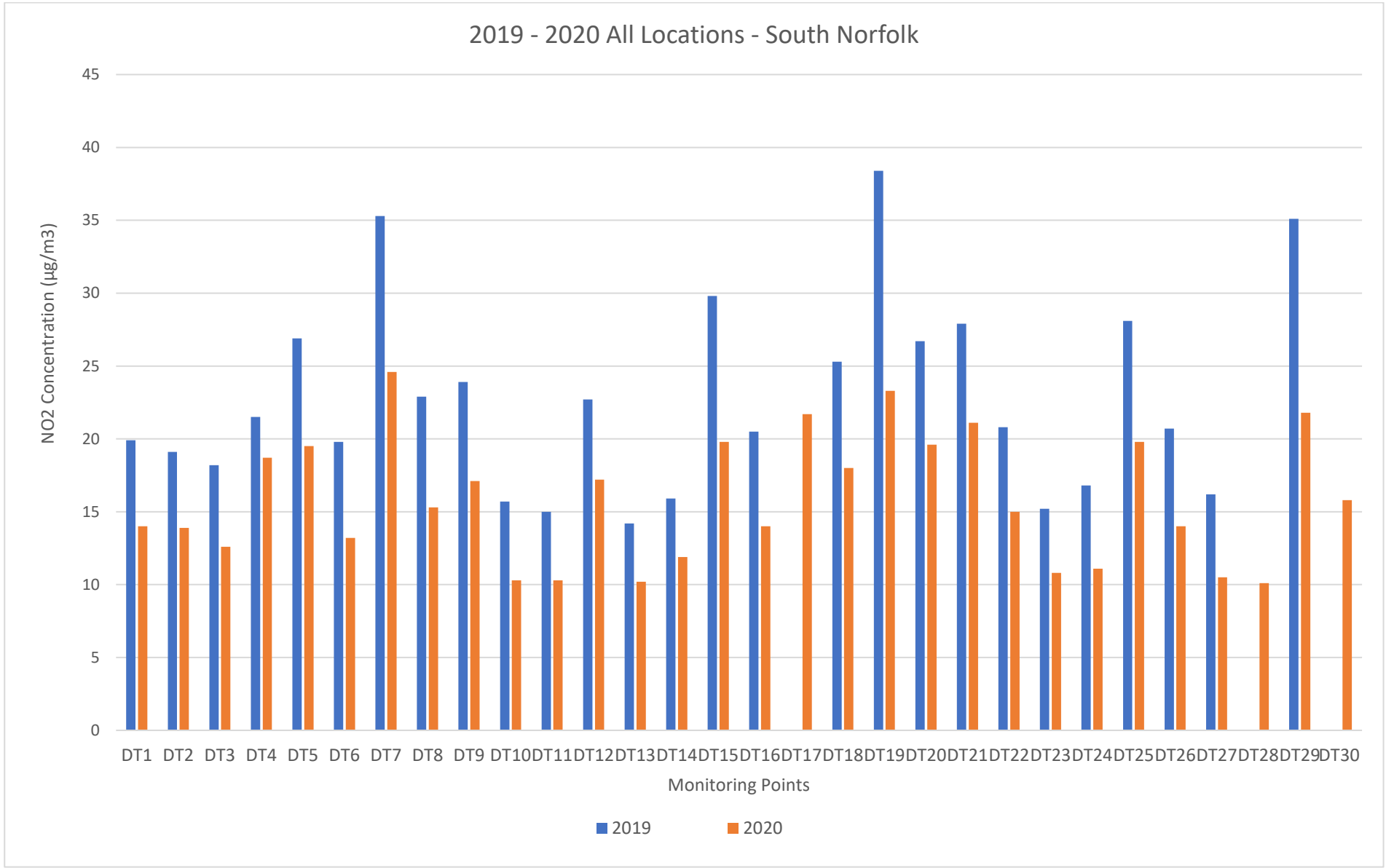

BN30 NO2 Mean Concentrations 2019 - 2020
25
20
15
10
5
0
NO2 Concentration (µg/m3)
2019
2020
BN30
22.9
15.2
Year/NO2 Annual Mean Concentration (µg/m3)

Figure A.2 – Trends in Annual Mean NO_2 Concentrations – South Norfolk

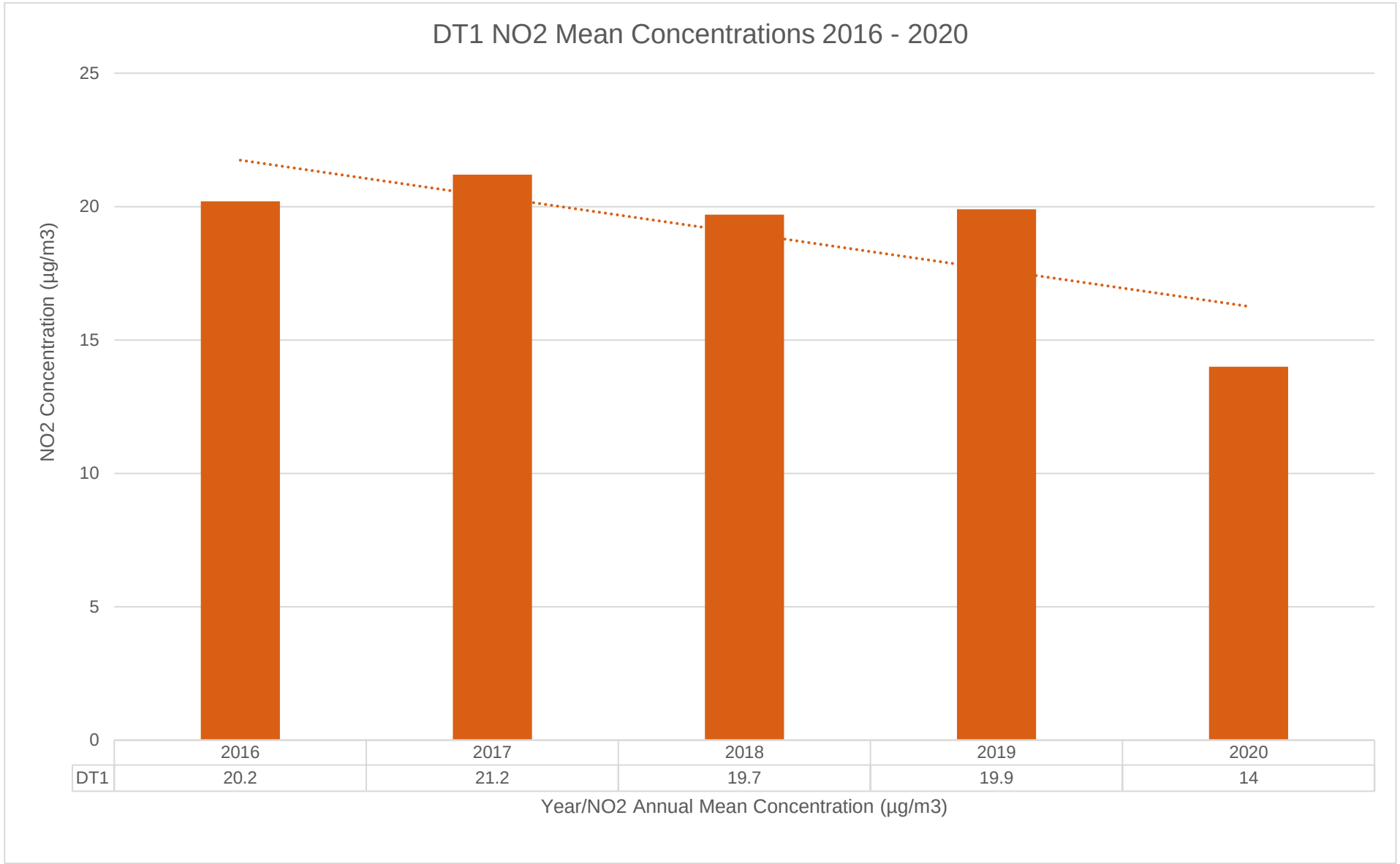
Concentrations recorded at all South Norfolk sites 2016-2020

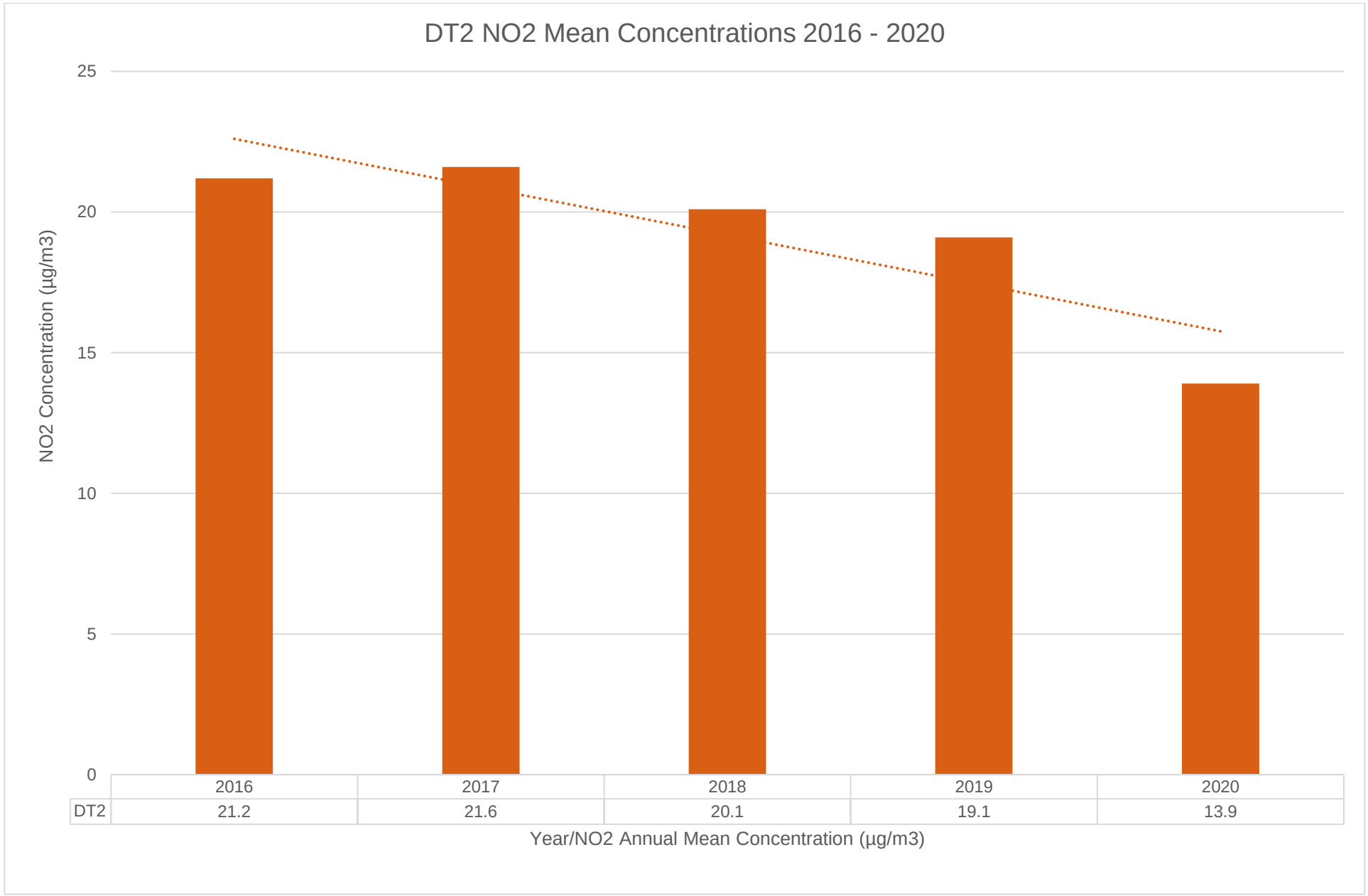


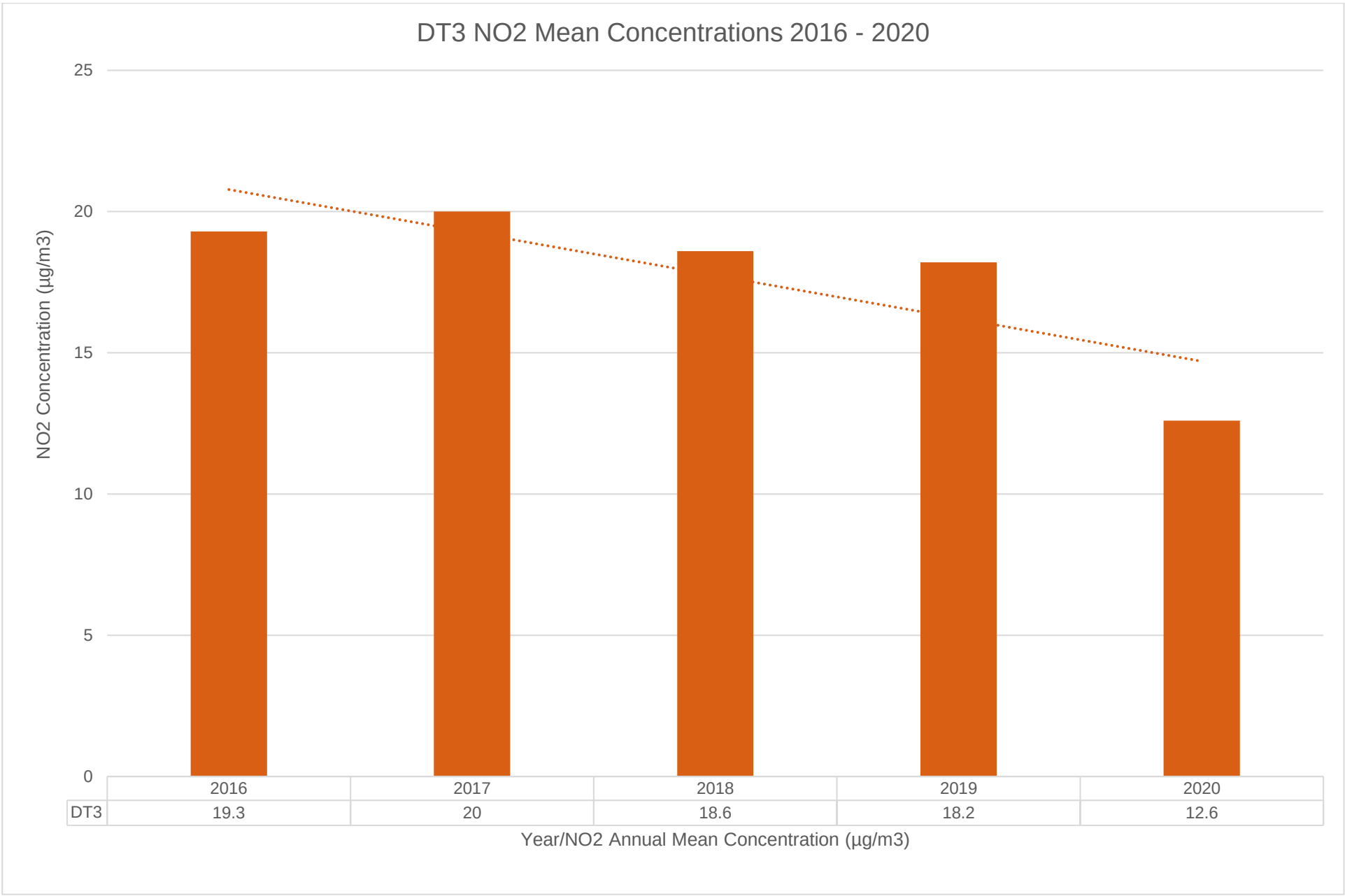
Concentrations recorded at all South Norfolk sites 2019-2020

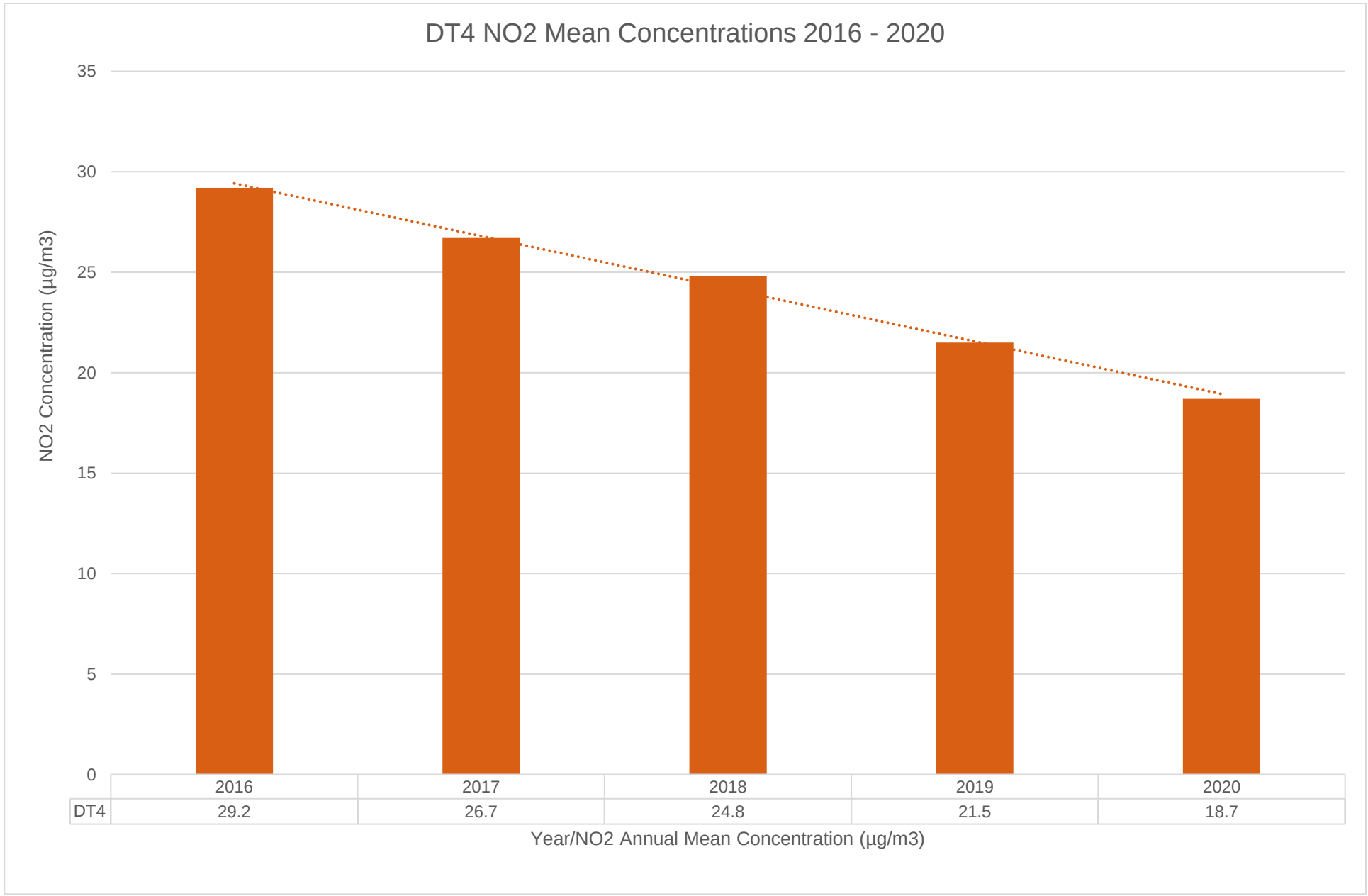


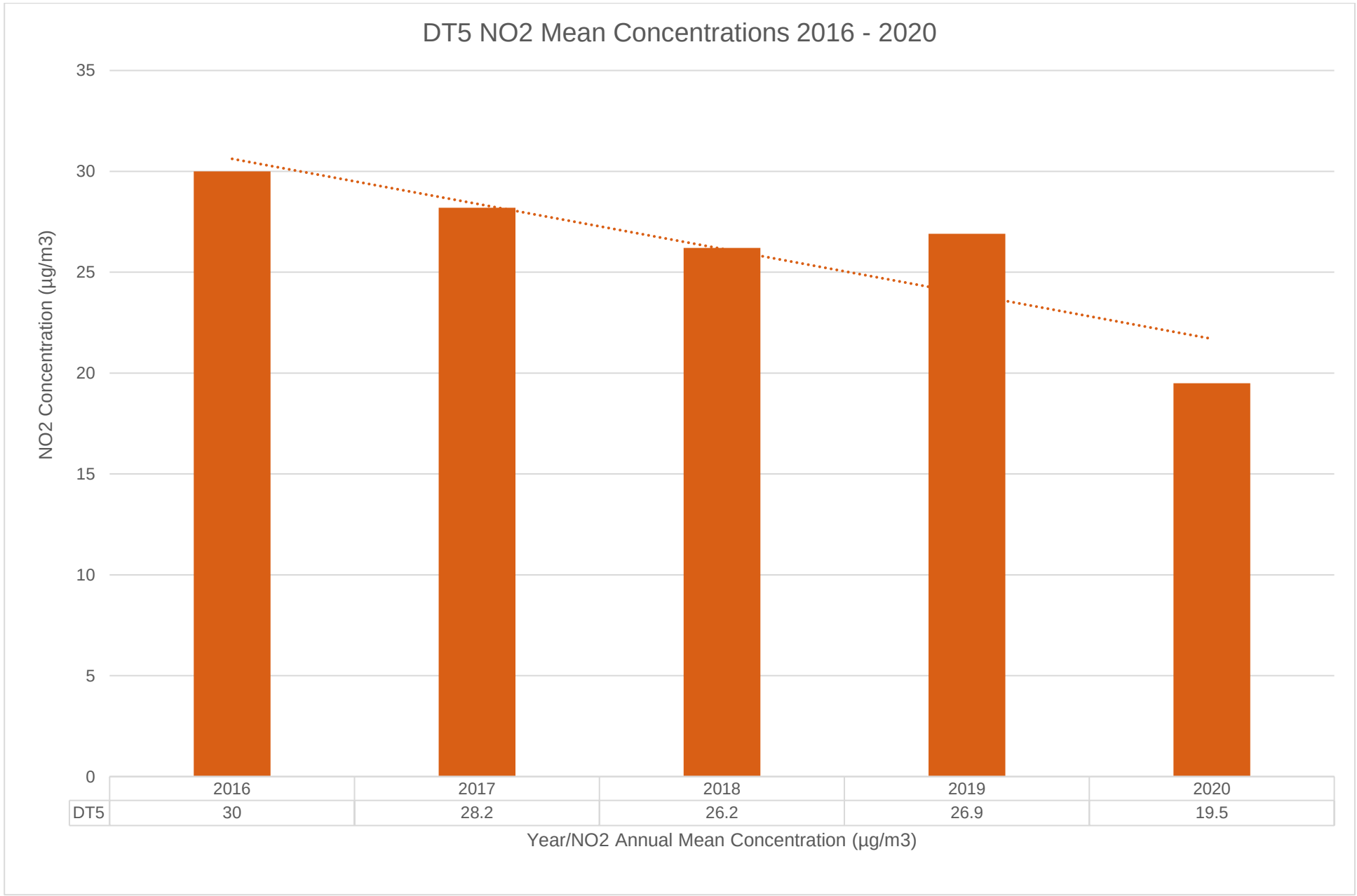
DT1

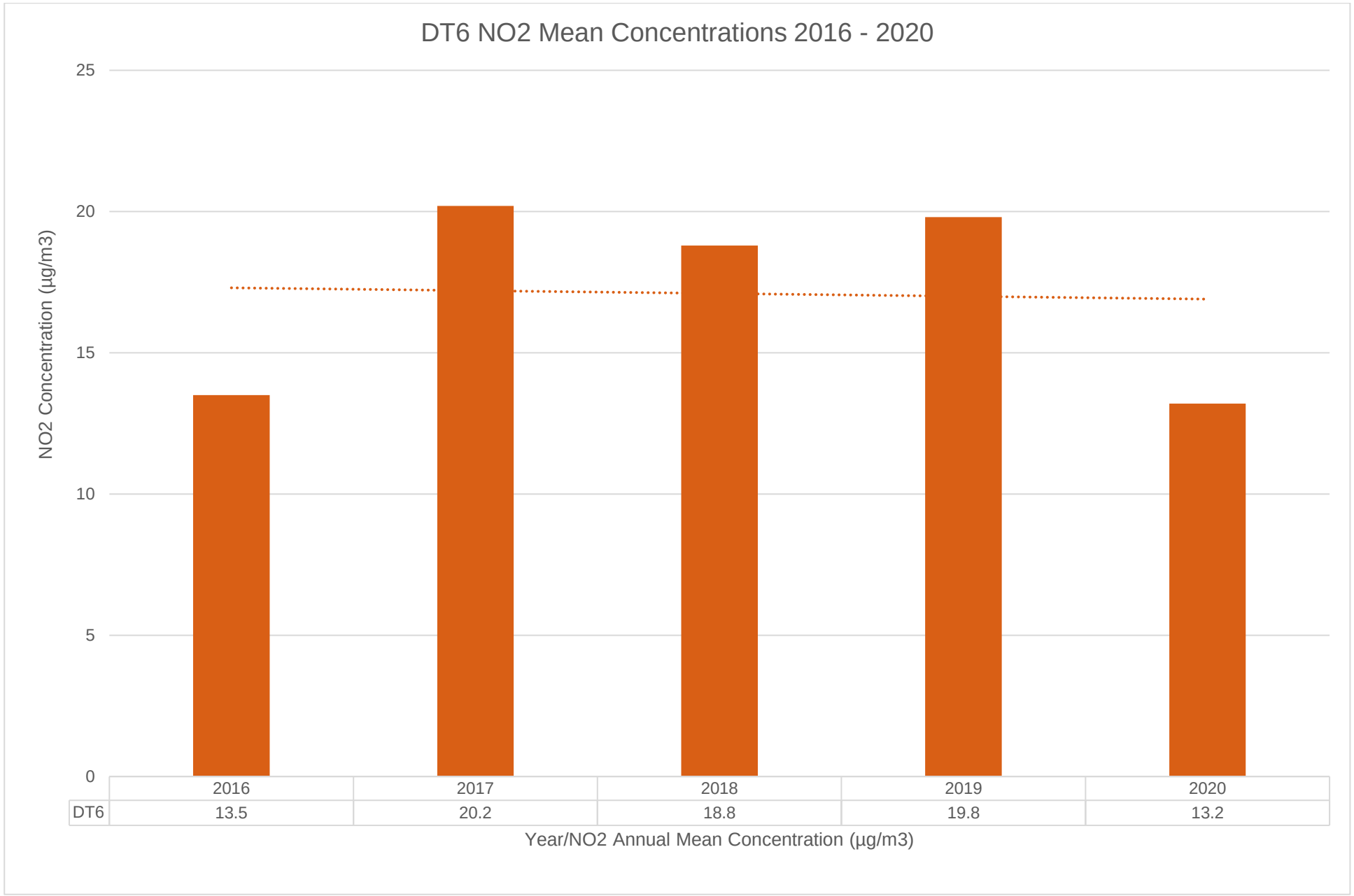

DT1 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT1
20.2
21.2
19.7
19.9
14
Year/NO2 Annual Mean Concentration (µg/m3)

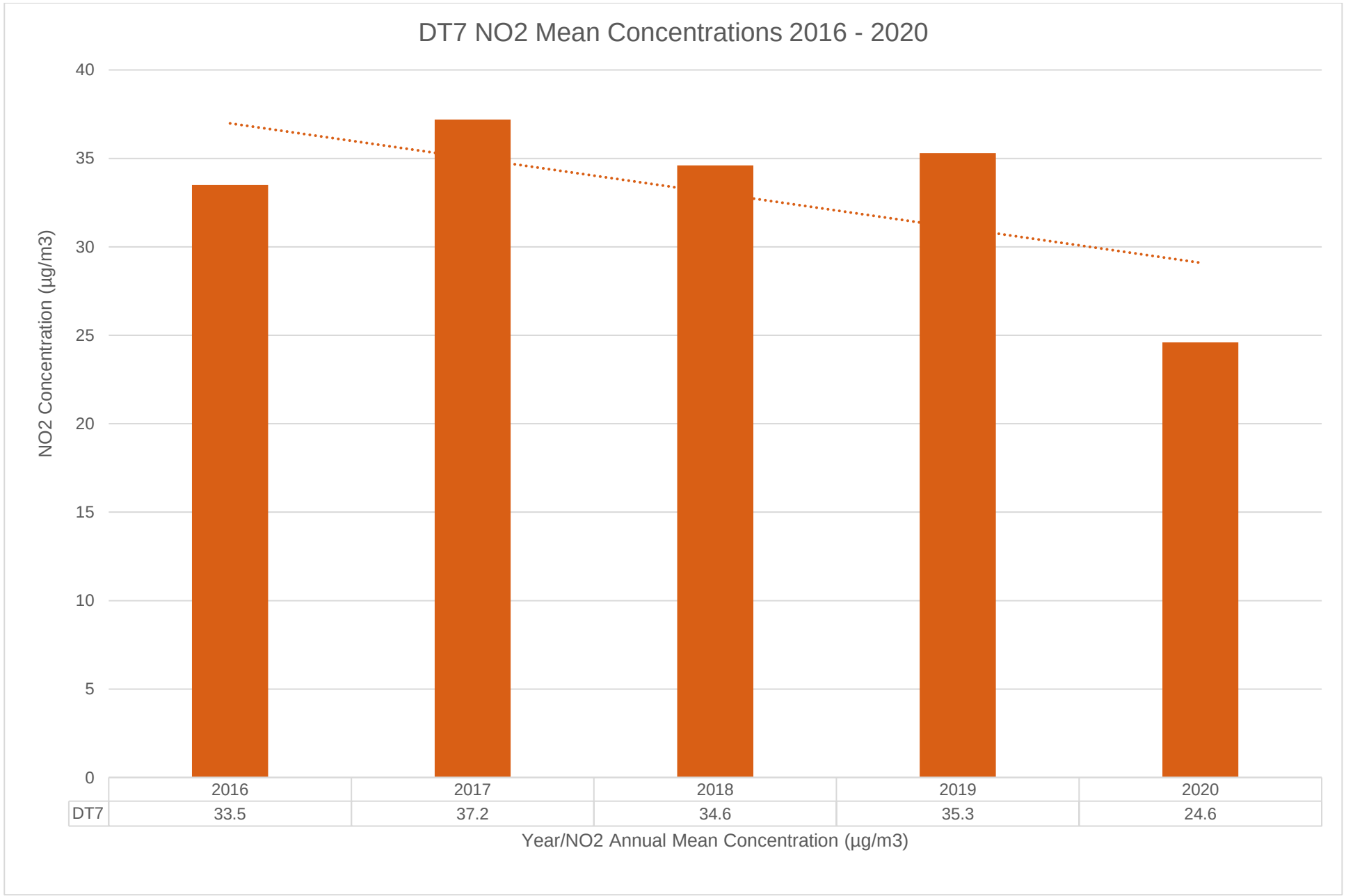

DT2 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT2
21.2
21.6
20.1
19.1
13.9
Year/NO2 Annual Mean Concentration (µg/m3)

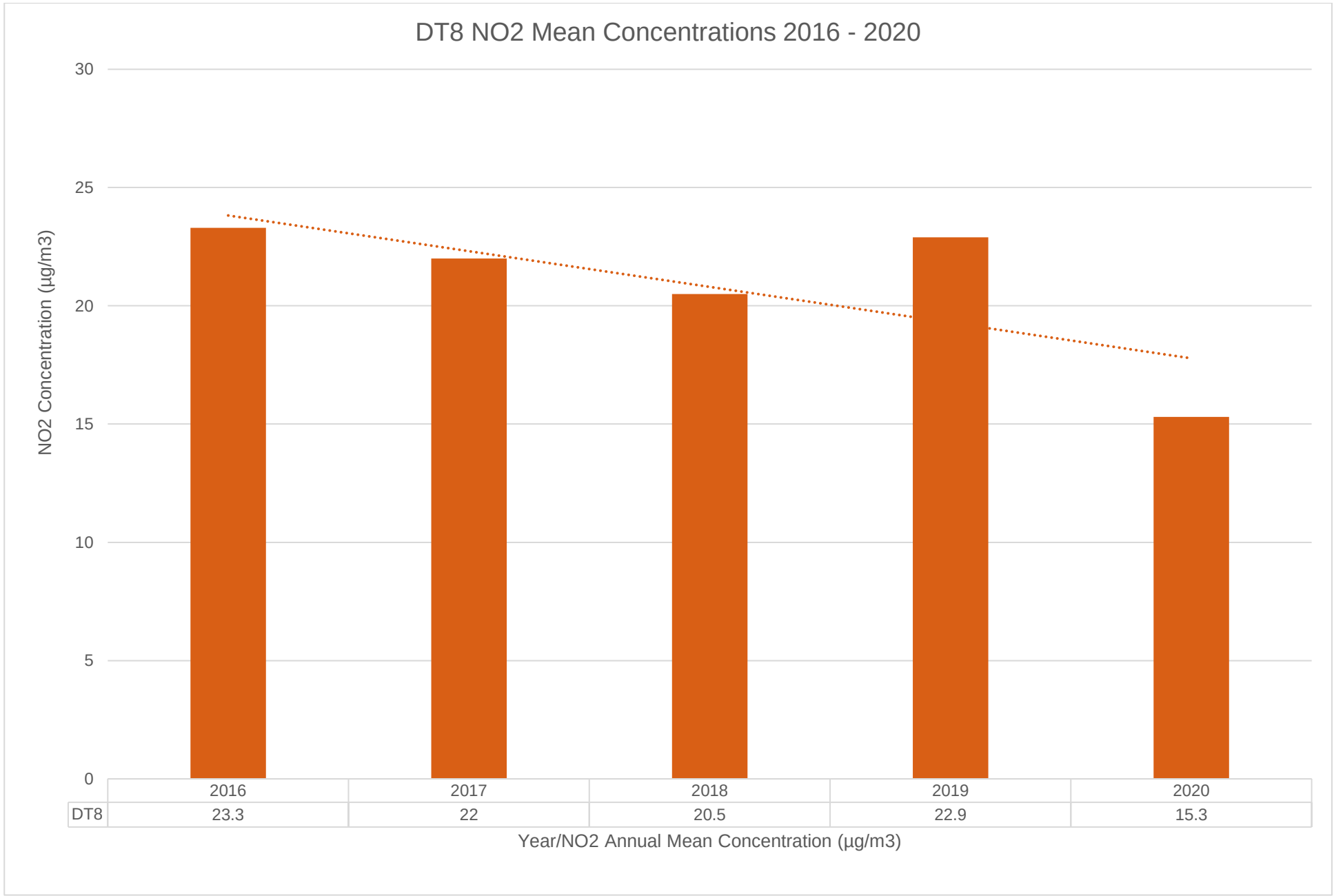

DT3 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT3
19.3
20
18.6
18.2
12.6
Year/NO2 Annual Mean Concentration (µg/m3)

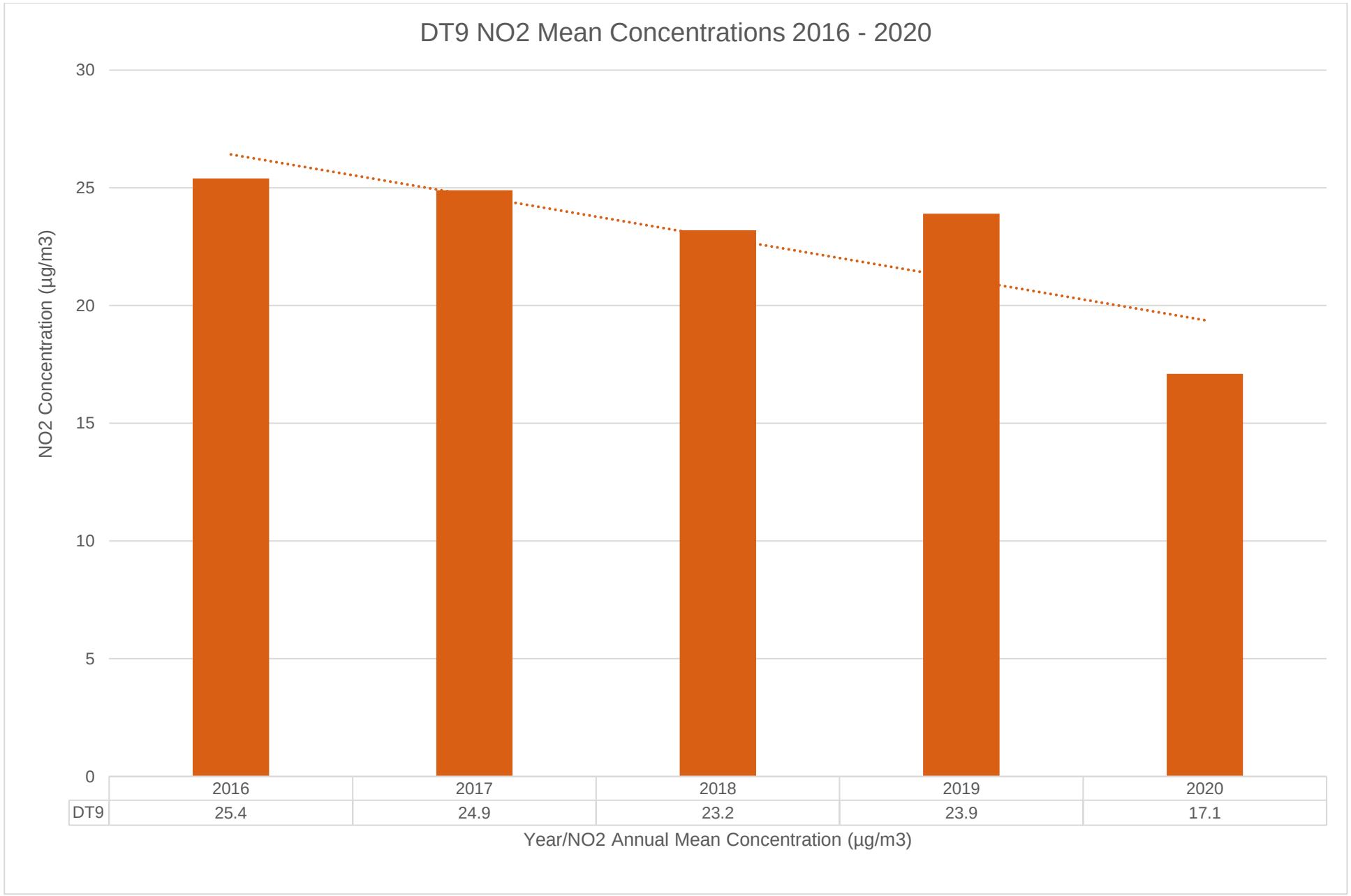

DT4 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT4
29.2
26.7
24.8
21.5
18.7
Year/NO2 Annual Mean Concentration (µg/m3)

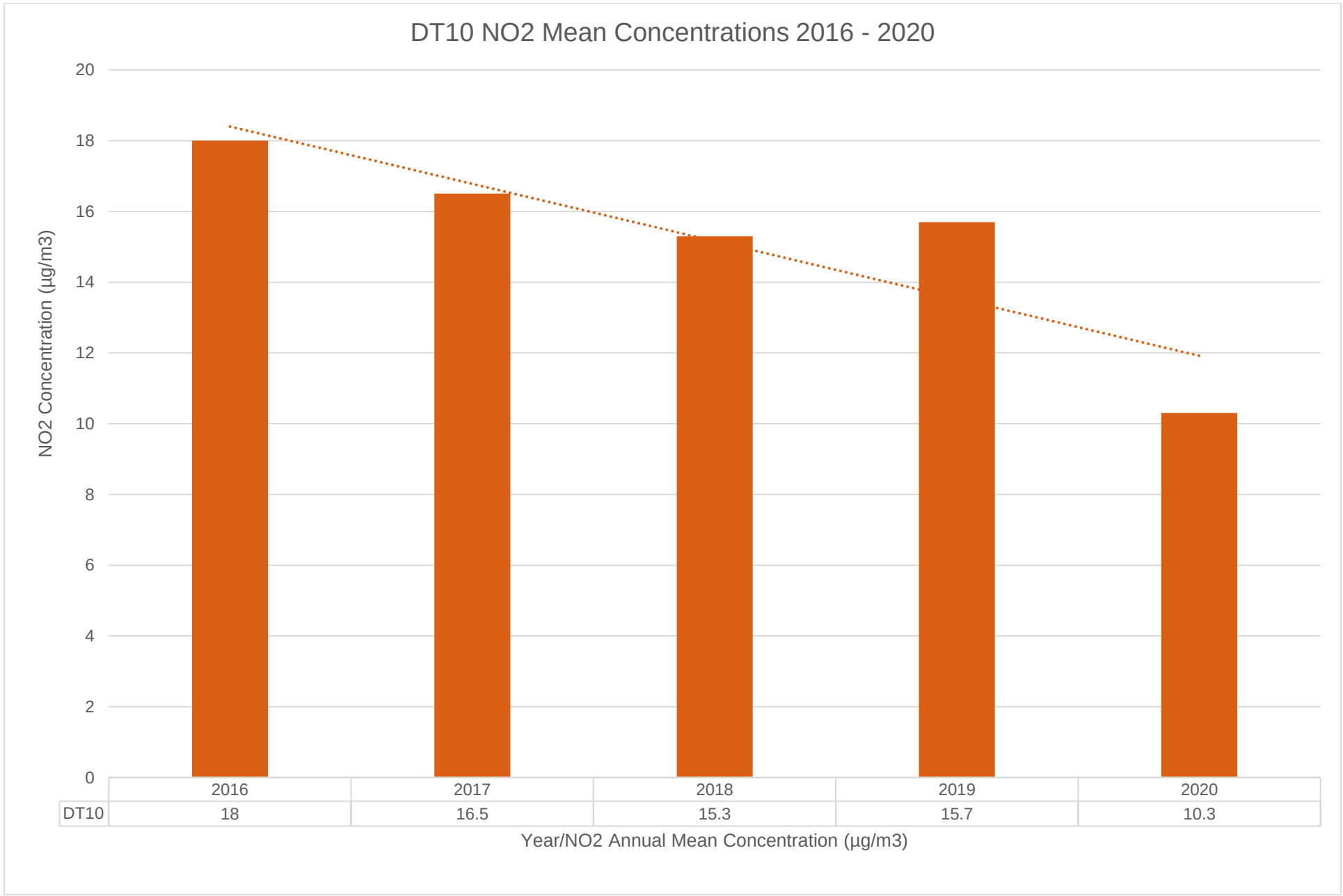

DT5 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT5
30
28.2
26.2
26.9
19.5
Year/NO2 Annual Mean Concentration (µg/m3)

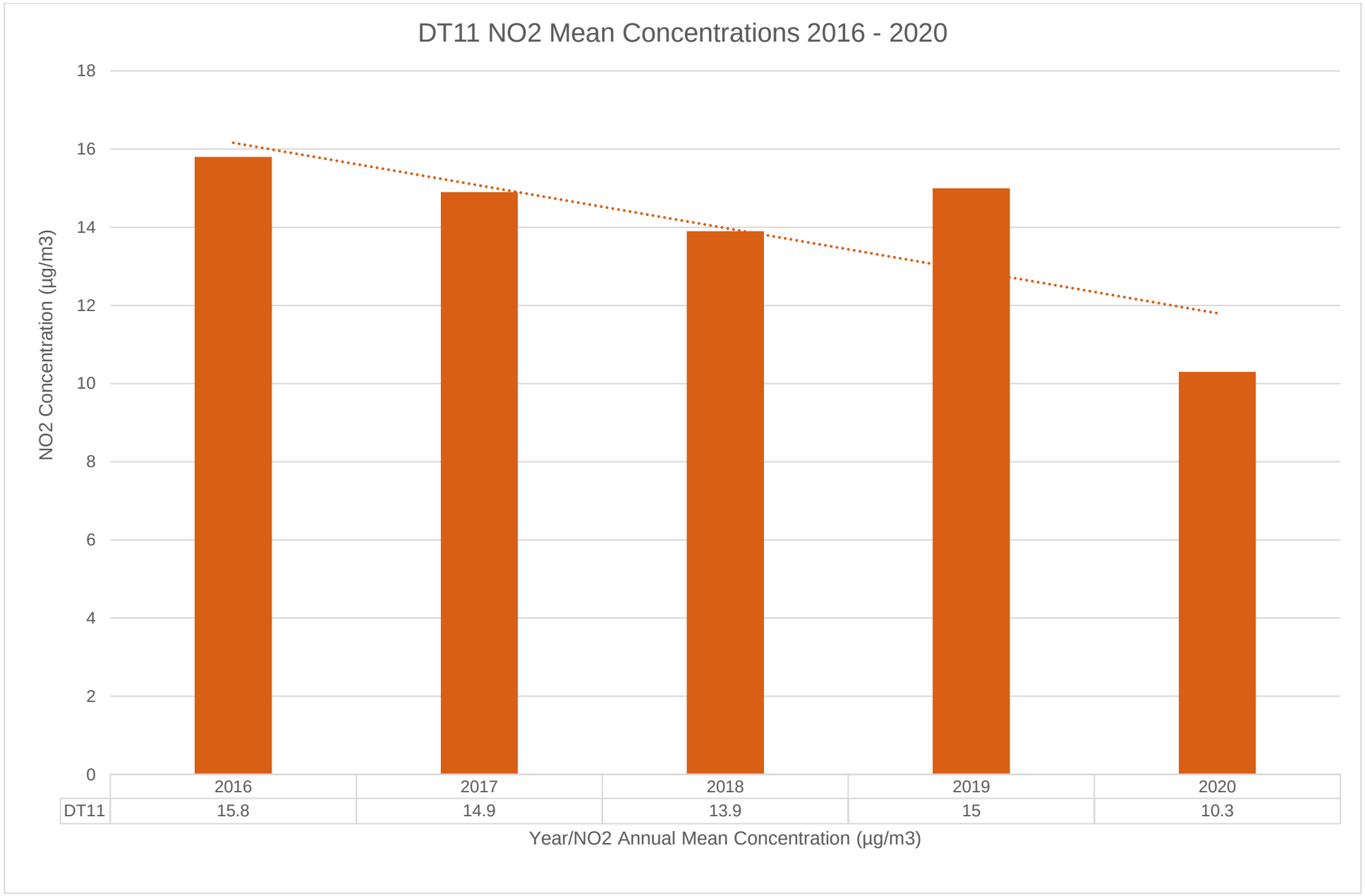

DT6 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT6
13.5
20.2
18.8
19.8
13.2
Year/NO2 Annual Mean Concentration (µg/m3)

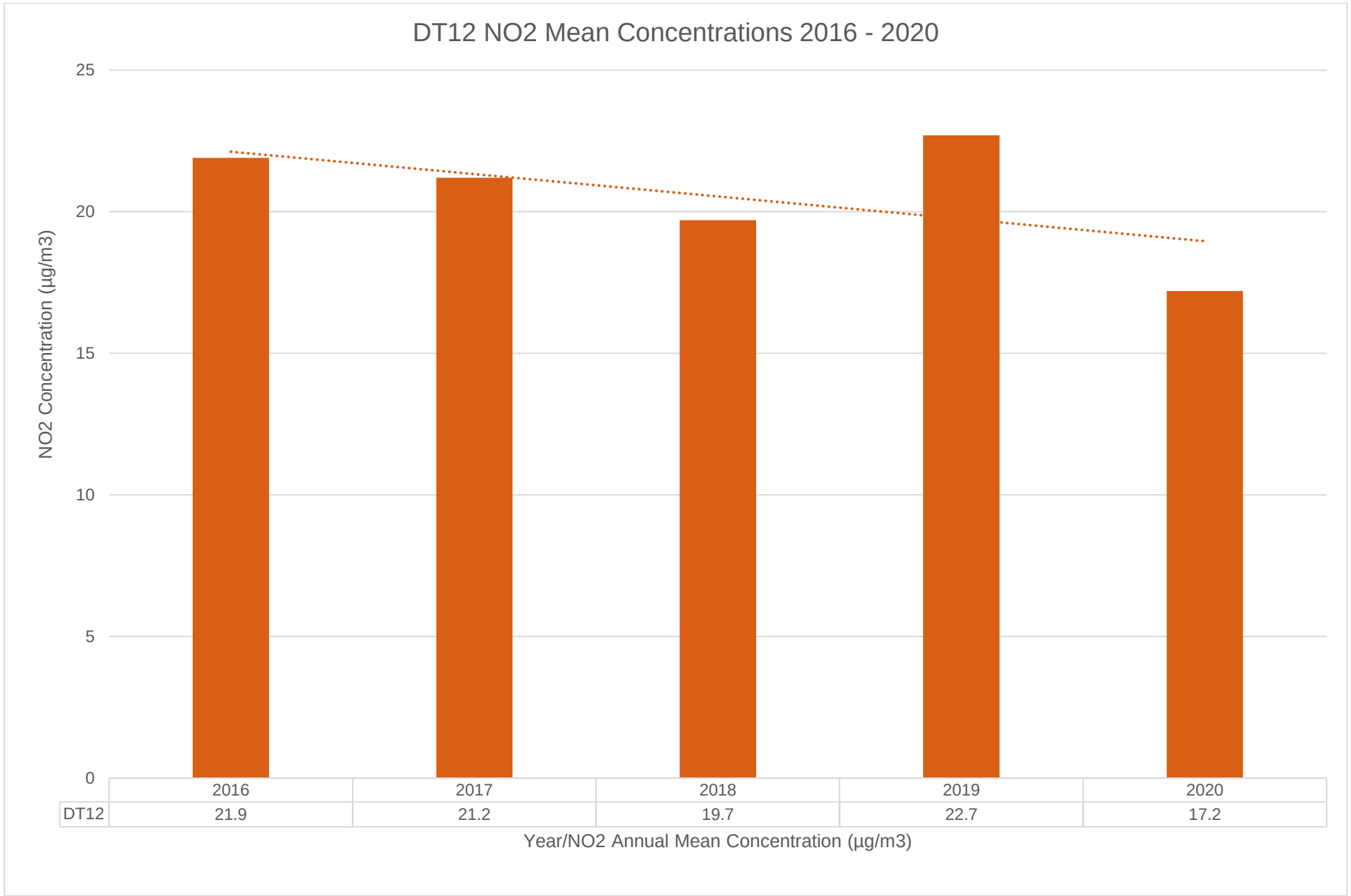

DT7 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
40
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT7
33.5
37.2
34.6
35.3
24.6
Year/NO2 Annual Mean Concentration (µg/m3)

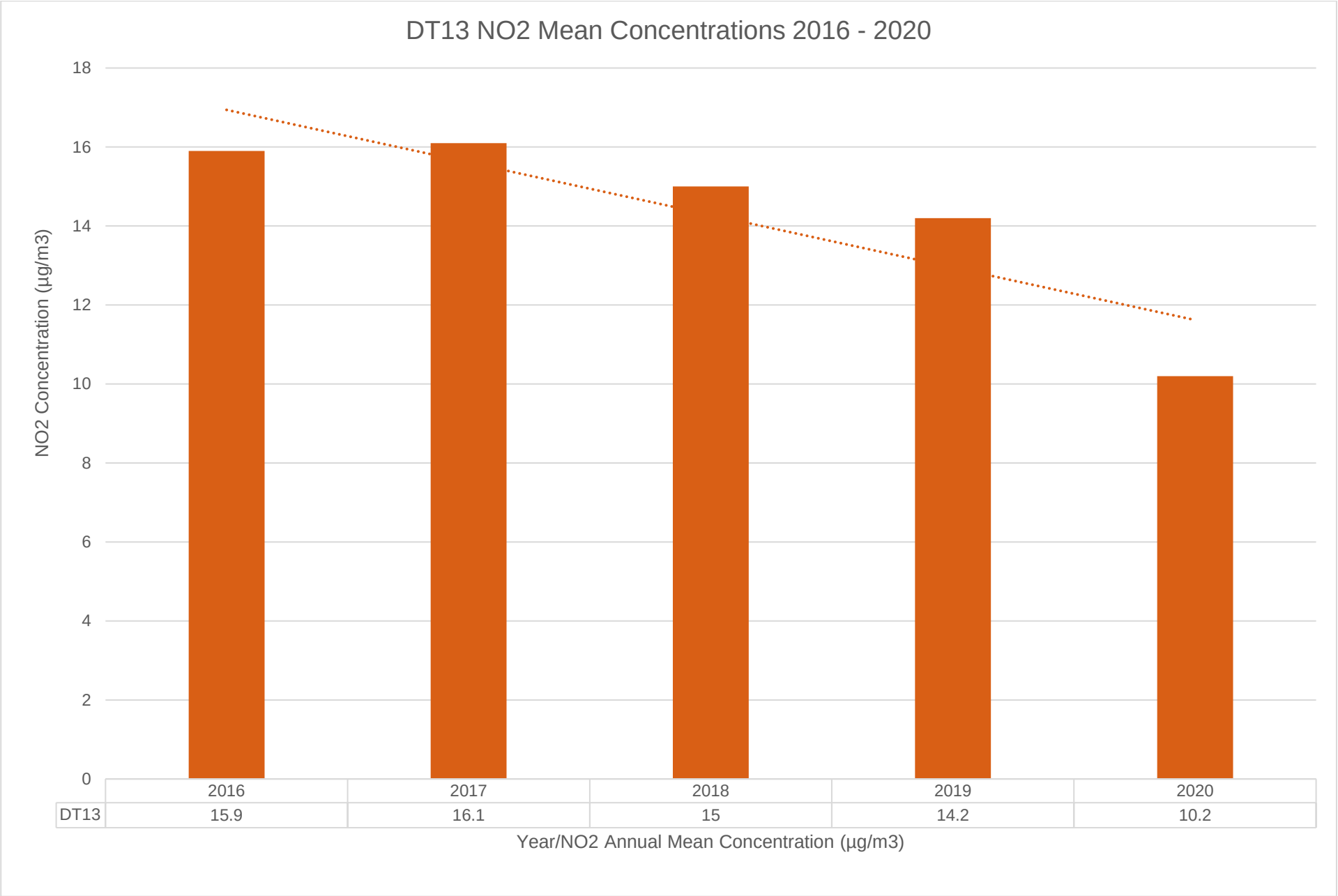

DT8 NO2 Mean Concentrations 2016 - 2020
30
25
20
15
10
5
0
NO2 Concentration (µg/m3)
2016
2017
2018
2019
2020
DT8
23.3
22
20.5
22.9
15.3
Year/NO2 Annual Mean Concentration (µg/m3)

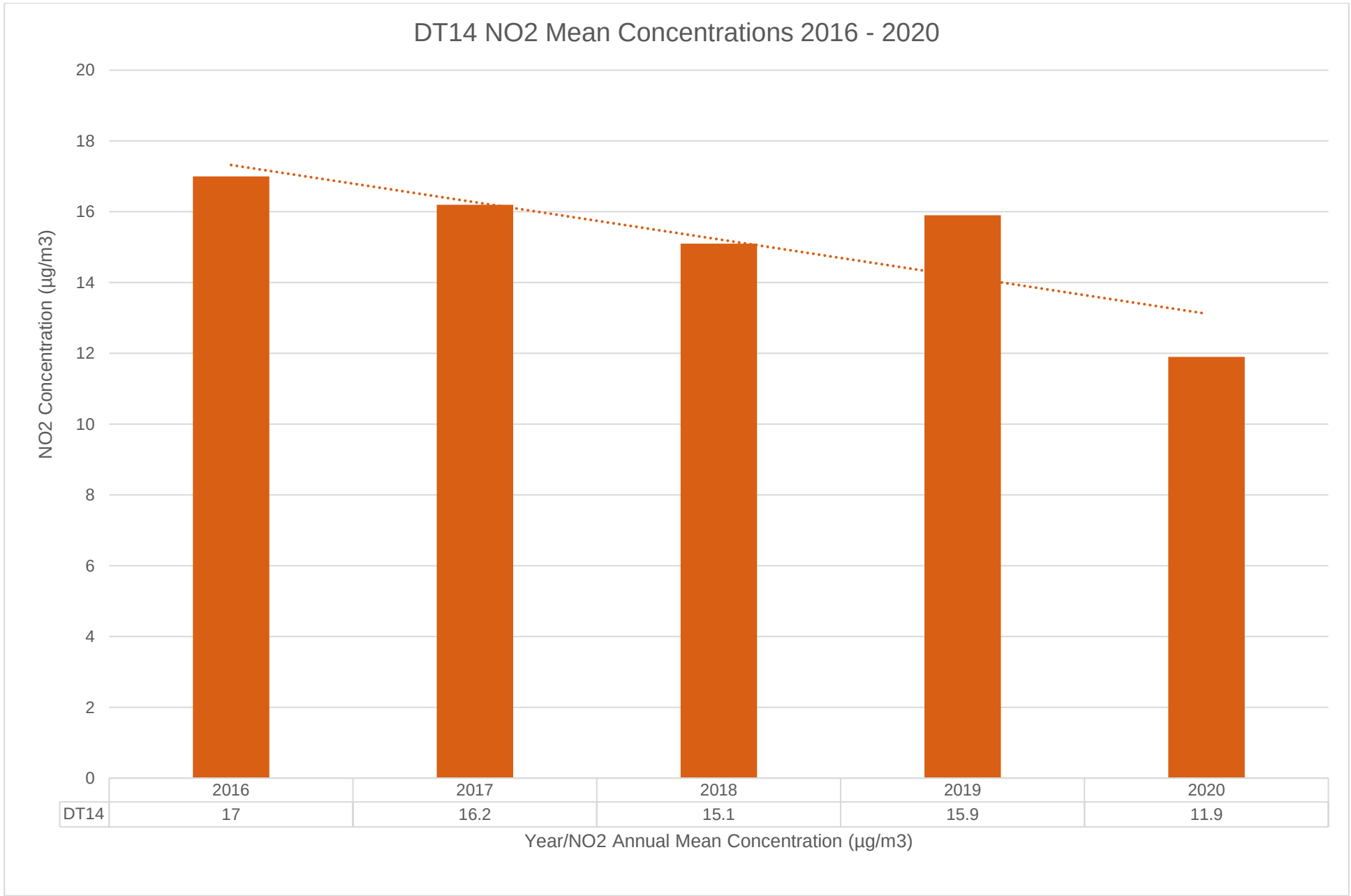

DT9 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT9
25.4
24.9
23.2
23.9
17.1
Year/NO2 Annual Mean Concentration (µg/m3)

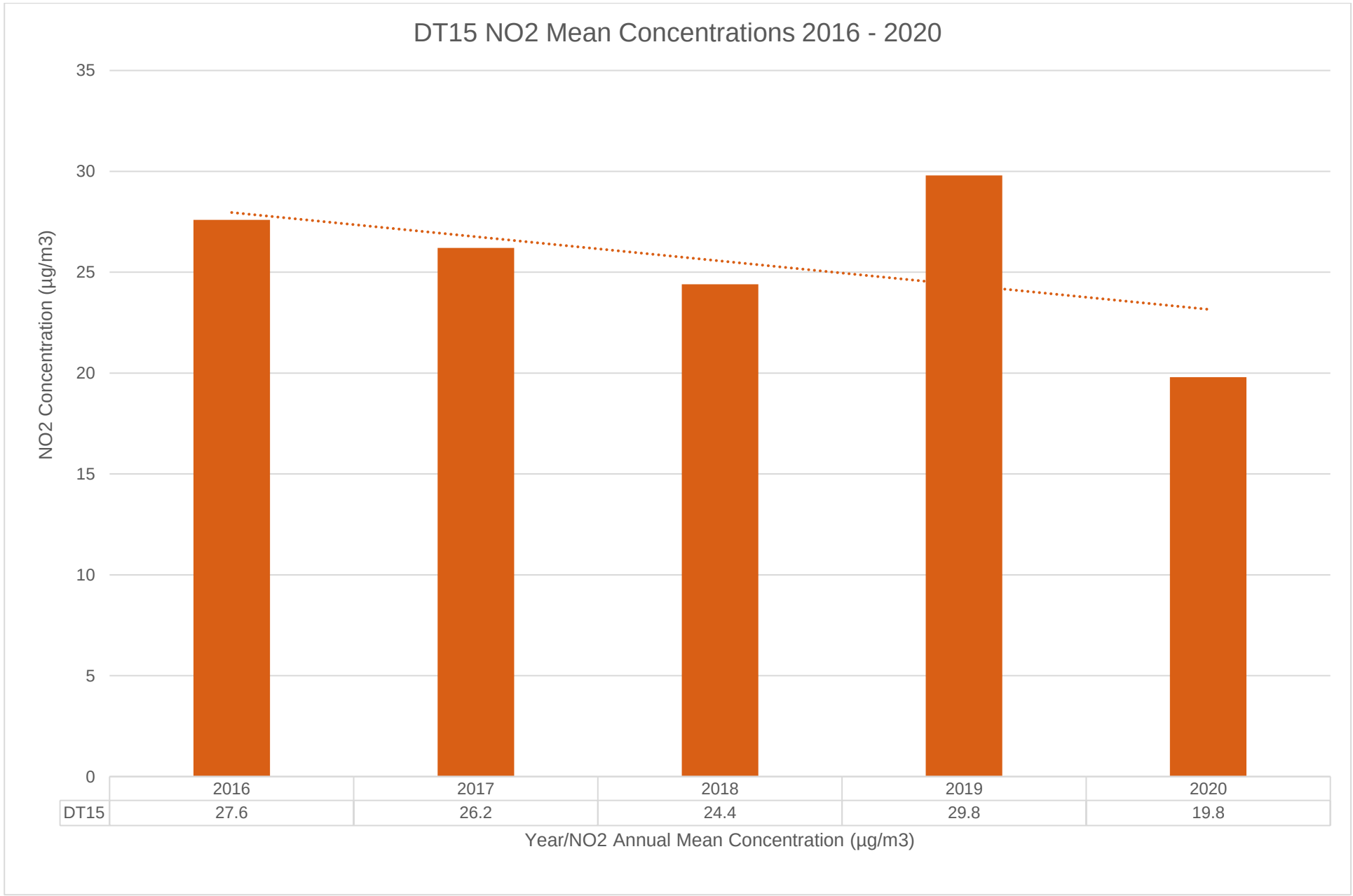

DT10 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
20
18
16
14
12
10
8
6
4
2
0
2016
2017
2018
2019
2020
DT10
18
16.5
15.3
15.7
10.3
Year/NO2 Annual Mean Concentration (µg/m3)

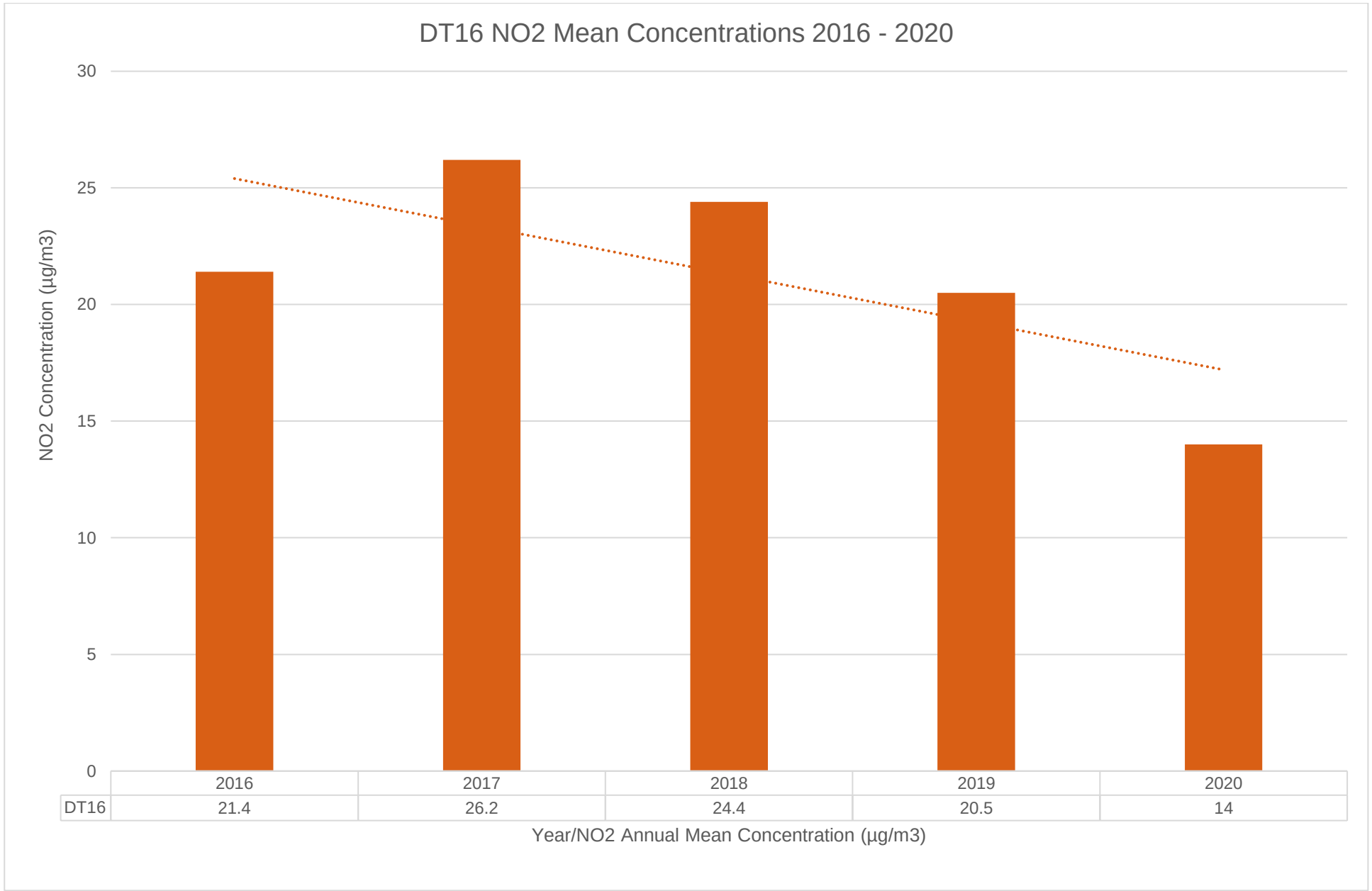

DT11 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
18
16
14
12
10
8
6
4
2
0
2016
2017
2018
2019
2020
DT11
15.8
14.9
13.9
15
10.3
Year/NO2 Annual Mean Concentration (µg/m3)

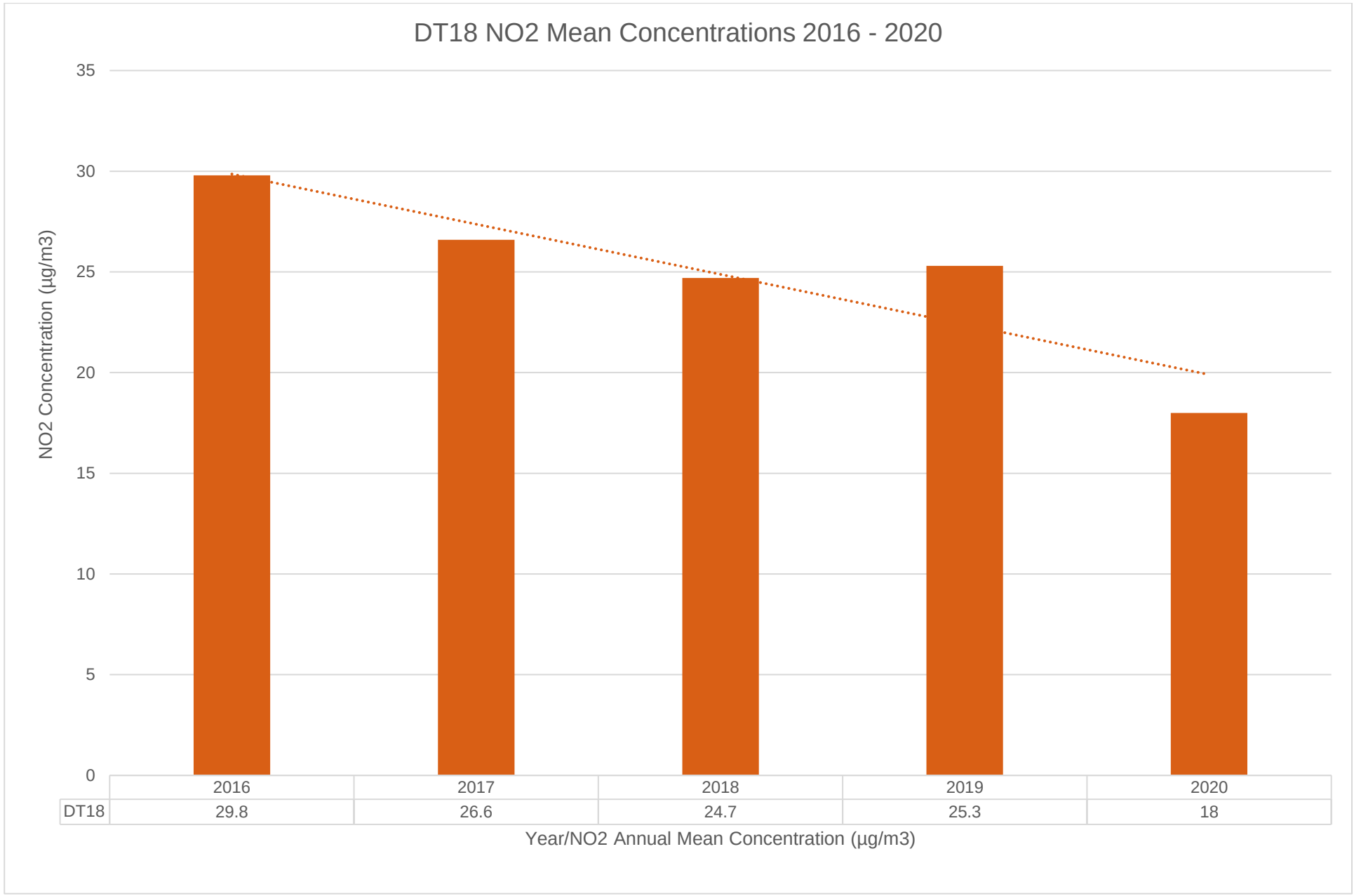

DT12 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT12
21.9
21.2
19.7
22.7
17.2
Year/NO2 Annual Mean Concentration (µg/m3)

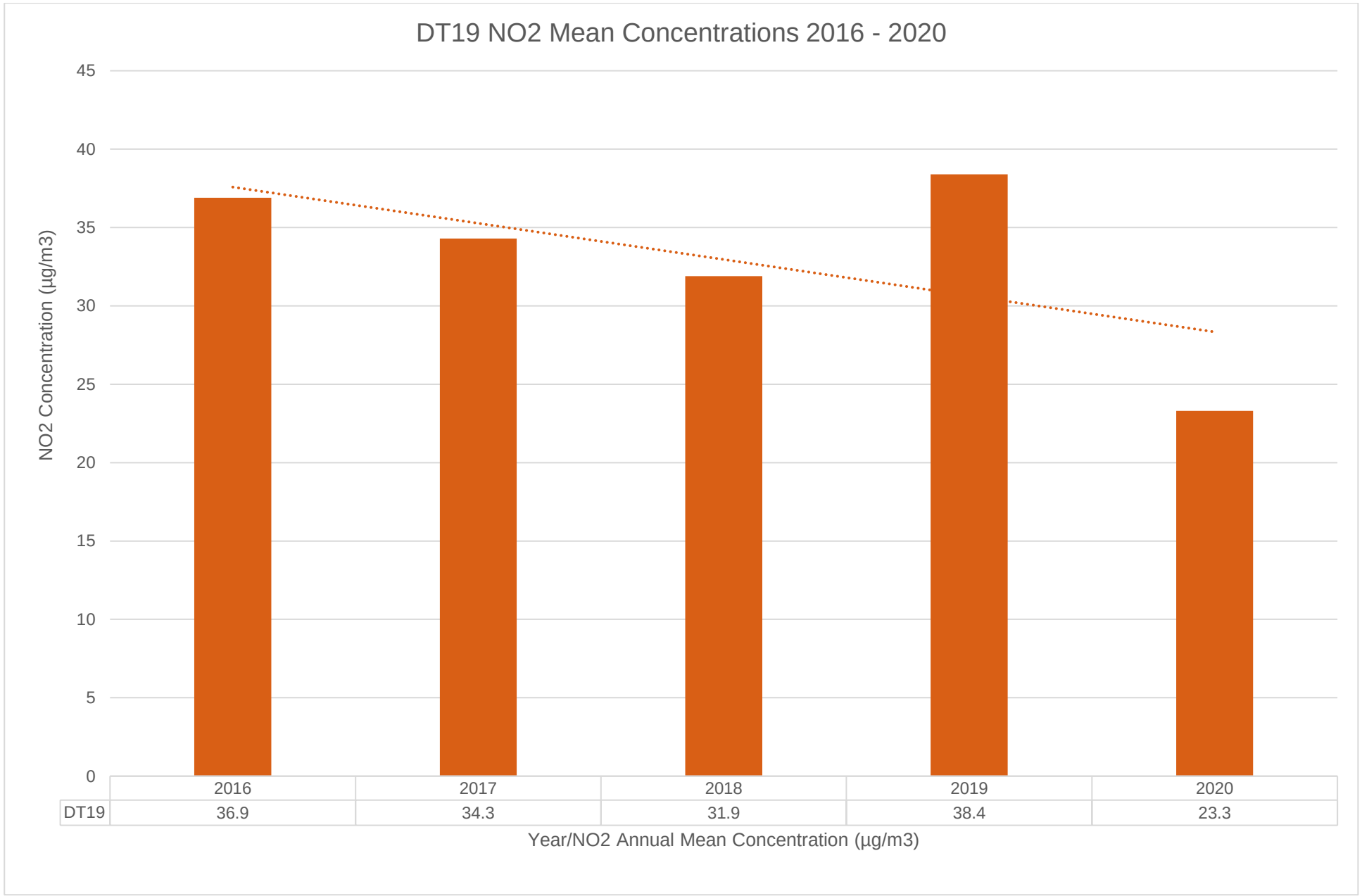

DT13 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
18
16
14
12
10
8
6
4
2
0
2016
2017
2018
2019
2020
DT13
15.9
16.1
15
14.2
10.2
Year/NO2 Annual Mean Concentration (µg/m3)

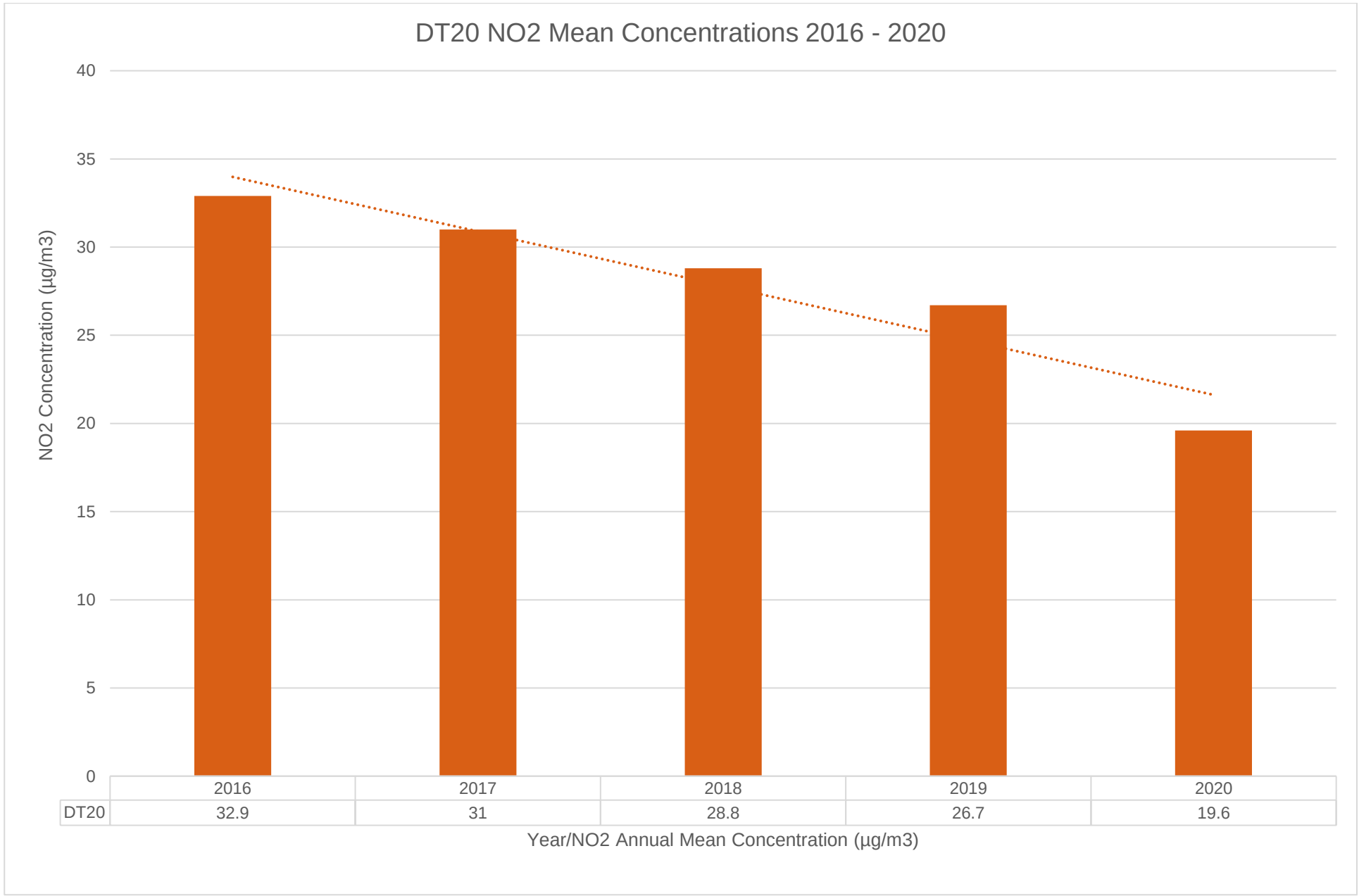

DT14 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
20
18
16
14
12
10
8
6
4
2
0
2016
2017
2018
2019
2020
DT14
17
16.2
15.1
15.9
11.9
Year/NO2 Annual Mean Concentration (µg/m3)

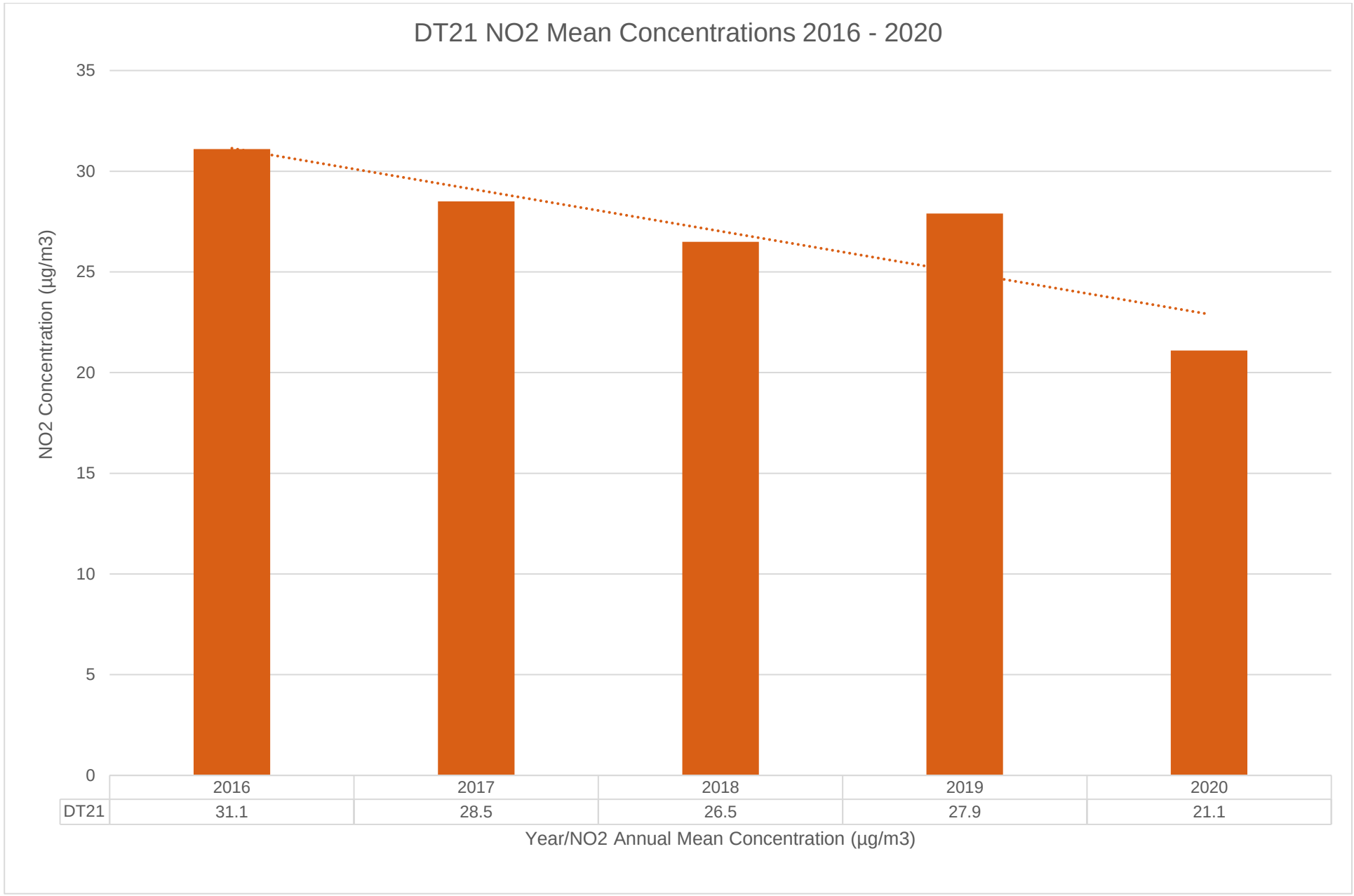

DT15 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT15
27.6
26.2
24.4
29.8
19.8
Year/NO2 Annual Mean Concentration (µg/m3)

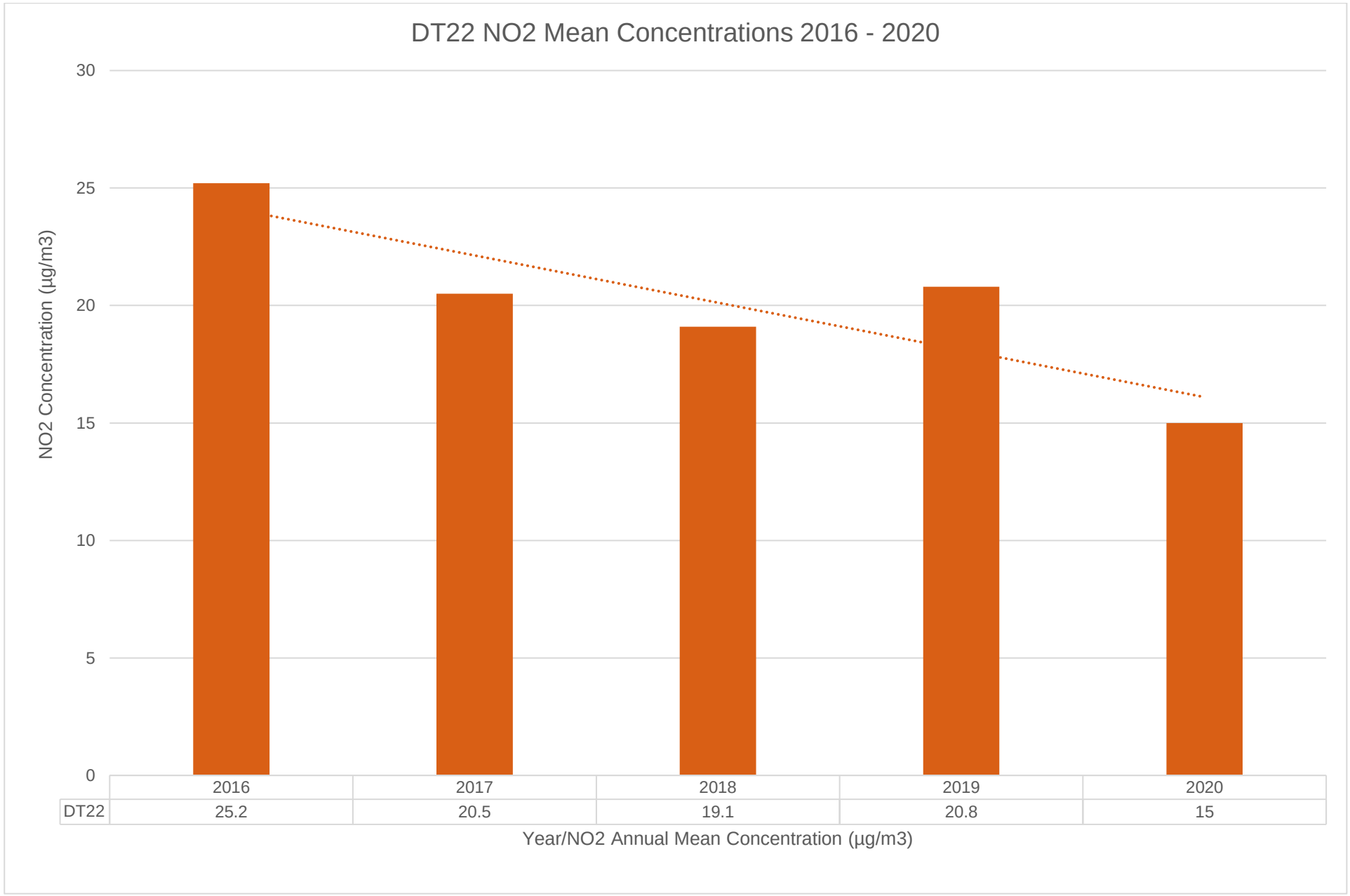

DT16 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT16
21.4
26.2
24.4
20.5
14
Year/NO2 Annual Mean Concentration (µg/m3)

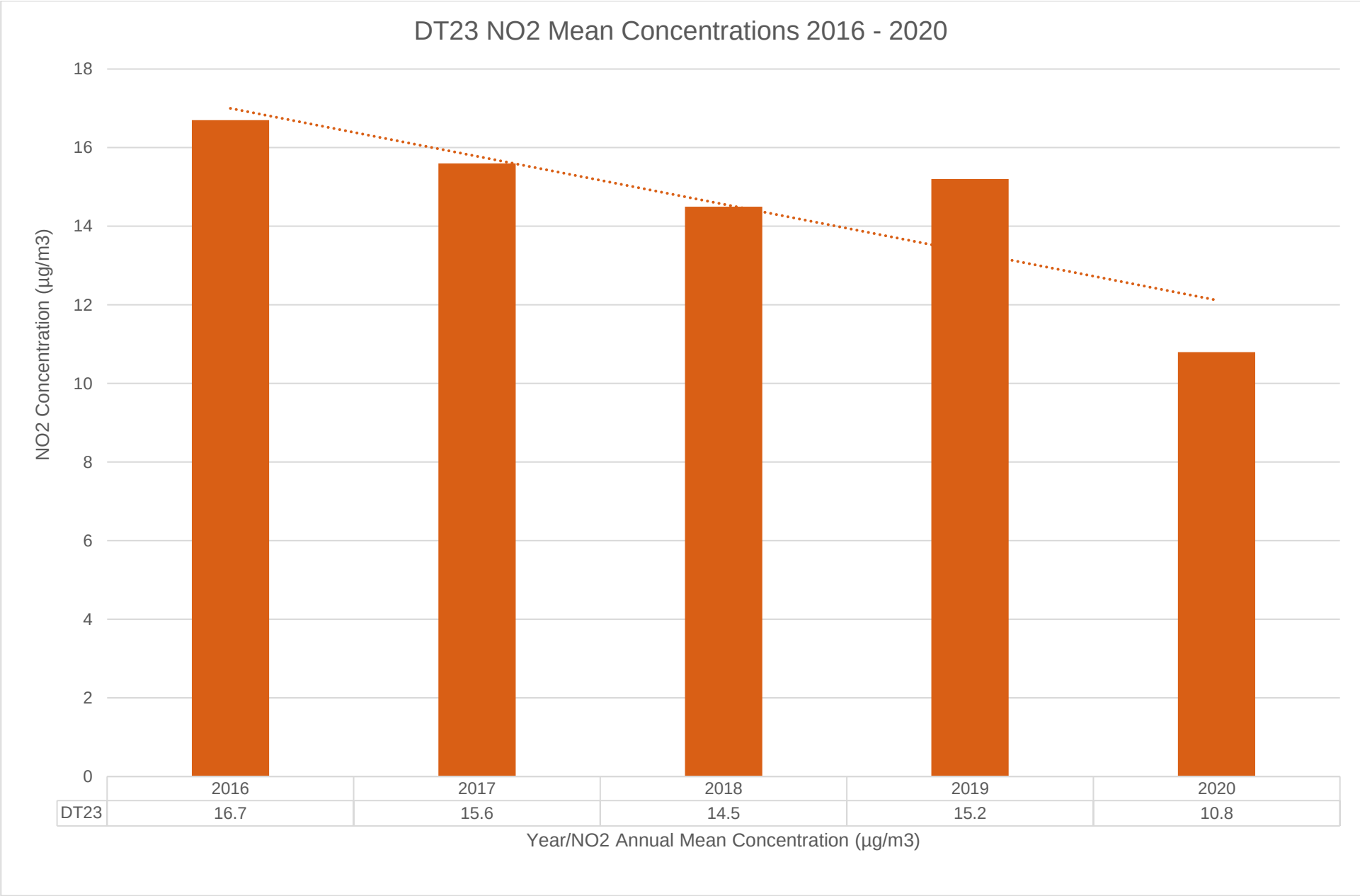

DT18 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT18
29.8
26.6
24.7
25.3
18
Year/NO2 Annual Mean Concentration (µg/m3)

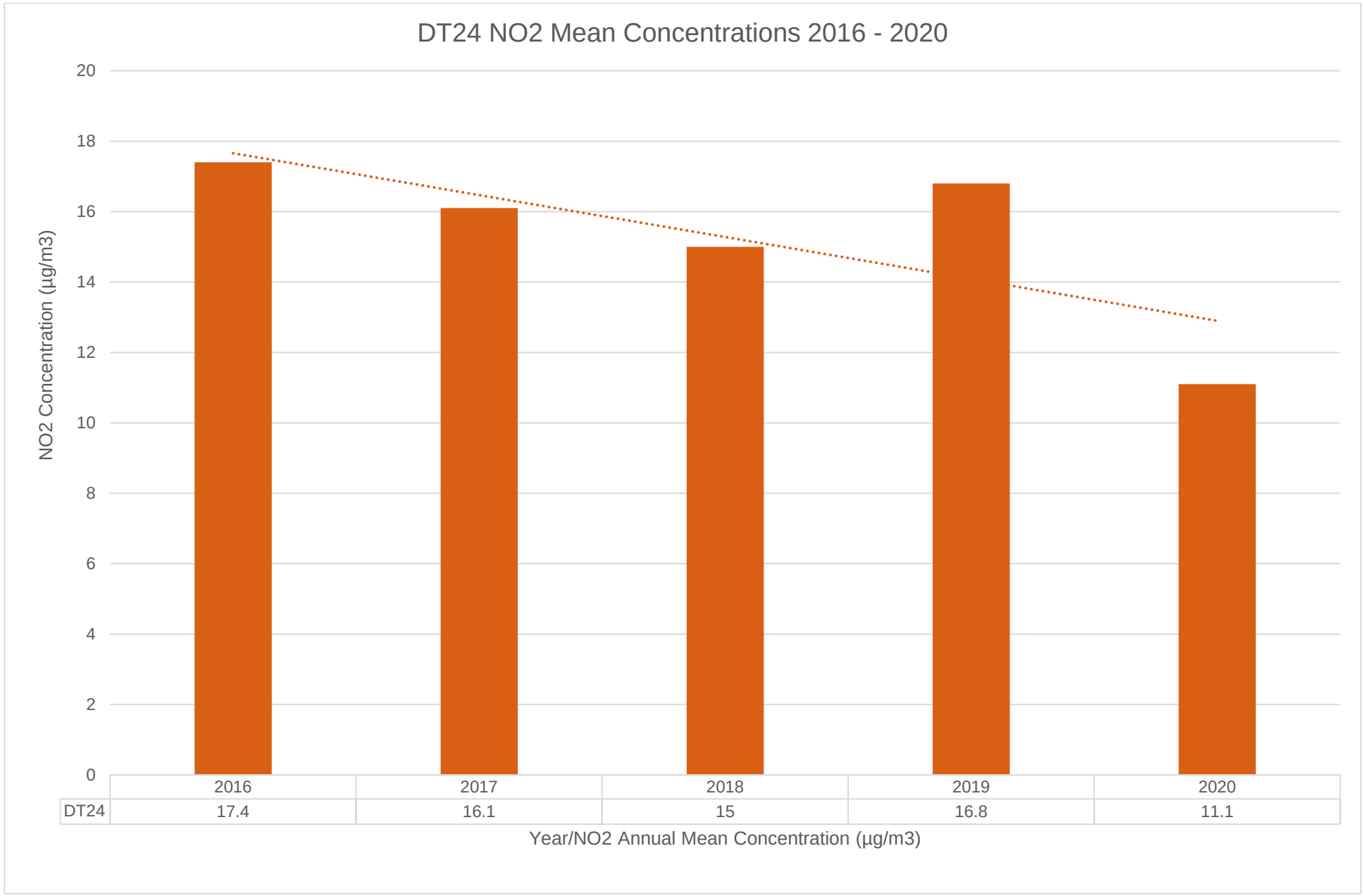

DT19 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
45
40
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT19
36.9
34.3
31.9
38.4
23.3
Year/NO2 Annual Mean Concentration (µg/m3)

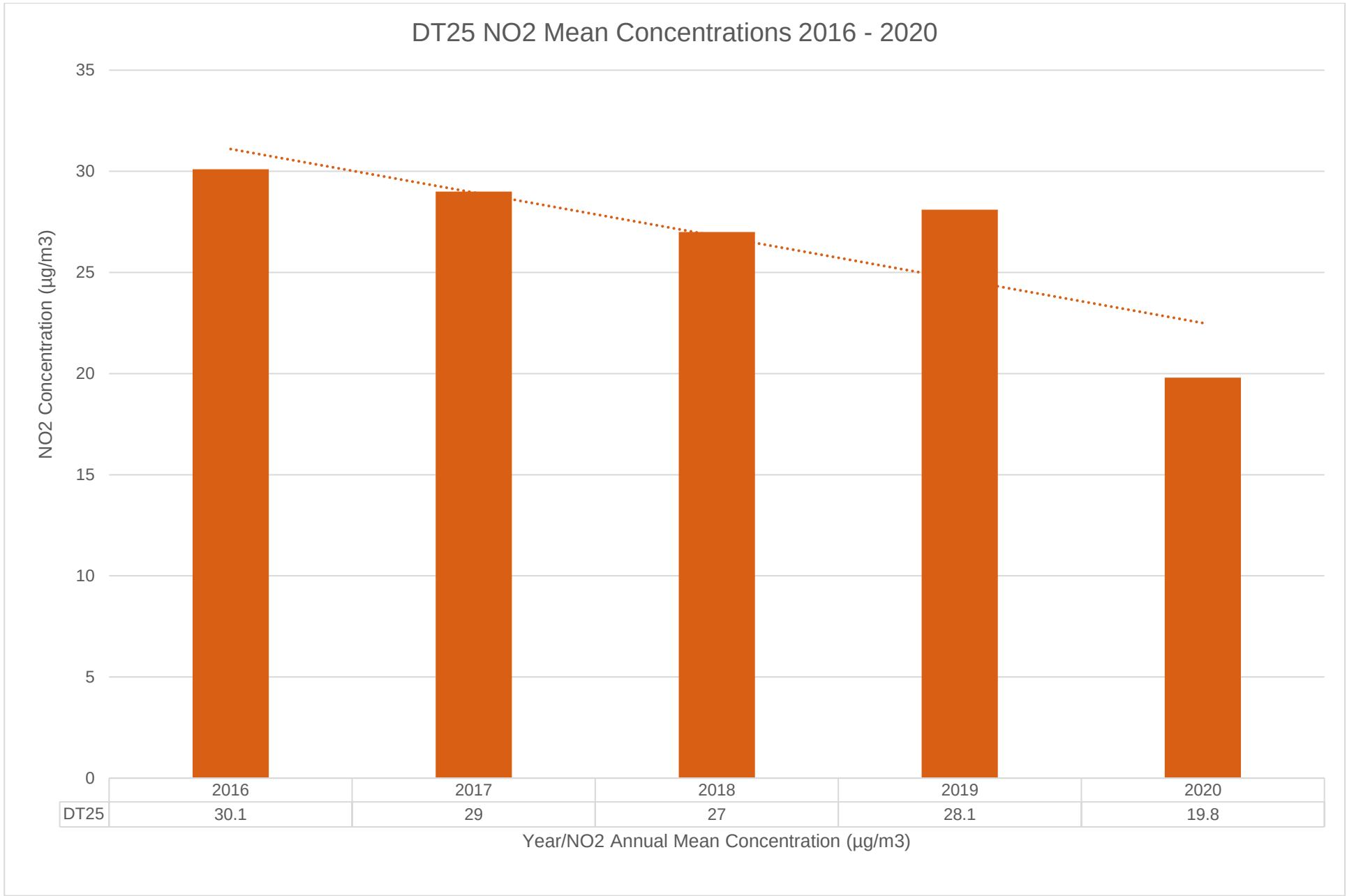

DT20 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
40
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT20
32.9
31
28.8
26.7
19.6
Year/NO2 Annual Mean Concentration (µg/m3)

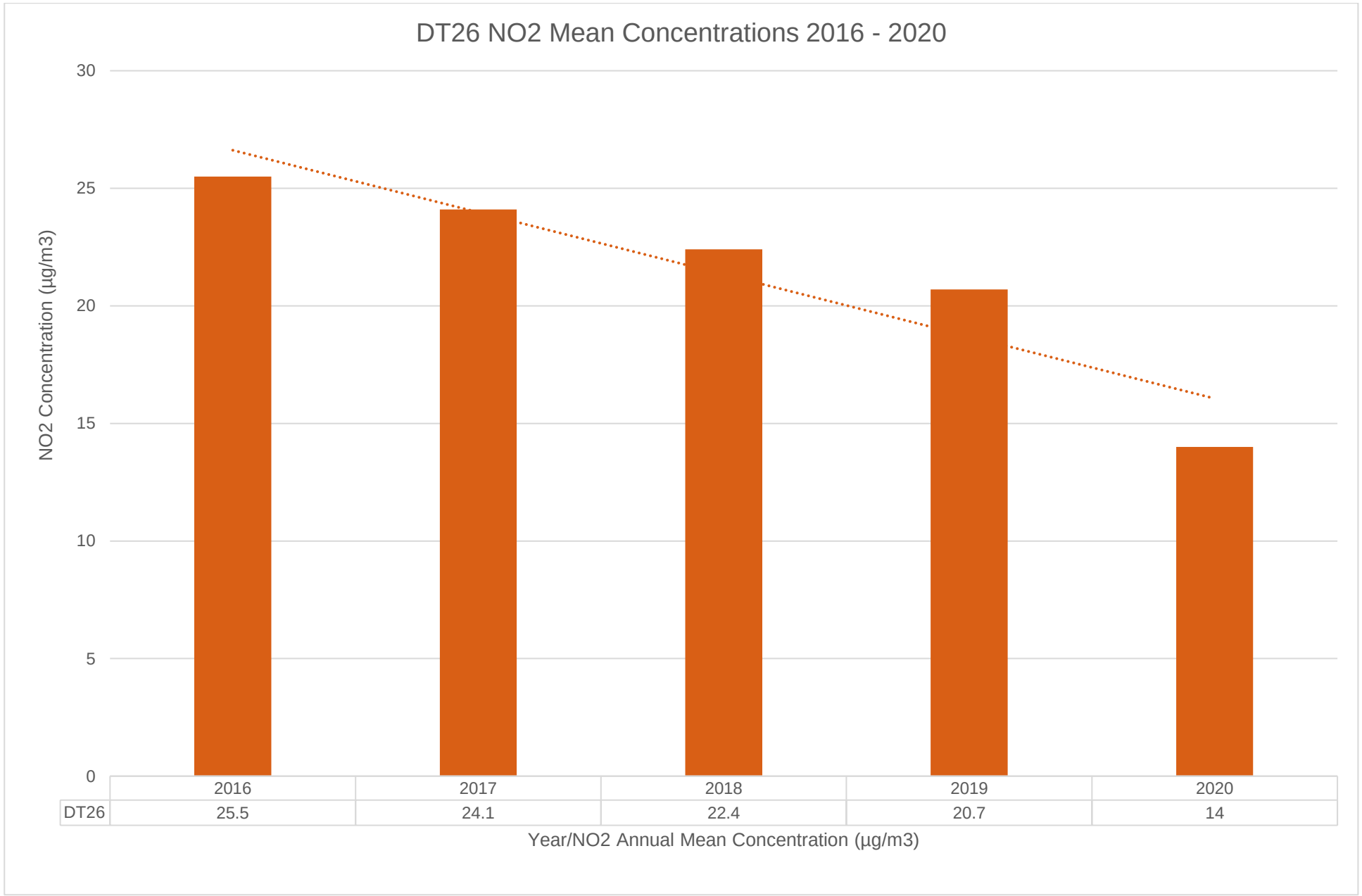

DT21 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT21
31.1
28.5
26.5
27.9
21.1
Year/NO2 Annual Mean Concentration (µg/m3)

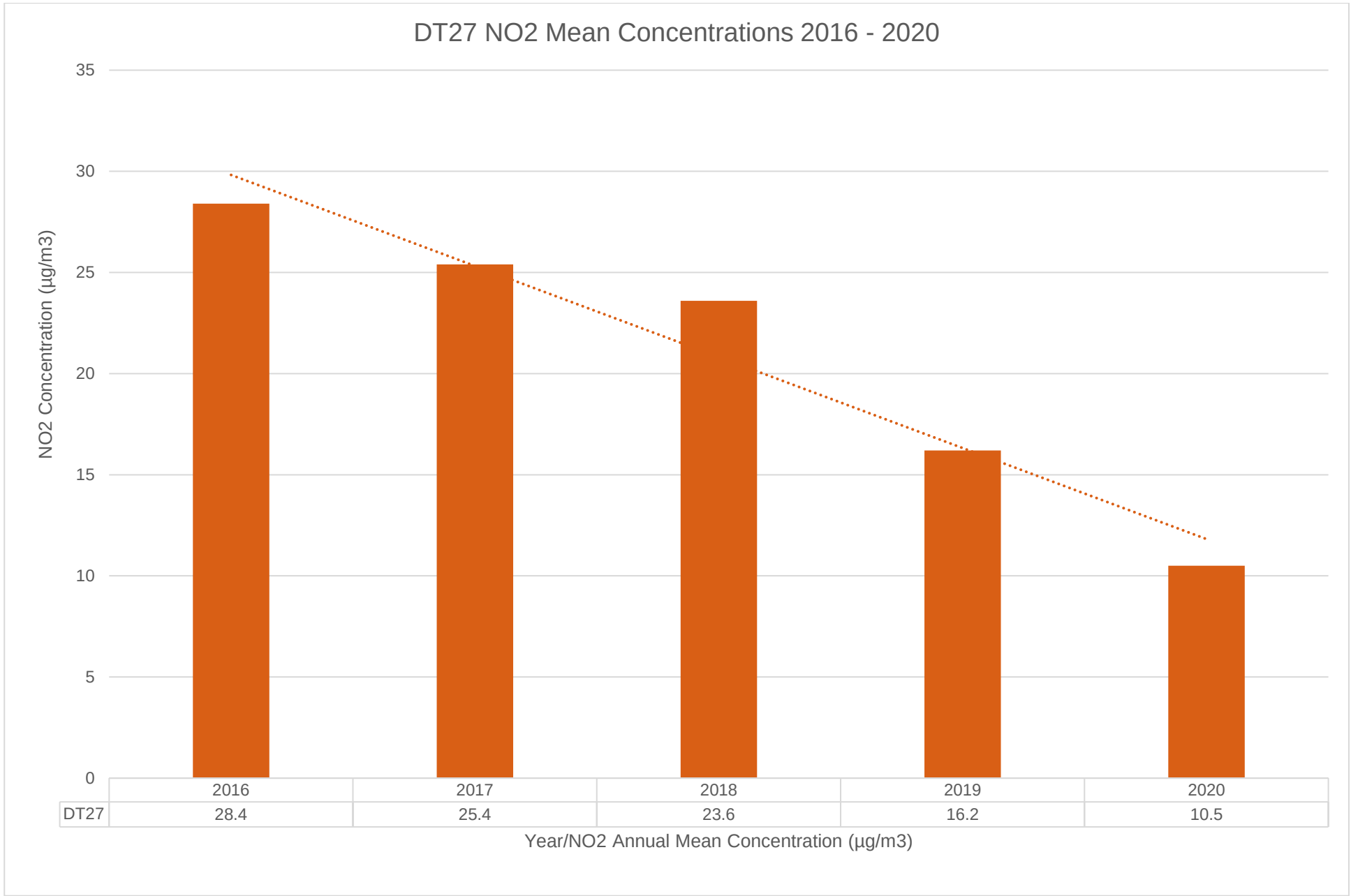

DT22 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT22
25.2
20.5
19.1
20.8
15
Year/NO2 Annual Mean Concentration (µg/m3)

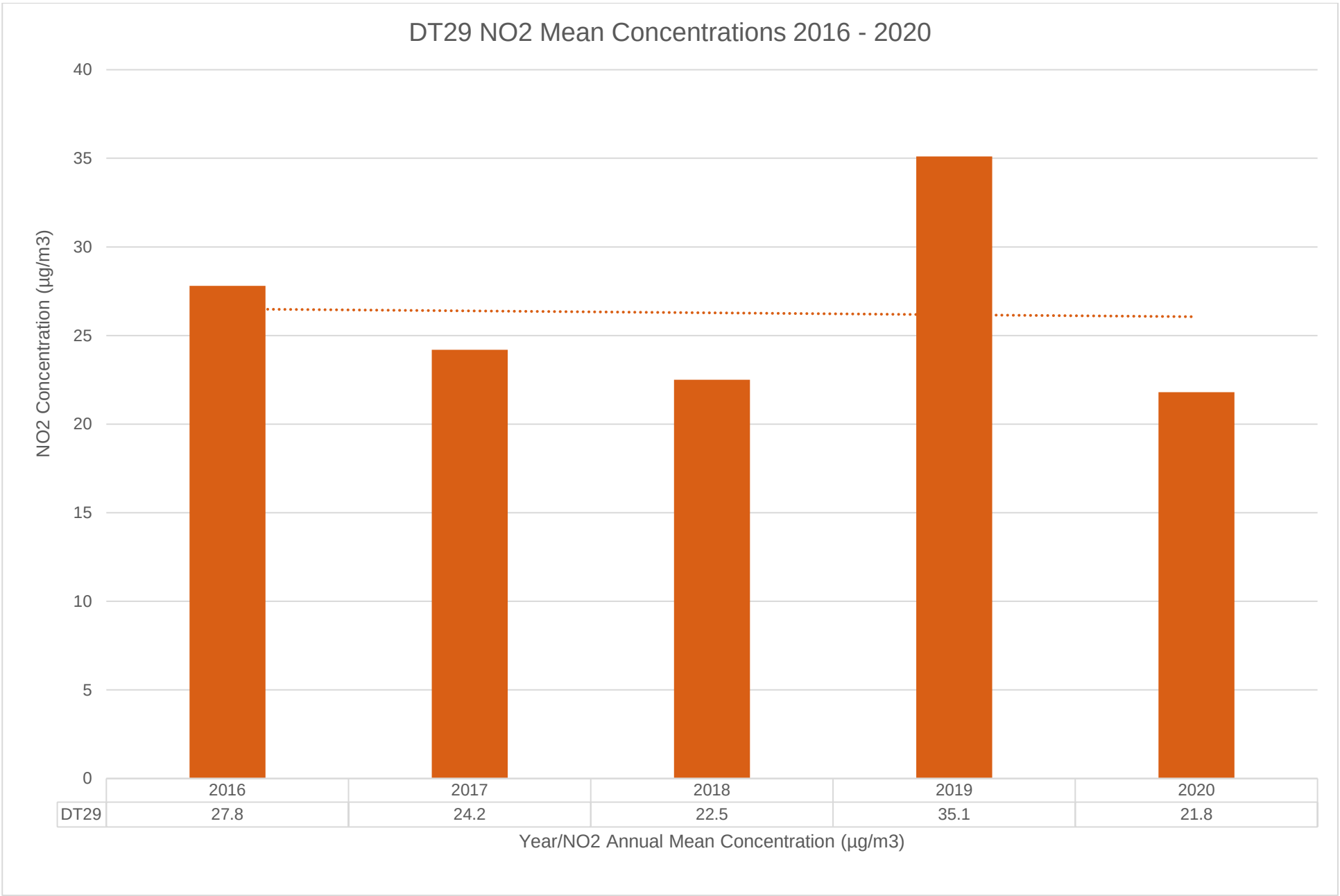

DT23 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
18
16
14
12
10
8
6
4
2
0
2016
2017
2018
2019
2020
DT23
16.7
15.6
14.5
15.2
10.8
Year/NO2 Annual Mean Concentration (µg/m3)


DT24 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
20
18
16
14
12
10
8
6
4
2
0
2016
2017
2018
2019
2020
DT24
17.4
16.1
15
16.8
11.1
Year/NO2 Annual Mean Concentration (µg/m3)


DT25 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT25
30.1
29
27
28.1
19.8
Year/NO2 Annual Mean Concentration (µg/m3)


DT26 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT26
25.5
24.1
22.4
20.7
14
Year/NO2 Annual Mean Concentration (µg/m3)


DT27 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT27
28.4
25.4
23.6
16.2
10.5
Year/NO2 Annual Mean Concentration (µg/m3)


DT29 NO2 Mean Concentrations 2016 - 2020
NO2 Concentration (µg/m3)
40
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
DT29
27.8
24.2
22.5
35.1
21.8
Year/NO2 Annual Mean Concentration (µg/m3)

Appendix B: Full Monthly Diffusion Tube Results for 2020

Table B.1 – NO_2 2020 Diffusion Tube Results (µg/m^3) – South Norfolk

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.81)	Annual Mean: Distance Corrected to Nearest Exposure
	619245	305653	27.0	22.0	12.0		11.0	14.0	15.0	17.0	17.0	23.0	26.0		17.3	14.0	-
T	616934	310462	26.0	21.0	12.0		12.0	16.0	15.0	19.0	18.0	23.0	19.0		17.1	13.9	-
DT3	626790	302088	22.0	20.0	11.0		12.0	13.0	13.0	14.0	16.0	21.0	24.0		15.6	12.6	-
DT4	611943	279567	25.0	24.0	18.0		21.0	22.0	24.0	27.0	24.0	23.0	32.0		23.1	18.7	-
DT	636210	298771	33.0	26.0	18.0		21.0	21.0	25.0	26.0	24.0	28.0	30.0		24.1	19.5	-
DT6	619725	292748	33.0	15.0	14.0		14.0	14.0	15.0	15.0	13.0	15.0	20.0		16.2	13.2	-
DT7	611100	301436	44.0	34.0	20.0		25.0	27.0	30.0	33.0	36.0	34.0	39.0		30.3	24.6	-
DT8	625438	306163	24.0	20.0	15.0		16.0	14.0	17.0	20.0	23.0	21.0	27.0		18.9	15.3	-
DT9	612514	302653	34.0	27.0	14.0		18.0	18.0	19.0	20.0	21.0	23.0	31.0		21.1	17.1	-
DT10	618138	305619	17.0	12.0	10.0		13.0	10.0	11.0	11.0	12.0	17.0	21.0		12.7	10.3	-
DT11	611529	300995	18.0	13.0	9.0		11.0	9.0	12.0	12.0	13.0	17.0	21.0		12.7	10.3	-
DT12	612704	302788	27.0	23.0	15.0		16.0	19.0	20.0	24.0	23.0	27.0	30.0		21.2	17.2	-
DT13	611367	301622	19.0	14.0	9.0		9.0	10.0	10.0	11.0	13.0	17.0	22.0		12.6	10.2	-
DT14	624476	283267	21.0	14.0	11.0		10.0	25.0	10.0	12.0	14.0	18.0	21.0		14.7	11.9	-
DT15	614902	278861	37.0	25.0	21.0		22.0	15.0	22.0	24.0	24.0	29.0	34.0		24.4	19.8	-
DT16	616984	311560	26.0	19.0	13.0		14.0	14.0	16.0	18.0	17.0	20.0	25.0		17.3	14.0	-
DT17	619714	292717	25.0	30.0	20.0		24.0	25.0	27.0	27.0	28.0	36.0	38.0		26.8	21.7	-
DT18	619731	292745	31.0	23.0	17.0		19.0	15.0	22.0	24.0	26.0	25.0	30.0		22.2	18.0	-
DT19	619643	292348	44.0	31.0	18.0		24.0	24.0	29.0	32.0	36.0	34.0	35.0		28.8	23.3	-

DT ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.81)	Annual Mean: Distance Corrected to Nearest Exposure
DT20	619685	292629	36.0	28.0	18.0		19.0	20.0	22.0	24.0	23.0	32.0	32.0		24.1	19.6	-
DT21	619711	292720	33.0	26.0	19.0		22.0	22.0	27.0	33.0	33.0	25.0	32.0		26.0	21.1	-
DT22	618991	309891	26.0	18.0	14.0		14.0	15.0	18.0	19.0	21.0	23.0	26.0		18.5	15.0	-
DT23	611325	301191	20.0	15.0	10.0		10.0	10.0	11.0	12.0	13.0	18.0	22.0		13.3	10.8	-
DT24	619821	293028	16.0	14.0	12.0		13.0	10.0	12.0	13.0	16.0	15.0	20.0		13.7	11.1	-
DT25	619772	305851	31.0	30.0	16.0		17.0	20.0	24.0	26.0	35.0	27.0	34.0		24.4	19.8	-
DT26	616852	310342	28.0	18.0	13.0		15.0	14.0	14.0	17.0	17.0	20.0	27.0		17.3	14.0	-
DT27	617170	311659	15.0	11.0	9.0		15.0	10.0	13.0	16.0	16.0	12.0	19.0		12.9	10.5	-
DT28	624633	283505	16.0	16.0	9.0		10.0	9.0	10.0	12.0	14.0	16.0	20.0		12.4	10.1	-
DT29	611785	279593		38.0	25.0		23.0	22.0	25.0	27.0	21.0	28.0	38.0		26.9	21.8	-
DT30	611779	279590			15.0		17.0	18.0	21.0	21.0	22.0	19.0	31.0		19.5	15.8	-

Table B.2 – NO_2 2020 Diffusion Tube Results (µg/m^3) – Broadland

DT ID		X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.81)	Annual Mean: Distance Corrected to Nearest Exposure
BN4		626918	308740	21.0	13.0	8.0		7.0	8.0	8.0	9.0	12.0	16.0	22.0		11.6	9.4	-
BN6		626317	311012	22.0	17.0	9.0		7.0	8.0	8.0	9.0	12.0	19.0	1.0		10.7	8.6	-
BN7		621539	312527	18.0	12.0	8.0		7.0	7.0	8.0	9.0	11.0	15.0	21.0		10.9	8.9	-
BN8		627029	309868	17.0	12.0	7.0		6.0	7.0	7.0	7.0	9.0	15.0	19.0		9.9	8.0	-
BN10		625369	308438	27.0		14.0		17.0	19.0	21.0	21.0	25.0	23.0	28.0		20.4	16.5	-
BN11		621651	311632	29.0	32.0	17.0		21.0	25.0	23.0	27.0	30.0	35.0	38.0		25.9	21.0	-

DT ID		X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.81)	Annual Mean: Distance Corrected to Nearest Exposure
BN12		621698	311569	36.0	24.0	18.0		22.0	20.0	22.0	23.0	26.0	30.0	34.0		24.3	19.7	-
BN13		621814	311648	25.0	25.0	12.0		15.0	18.0	17.0	19.0	22.0	29.0	29.0		19.6	15.8	-
BN15		630114	318015	26.0	19.0	12.0		14.0	15.0	19.0	17.0	19.0	22.0	24.0		17.7	14.3	-
BN18		620186	311834		20.0	11.0		11.0	13.0	14.0	15.0	16.0	21.0	25.0		15.3	12.4	-
BN19		627490	308775	26.0	19.0	16.0		20.0	17.0	21.0	23.0	25.0	20.0	26.0		20.6	16.7	-
BN20		640166	310354	28.0	23.0	13.0		14.0	16.0	17.0	19.0	21.0	25.0	27.0		19.1	15.5	-
BN21		627743	310905	20.0	16.0	10.0		10.0	13.0	12.0	13.0	15.0	22.0	1.0		12.6	10.2	-
BN22		624065	311161	35.0	32.0	20.0		22.0	23.0	23.0	27.0	31.0	32.0	37.0		26.8	21.7	-
BN24		621465	312666	20.0	19.0	11.0		12.0	11.0	13.0	14.0	16.0	19.0	24.0		15.0	12.2	-
BN25		619321	326913	19.0	14.0	10.0		10.0	9.0	9.0	9.0	9.0	16.0	18.0		11.8	9.6	-
BN26		626308	310096	21.0	16.0	9.0		11.0	10.0	12.0	13.0	15.0	16.0	19.0		13.3	10.8	-
BN27		625504	312473	18.0	32.0	17.0		23.0	24.0	22.0	28.0	31.0	28.0	31.0		24.1	19.5	-
BN28		621212	312970	1.0	11.0	10.0		12.0	9.0	12.0	12.0	13.0	17.0	22.0		11.7	9.5	-
BN29		613459	323916	21.0	15.0	12.0		13.0	13.0	16.0	15.0	13.0	20.0	23.0		15.5	12.5	-
BN30		626171	311059	35.0	29.0	16.0		11.0	11.0	11.0		16.0	21.0	27.0		18.7	15.2	-
BN31		623069	311327	37.0	32.0	20.0		27.0	28.0	25.0	31.0	35.0	36.0	44.0		29.6	24.0	-
BN32		627038	309912		13.0	9.0		7.0	8.0	8.0	9.0	11.0	16.0	21.0		10.8	8.8	-
BN33		637749	309865		22.0	13.0		16.0	15.0	18.0	19.0	20.0	22.0	28.0		18.2	14.7	-
BN34		621713	311699		41.0	21.0		29.0	29.0	30.0	33.0	33.0	39.0	47.0		31.3	25.4	-
BN35		620205	311723		19.0	14.0		17.0	15.0	16.0	20.0	17.0	22.0	26.0		17.7	14.3	-
BN36		629892	317484		26.0	16.0		17.0	19.0	20.0	22.0	27.0	28.0	34.0		21.9	17.8	-

DT ID		X OS Grid Ref (Easting)	Y OS Grid Ref (Easting)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean: Raw Data	Annual Mean: Annualised and Bias Adjusted (0.81)	Annual Mean: Distance Corrected to Nearest Exposure
BN37		627597	309179		14.0	10.0		8.0	10.0	10.0	11.0	13.0	19.0	21.0		12.3	10.0	-
BN38		619440	315702			12.0		15.0	14.0	15.0	15.0	18.0	21.0	26.0		16.1	13.0	-

☒ **All erroneous data has been removed from the NO_2 diffusion tube dataset presented in Table B.1**.

☒ **Annualisation has been conducted where data capture is <75% and >25% in line with LAQM.TG16.**

☒ **Local bias adjustment factor used.**

☒ **National bias adjustment factor used**

☒ **Where applicable, data has been distance corrected for relevant exposure in the final column**

☒ **Broadland and South Norfolk Councils confirm that all 2020 diffusion tube data has been uploaded to the Diffusion Tube Data Entry System.**

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined**.

See Appendix C for details on bias adjustment and annualisation.

Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC

New or Changed Sources Identified Within South Norfolk and Broadland During 2020

South Norfolk and Broadland has not identified any new sources relating to air quality within the reporting year of 2020.

Additional Air Quality Works Undertaken by South Norfolk and Broadland During 2020

South Norfolk and Broadland has not completed any additional works within the reporting year of 2020

QA/QC of Diffusion Tube Monitoring

The supplier used for diffusion tube preparation and analysis within 2020 was Gradko International Ltd and the method of preparation was 20% TEA in water.

Diffusion Tube Annualisation

All diffusion tube monitoring locations within South Norfolk and Broadland recorded data capture of 75% therefore it was not required to annualise any monitoring data. In addition, any sites with a data capture below 25% do not require annualisation.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2020 ASR have been corrected for bias using an adjustment factor. Bias represents the overall tendency of the diffusion tubes to under or over-read relative to the reference chemiluminescence analyser. LAQM.TG16 provides guidance with regard to the application of a bias adjustment factor to correct diffusion tube monitoring. Triplicate co-location studies can be used to determine a local bias factor based on the comparison of diffusion tube results with data taken from NO_x/NO_2

continuous analysers. Alternatively, the national database of diffusion tube co-location surveys provides bias factors for the relevant laboratory and preparation method.

South Norfolk and Broadland have applied a national bias adjustment factor of 0.81 to the 2020 monitoring data. A summary of bias adjustment factors used over the past five years is presented in Table C.1.

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2020	National	03/21	0.81
2019	National	03/20	0.93
2018	National	03/19	0.93
2017	National	03/18	0.89
2016	National	03/17	0.97

NO_2 Fall-off with Distance from the Road

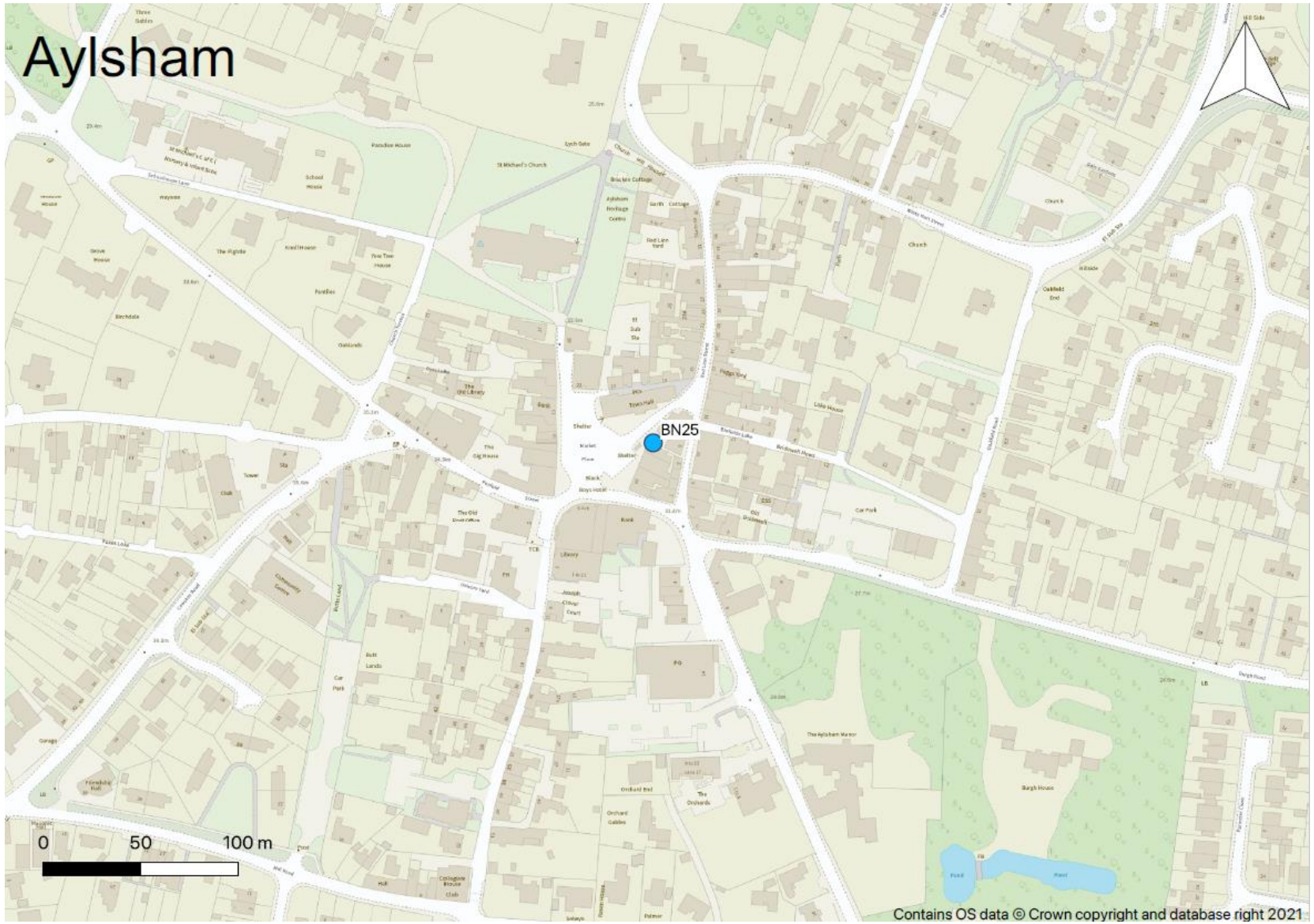
Wherever possible, local authorities should ensure that monitoring locations are representative of exposure. However, where this is not possible, the NO_2 concentration at the nearest location relevant for exposure should be estimated using the Diffusion Tube Data Processing Tool/NO_2 fall-off with distance calculator available on the LAQM Support website. Where appropriate, non-automatic annual mean NO_2 concentrations corrected for distance are presented in Table B.1.

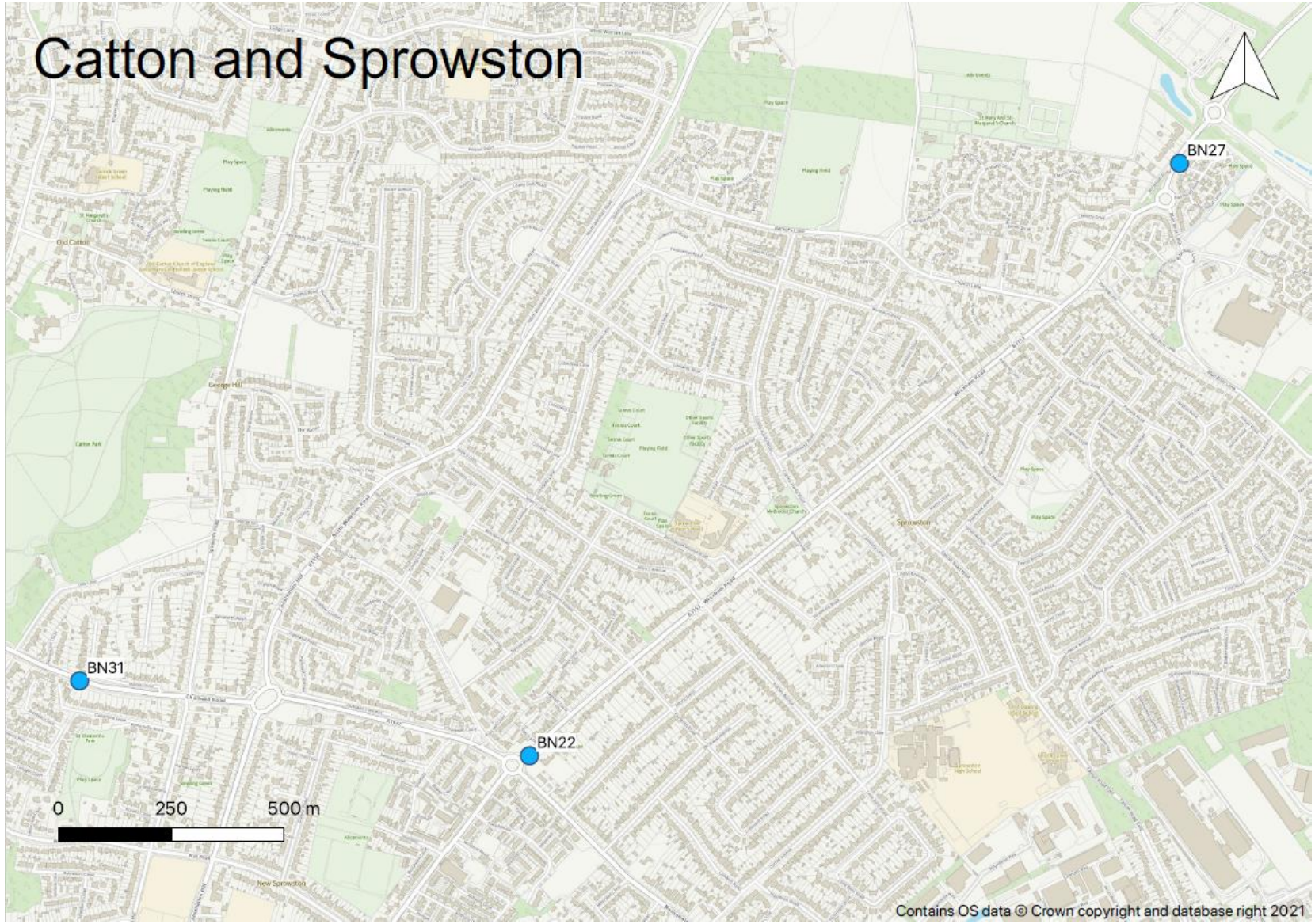
No diffusion tube NO_2 monitoring locations within Broadland and South Norfolk required distance correction during 2020.

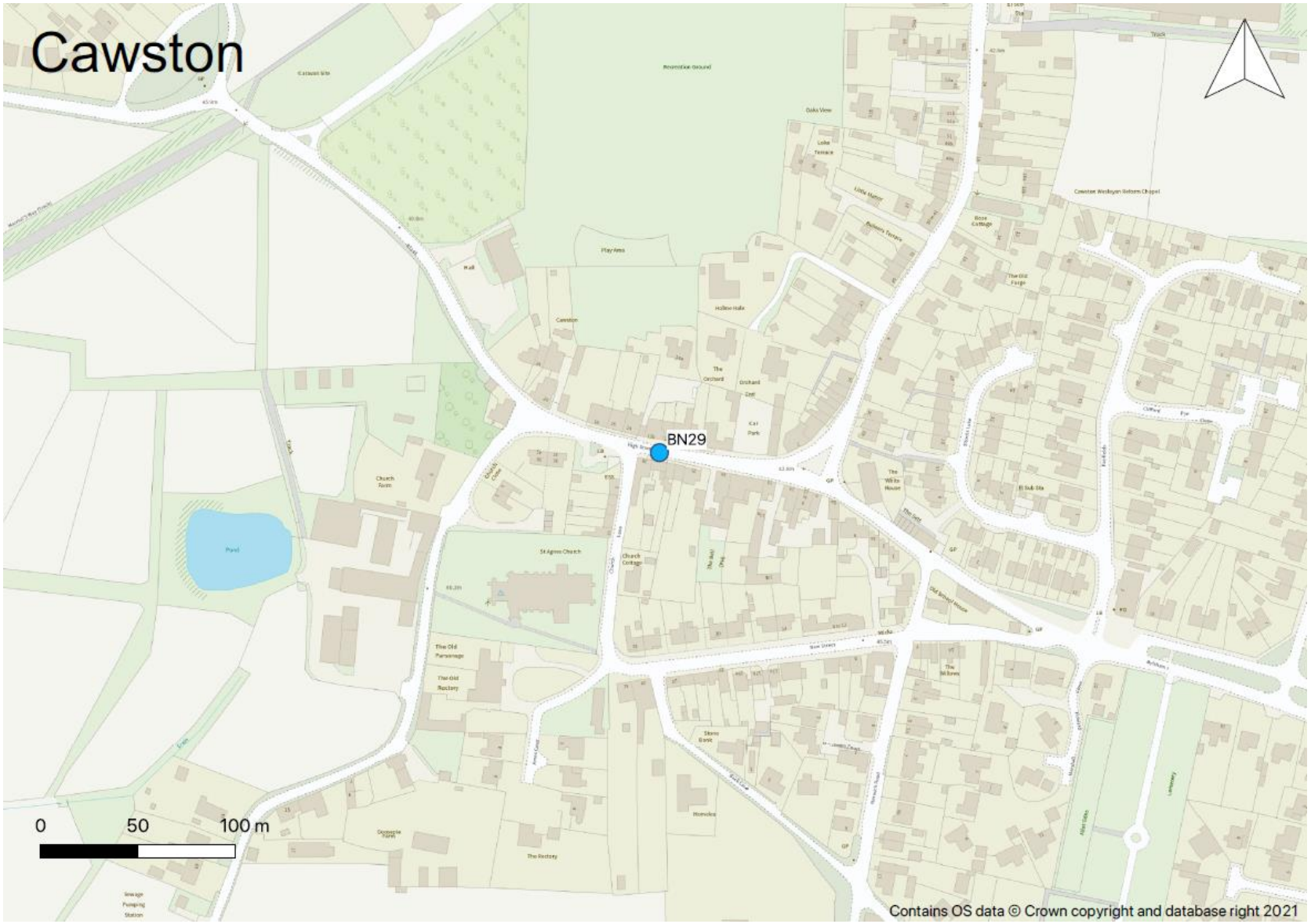
Appendix D: Map(s) of Monitoring Locations and AQMAs

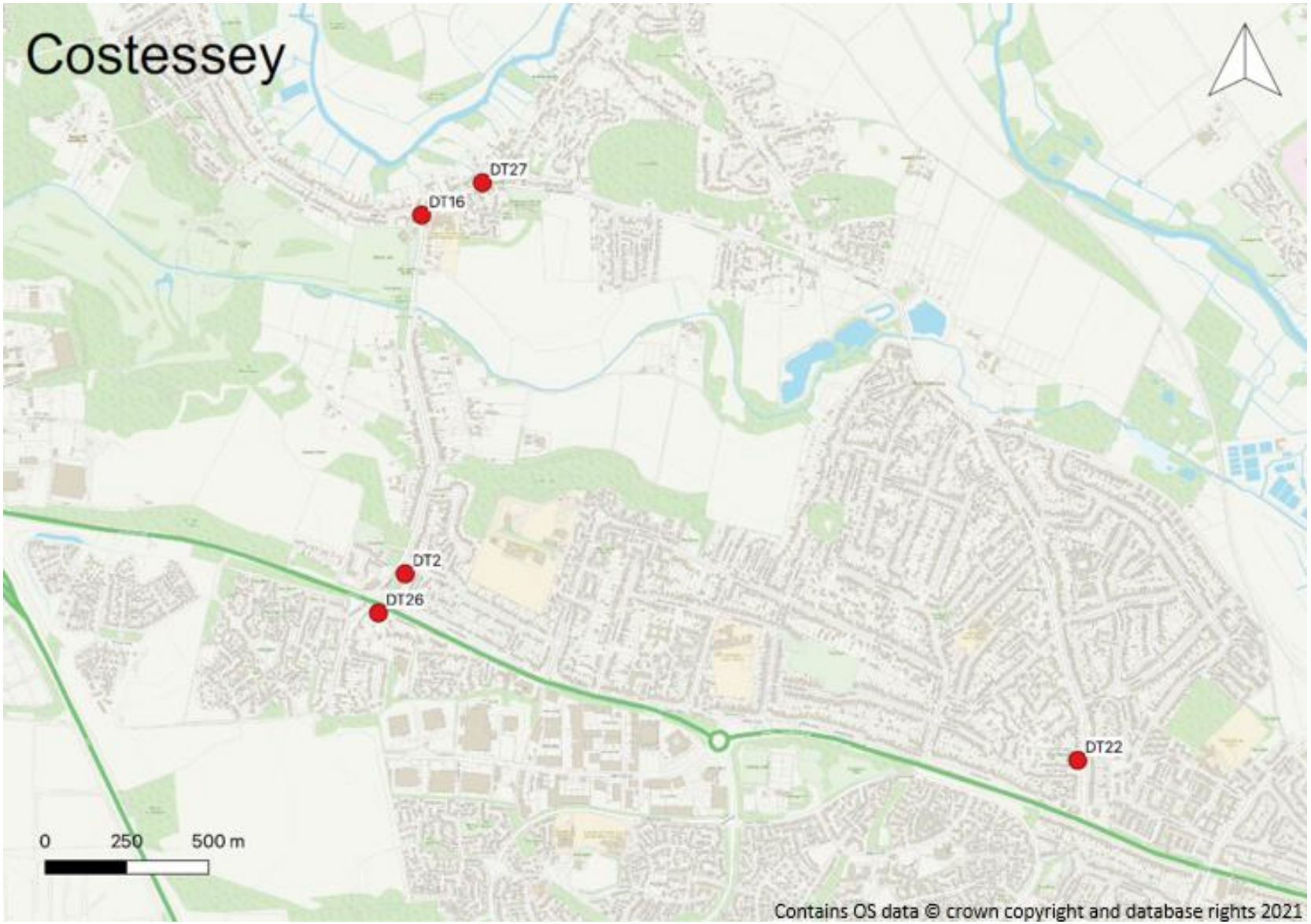

A47 Thickthorn and Cringleford
DT25
DT10
0
250
500 m
Contains OS data © crown copyright and database rights 2021


A47/A146 and Poringland
DT8
DT3
0
750
1,500 m
Contains OS data © crown copyright and database rights 2021

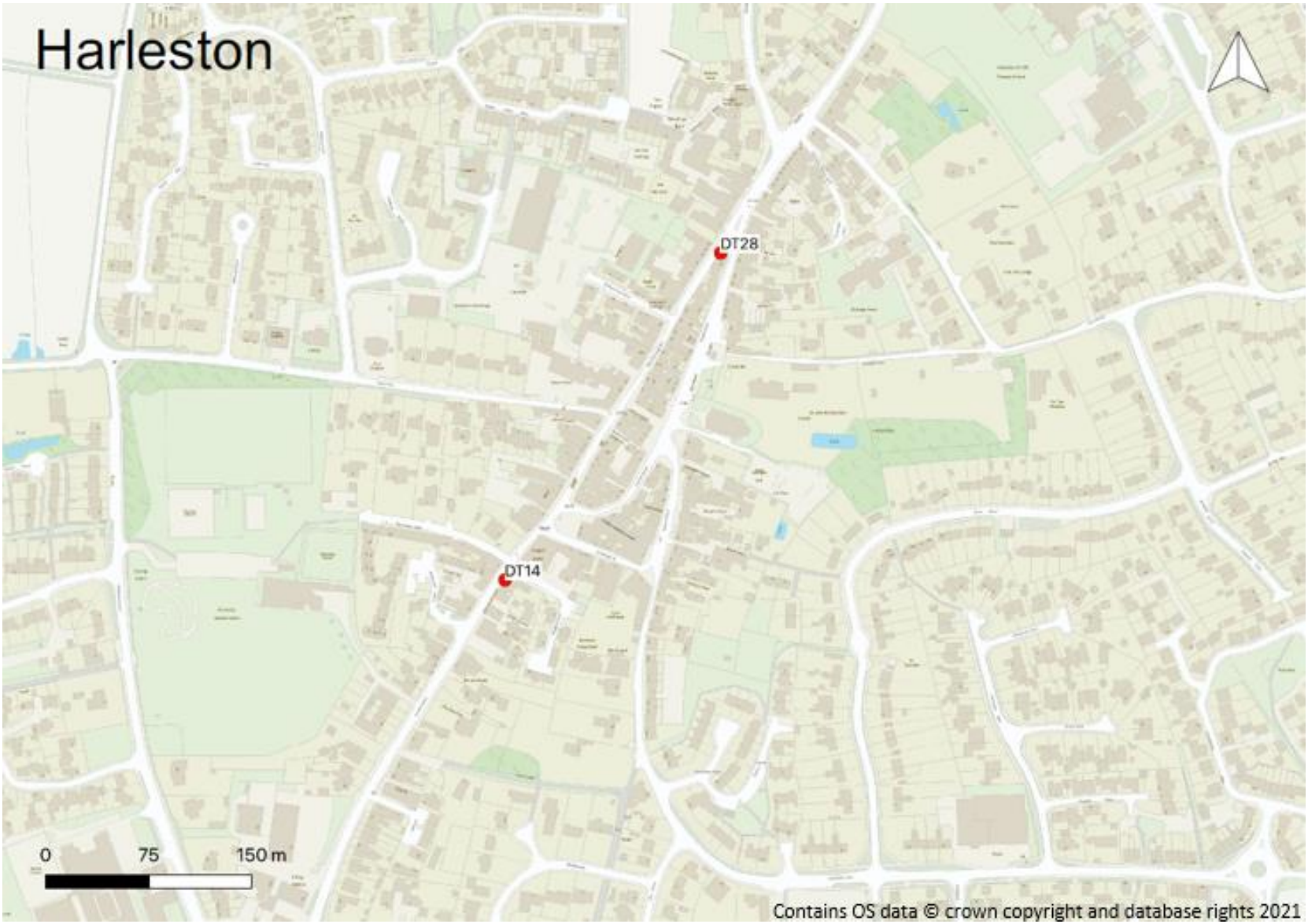

Aylsham
BN25
0
50
100 m
Contains OS data © Crown copyright and database right 2021


Catton and Sprowston
BN27
BN31
BN22
0
250
500 m
Contains OS data © Crown copyright and database right 2021

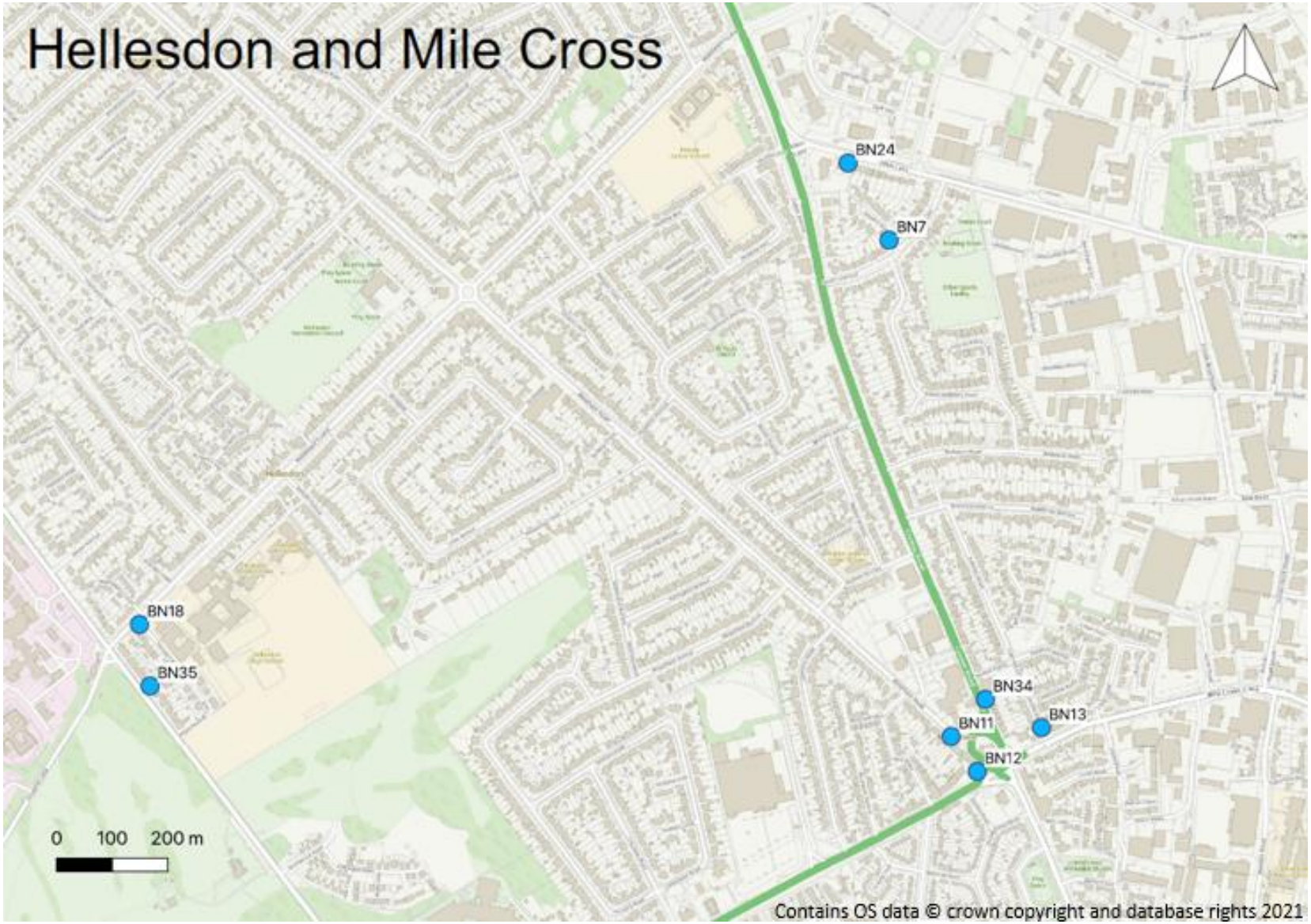

Cawston
BN29
0
50
100 m
Contains OS data © Crown copyright and database right 2021

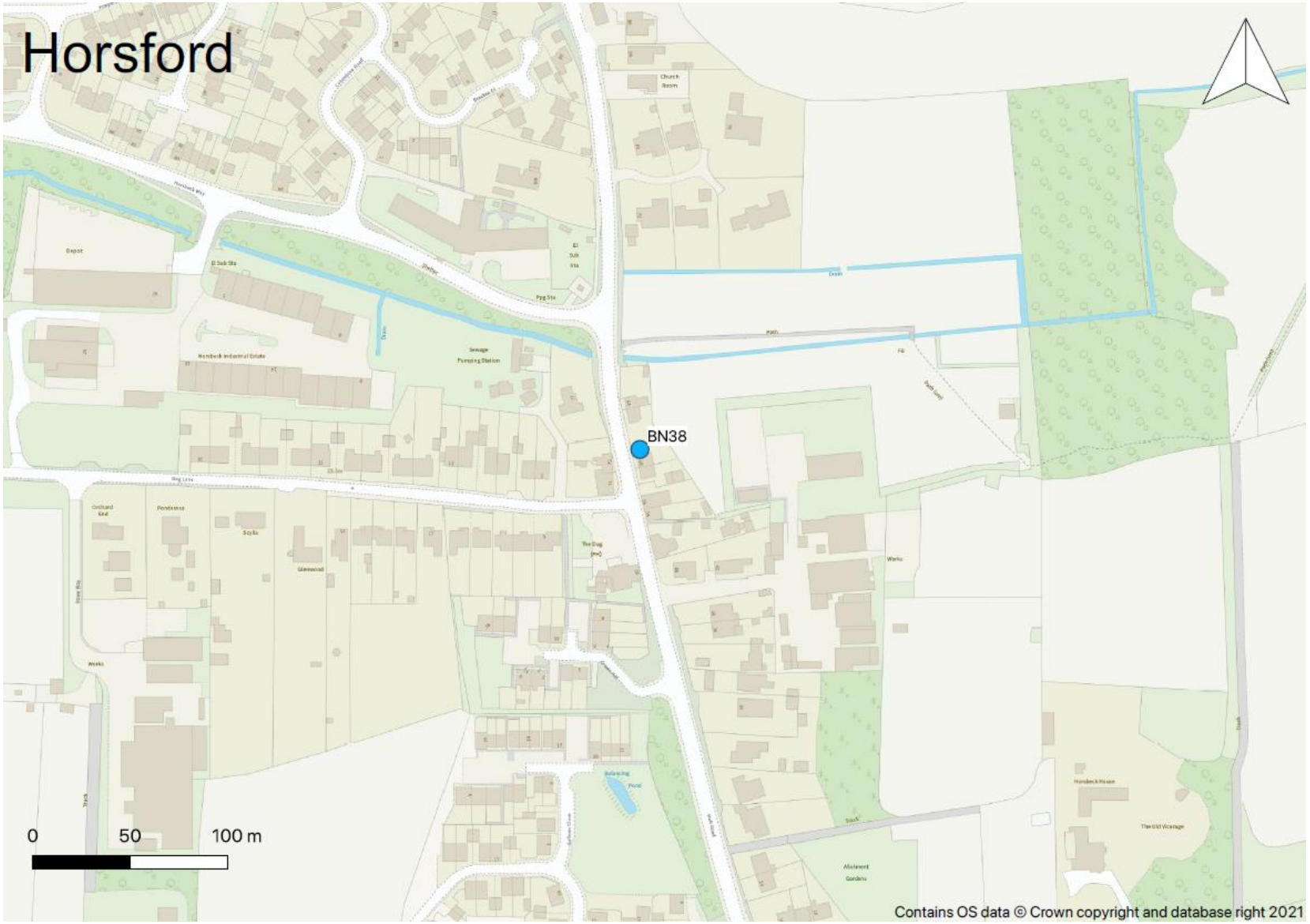

Costessey
DT27
DT16
DT2
DT26
DT22
0
250
500 m
Contains OS data © crown copyright and database rights 2021


Diss and Scole
DT29
DT4
DT15
0
250
500 m
Contains OS data © crown copyright and database rights 2021


Harleston
DT28
DT14
0
75
150 m
Contains OS data © crown copyright and database rights 2021

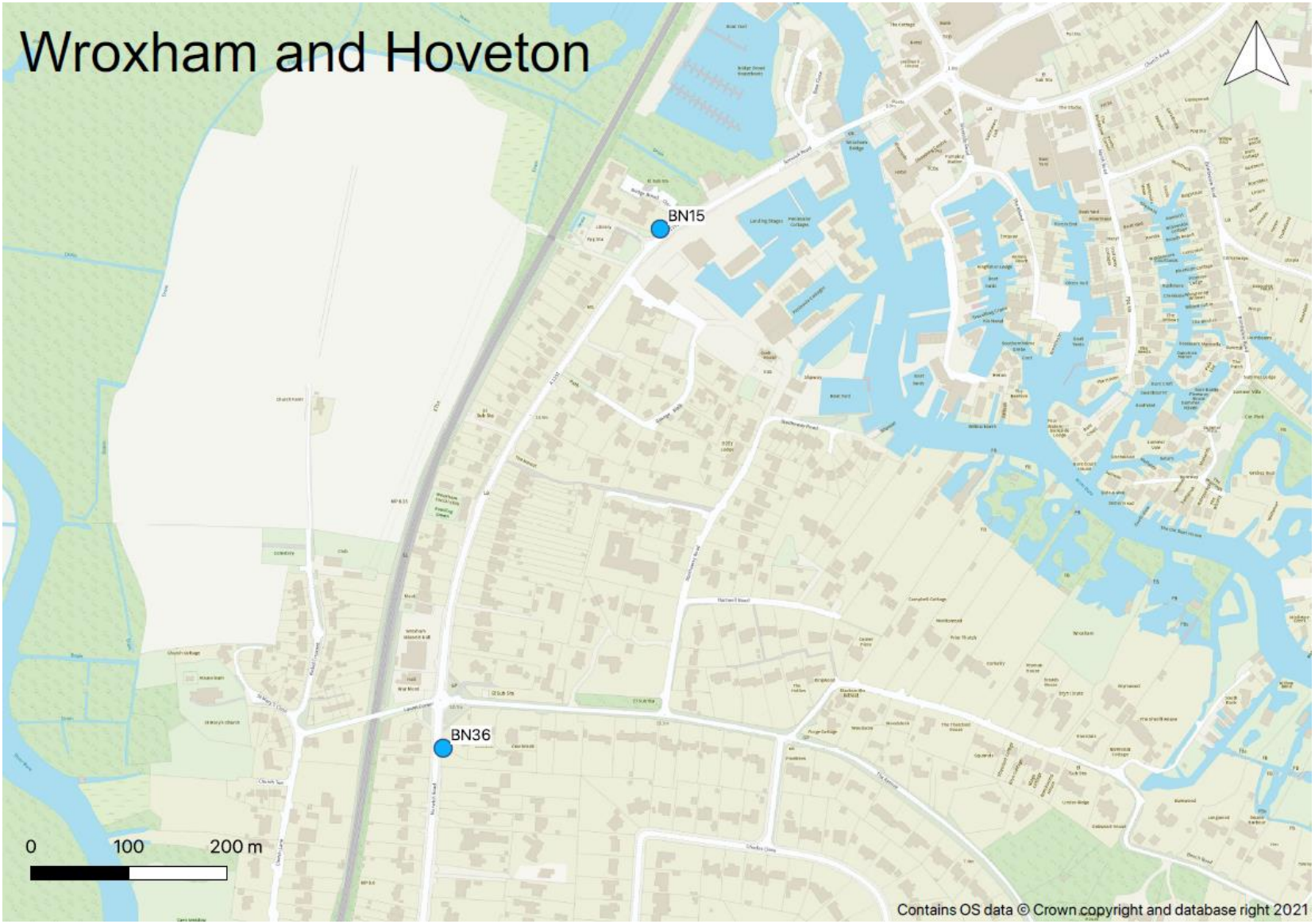

Heartsease and Thorpe St Andrew
BN30
BN6
BN21
BN26
BN8
BN32
BN37
BN19
BN10
0
250
500 m
Contains OS data © Crown copyright and database right 2021

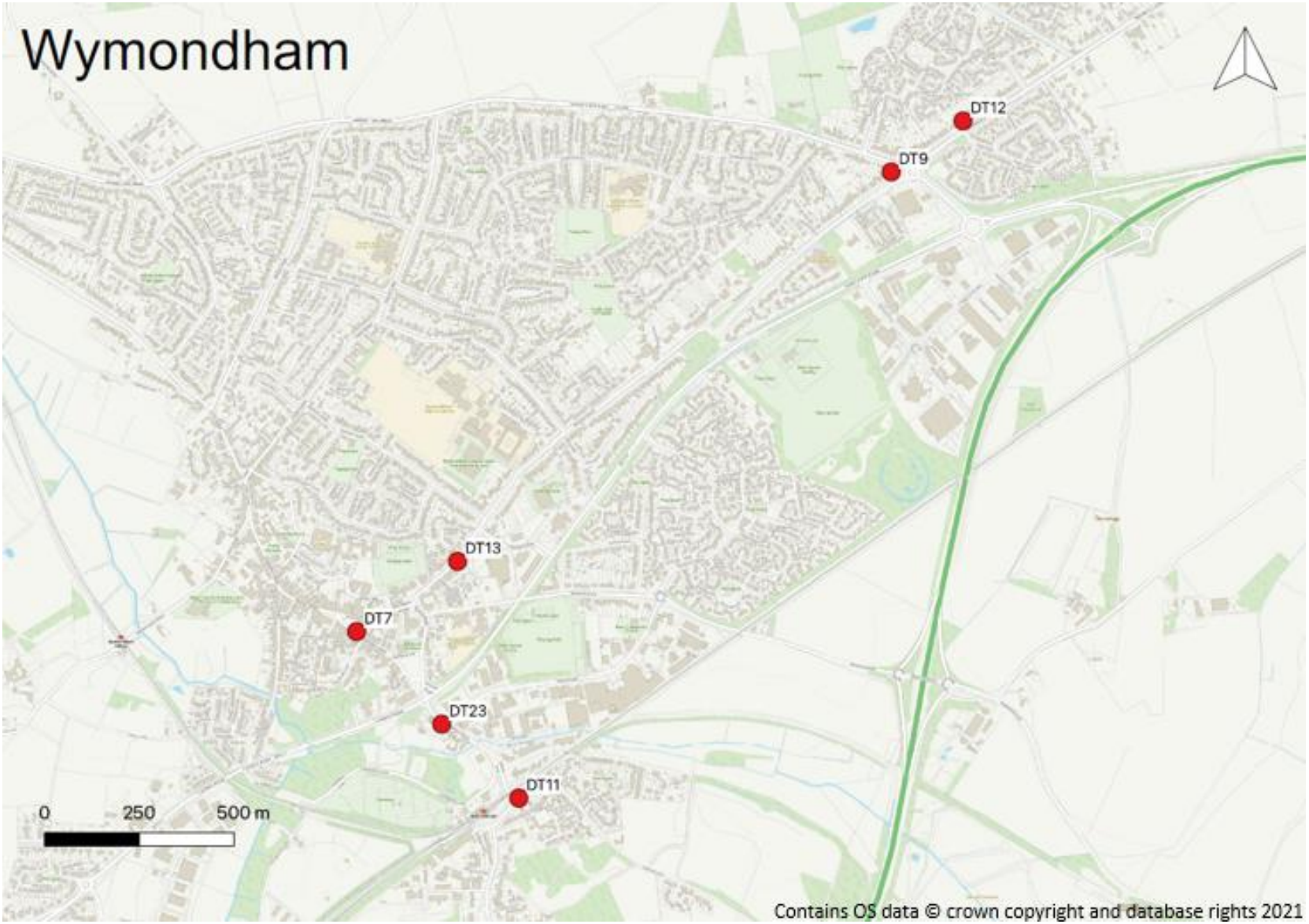

Hellesdon and Mile Cross
BN24
BN7
BN18
BN35
BN34
BN11
BN13
BN12
0 100 200 m
Contains OS data © crown copyright and database rights 2021


Horsford
BN38
0
50
100 m
Contains OS data © Crown copyright and database right 2021


Loddon
DT5
0
25
50 m
Contains OS data © crown copyright and database rights 2021


Long Stratton
DT24
DT6
DT18
DT21
DT17
DT20
0
75
150 m
Contains OS data © crown copyright and database rights 2021


Wroxham and Hoveton
BN15
BN36
0
100
200 m
Contains OS data © Crown copyright and database right 2021


Wymondham
DT12
DT9
DT13
DT7
DT23
DT11
0
250
500 m
Contains OS data © crown copyright and database rights 2021

Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England[7]

Pollutant	Air Quality Objective: Concentration	Air Quality Objective: Measured as
Nitrogen Dioxide (NO_2)	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
Nitrogen Dioxide (NO_2)	40µg/m^3	Annual mean
Particulate Matter (PM_{10})	50µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
Particulate Matter (PM_{10})	40µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
Sulphur Dioxide (SO_2)	125µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
Sulphur Dioxide (SO_2)	266µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[7] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Appendix F: Impact of COVID-19 upon LAQM

COVID-19 has had a significant impact on society. Inevitably, COVID-19 has also had an impact on the environment, with implications to air quality at local, regional and national scales.

COVID-19 has presented various challenges for Local Authorities with respect to undertaking their statutory LAQM duties in the 2021 reporting year. Recognising this, Defra provided various advice updates throughout 2020 to English authorities, particularly concerning the potential disruption to air quality monitoring programmes, implementation of Air Quality Action Plans (AQAPs) and LAQM statutory reporting requirements. Defra has also issued supplementary guidance for LAQM reporting in 2021 to assist local authorities in preparing their 2021 ASR. Where applicable, this advice has been followed.

Despite the challenges that the pandemic has given rise to, the events of 2020 have also provided Local Authorities with an opportunity to quantify the air quality impacts associated with wide-scale and extreme intervention, most notably in relation to emissions of air pollutants arising from road traffic. The vast majority (>95%) of AQMAs declared within the UK are related to road traffic emissions, where attainment of the annual mean objective for nitrogen dioxide (NO_2) is considered unlikely. On 23rd March 2020, the UK Government released official guidance advising all members of public to stay at home, with work-related travel only permitted when absolutely necessary. During this initial national lockdown (and to a lesser extent other national and regional lockdowns that followed), marked reductions in vehicle traffic were observed; Department for Transport (DfT) data[8] suggests reductions in vehicle traffic of up to 70% were experienced across the UK by mid-April, relative to pre COVID-19 levels.

This reduction in travel in turn gave rise to a change of air pollutant emissions associated with road traffic, i.e. nitrous oxides (NO_x), and exhaust and non-exhaust particulates (PM). The Air Quality Expert Group (AQEG)[9] has estimated that during the initial lockdown period in 2020, within urbanised areas of the UK reductions in NO_2 annual mean concentrations were between 20 and 30% relative to pre-pandemic levels, which

[8] Prime Minister's Office, COVID-19 briefing on the 31st of May 2020

[9] Air Quality Expert Group, Estimation of changes in air pollution emissions, concentrations and exposure during the COVID-19 outbreak in the UK, June 2020

represents an absolute reduction of between 10 to 20µg/m^3 if expressed relative to annual mean averages. During this period, changes in $PM_{2.5}$ concentrations were less marked than those of NO_2. $PM_{2.5}$ concentrations are affected by both local sources and the transport of pollution from wider regions, often from well beyond the UK. Through analysis of AURN monitoring data for 2018-2020, AQEG have detailed that $PM_{2.5}$ concentrations during the initial lockdown period are of the order 2 to 5µg/m^3 lower relative to those that would be expected under business-as-usual conditions.

As restrictions are gradually lifted, the challenge is to understand how these air quality improvements can benefit the long-term health of the population.

Impacts of COVID-19 on Air Quality within South Norfolk and Broadland Districts

As can been seen there has been a significant reduction in our annual mean for nitrogen dioxide at all locations monitored. This is directly associated with the reduction in road traffic relative to pre COVID-19 levels. As such this data should be handled with caution and should not be used to support

The restrictions and associated working arrangements have limited our ability to undertake any additional proactive work with our partners as planned.

Opportunities Presented by COVID-19 upon LAQM within South Norfolk and Broadland

No LAQM related opportunities have arisen as a consequence of COVID-19 within Broadland and South Norfolk.

Challenges and Constraints Imposed by COVID-19 upon LAQM within South Norfolk and Broadland

- As with previous years, a national bias adjustment factor has been utilised to adjust the diffusion tube results for 2020. Within 2019 there were 25 co-location studies that were utilised to calculate the bias factor for the laboratory and preparation method used. For 2020, this number has reduced to only three studies. There is

therefore the potential for there to be a greater degree of uncertainty associated with the resultant annual mean NO_2 concentrations in 2020 than in previous years.

- During 2020, access to a number of diffusion tube monitoring sites was restricted due to their locations on residential buildings and travel restrictions. Therefore, it was not possible to maintain diffusion tube exposure periods in line with the national monitoring calendar. This has affected data capture within 2020, this has however not resulted in monitoring sites having to be annualised.

Table F 1 – Impact Matrix

Category	Impact Rating: None	Impact Rating: Small	Impact Rating: Medium	Impact Rating: Large
Automatic Monitoring – Data Capture (%)	More than 75% data capture	50 to 75% data capture	25 to 50% data capture	Less than 25% data capture
Automatic Monitoring – QA/QC Regime	Adherence to requirements as defined in LAQM.TG16	Routine calibrations taken place frequently but not to normal regime. Audits undertaken alongside service and maintenance programmes	Routine calibrations taken place infrequently and service and maintenance regimes adhered to. No audit achieved	Routine calibrations not undertaken within extended period (e.g. 3 to 4 months). Interruption to service and maintenance regime and no audit achieved
Passive Monitoring – Data Capture (%)	More than 75% data capture	50 to 75% data capture	25 to 50% data capture	Less than 25% data capture
Passive Monitoring – Bias Adjustment Factor	Bias adjustment undertaken as normal	<25% impact on normal number of available bias adjustment colocation studies (2020 vs 2019)	25-50% impact on normal number of available bias adjustment studies (2020 vs 2019)	>50% impact on normal number of available bias adjustment studies (2020 vs 2019) and/or applied bias adjustment factor studies not considered representative of local regime
Passive Monitoring – Adherence to Changeover Dates	Defra diffusion tube exposure calendar adhered to	Tubes left out for two exposure periods	Tubes left out for three exposure periods	Tubes left out for more than three exposure periods
Passive Monitoring – Storage of Tubes	Tubes stored in accordance with laboratory guidance and analysed promptly.	Tubes stored for longer than normal but adhering to laboratory guidance	Tubes unable to be stored according to be laboratory guidance but analysed prior to expiry date	Tubes stored for so long that they were unable to be analysed prior to expiry date. Data unable to be used
AQAP – Measure Implementation	Unaffected	Short delay (<6 months) in development of a new AQAP, but is on-going	Long delay (>6 months) in development of a new AQAP, but is on-going	No progression in development of a new AQAP
AQAP – New AQAP Development	Unaffected	Short delay (<6 months) in development of a new AQAP, but is on-going	Long delay (>6 months) in development of a new AQAP, but is on-going	No progression in development of a new AQAP

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide

References

- Local Air Quality Management Technical Guidance LAQM.TG16. April 2021. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.
- Local Air Quality Management Policy Guidance LAQM.PG16. May 2016. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland.