

2020 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the
Environment Act 1995
Local Air Quality Management

2020 (June 2020)

Broadland and South Norfolk District Councils

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Executive Summary: Air Quality in the Broadland and South Norfolk Area

Air Quality in the Broadland South Norfolk Council Areas

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 and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas^{1,2}.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion³.

This is the second combined Broadland District Council and South Norfolk District Council Air Quality Annual Status Report. The two councils have formed one team sharing resources. As a result of this collaboration DEFRA agreed to a single ASR to cover both authority areas in 2019.

Air quality in both Broadland and South Norfolk is generally good. The areas are not intensively built up or industrialised and includes large rural areas. Air pollution in both areas is mainly associated with road traffic and in particular with queuing traffic on busy roads primarily in the suburbs of Norwich and the market towns across both districts. There are no Air Quality Management Areas (AQMA's) in either Broadland or South Norfolk District Council areas. The monitoring undertaken has been for NO₂ using passive diffusion tubes and the annual average concentrations recorded at each monitoring is below the air quality standard in the Regulations of 40 ug/m³.

Construction of the Norwich Northern Distributor Road (NNDR) also known as the A1270 Broadland Northway together with the associated cycle paths is now complete and the road is being used by many drivers as an alternative to the Norwich outer ring road. Plans have been developed to extend the Broadland Northway from its current western limit at the A1067 Fakenham Road in Attlebridge to join with the A47 to the west of Norwich. If the extension is constructed it will offer a range of new

¹ Environmental equity, air quality, socioeconomic status and respiratory health, 2010

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

³ Defra. Abatement cost guidance for valuing changes in air quality, May 2013

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routes to and from the Broadland area, north Norwich and north Norfolk and reduce the traffic movement on the outer ring road and around the Norwich urban fringe. This extension is currently at the design and consultation stage.

As highlighted in previous reports a by-pass is proposed for Long Stratton with an application currently being processed by the planning department as part of further development in the area.

Both councils continue to monitor air quality in their market towns. 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.

Actions to Improve Air Quality

Broadland and South Norfolk Council staff work closely with colleagues in Public Health, Transport for Norwich (within the Department of Planning and Transportation at Norfolk County Council) and the Norfolk Environmental Protection Group Air Quality sub group. 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.

Conclusions and Priorities

The monitoring undertaken during 2019 has in general shown an improvement compared to the previous year's data in Broadland but there has been a slight increase in NO₂ levels recorded at a number of sites in South Norfolk. In all cases the increase is below the threshold of 40ug/m³. In three locations further investigation is advised to try and ascertain why the increase has occurred. This year's data on its own is not an indication of a trend and consideration of this data as part of subsequent year's assessments will enable a better understanding of whether a trend is forming. Broadland and South Norfolk Councils continue to work together and with partner authorities on alternative methods of monitoring and potential schemes to reduce emissions from vehicles.

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The council's will also work with developers to consider air pollution as early as possible in the planning and development process.

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)

<https://air-uk.defra.gov.uk/data/> (UK Government air quality archive)

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.
- Look for sustainable home energy suppliers who don't use fossil fuel.

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1 Local Air Quality Management

This report provides an overview of air quality in the Broadland and South Norfolk districts during 2019. 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 objectives set 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 can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 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 must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

Neither Broadland District Council nor South Norfolk District Council currently have any AQMAs. For reference, a map of the Broadland and South Norfolk Council monitoring locations is available in Appendix D.

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

Defra's appraisal of last year's ASR concluded that it was satisfied with the council's approach to assessing the locations of the monitoring points and also with the plans to investigate expanding the scope of parameters monitored.

Broadland District Council and South Norfolk District Council have taken forward a number of direct measures during the current reporting year in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.1.

Key completed measures are:

- Carry out a review of existing NOX tube locations in both authority areas and relocate as appropriate.
- Introduce new NOX tube locations at key traffic queueing junctions where queues regularly form (based on Norfolk County Council traffic flow data) and where concern about air quality has been raised by residents.
- Evaluate the need to monitor PM_{2.5} and if considered relevant
 - Identify locations where monitoring could be undertaken; and,
 - Source suitable portable continuous monitors to enable short term monitoring to better ascertain air quality peaks within both districts.

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The 2 council's priorities for the coming year are:

- Work with Norfolk County Council to review traffic data for the A1270 Broadland Northway and the primary routes through Broadland towards Norwich, to assess changes in traffic flow and movement following the opening of this major new road.
- Promoting sustainable travel alternatives to the car; Broadland and South Norfolk Councils are working in conjunction with the other authorities within the Greater Norwich area to develop walking and cycling routes for journeys to work and supporting the use of public transport
- The Covid-19 Pandemic has had an impact on air quality globally which has been widely reported in the press and professional journals. With restrictions on the use of public transport in order to reduce the risk of further spreading the virus there is the potential for increased use of private cars rather than public transport. However, as a result of the lockdown there has been an increase in the number of people walking and cycling both for leisure and for general travel purposes. It is therefore unclear whether there will be a noticeable increase in car use compared to previous years or whether more people will use sustainable methods of transport. The impact of the changes in how people travel during 2020 will be considered when the 2021 Annual Screening Report is written.
- Working with developers to ensure air quality is considered as part of large developments
- Continue the development of the Greater Norwich Air Quality Working Group to feed into the Greater Norwich Development Plans and to support action to reduce emissions from vehicles within the Greater Norwich area

The principal challenges and barriers to implementation that Broadland and South Norfolk councils anticipate are as follows:

- Procuring a good quality reliable portable monitor that produces monitoring data that reflects the pollutant concentrations at the monitoring location
- The cost of procuring suitable monitors, once a suitable monitor has been identified

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As part of the annual review of NO_x tube locations a further 5 tubes (BN26-BN30) have been introduced in the Broadland area in locations of local heavy traffic or as part of an assessment of air quality for a planning application. The sites within South Norfolk have not been altered as a result of the review but will remain under close monitoring to ensure they remain relevant.

In addition monitoring point BN1 has been relocated closer to a receptor to better reflect conditions at a point of exposure.

Table 2.1 – Progress on Measures to Improve Air Quality

Measure No.	Measure	EU Category	EU Classification	Date Measure Introduced	Organisations involved	Funding Source	Key Performance Indicator	Reduction in Pollutant / Emission from Measure	Progress to Date	Estimated / Actual Completion 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	Reduction of energy bills and energy use	N/A	Implemented	On going	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	Reducing emissions and energy use	N/A	Providing information when requested	On going	Reducing emissions and energy use
3	Link 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	Reducing emissions and energy use	N/A	Providing information when requested	On going	Reducing emissions and energy use
4	Health Improvement Grants	Other	Other	2018	Broadland and South Norfolk DC's	Broadland and South Norfolk DC's	Reducing emissions and energy use and improving residents health and well being	N/A	On going	On going	Reducing emissions and energy use and improving residents 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	Reducing emissions and energy use and improving residents health and well being	N/A	Planning	On going	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	Collaborative working to improve air quality within the Greater Norwich Area through various projects and initiatives	T.B.C	Planning	On going	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	Individual up take	N/A	Planning	On going	Re-routing traffic from Norwich outer ring-road and join Norwich Southern by-pass to key routes north of Norwich

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	Road from A1067 to A47 west of Norwich		management, Selective vehicle priority, bus priority, high vehicle occupancy lane								
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	Individual up take	N/A	On going	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	Collaborative working to improve air quality within the Greater Norwich Area through various projects and initiatives	N/A	On going	On going	Reducing emissions and congestion, promoting healthier living

2.3 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/m³ 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.

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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

3.1 Summary of Monitoring Undertaken

3.1.1 Non-Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Broadland and South Norfolk Councils undertook non- automatic (passive) monitoring of NO₂ at 53 sites (25 sites in Broadland and 28 sites in South Norfolk) during 2019. Appendix A shows the details of this.

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.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, “annualisation” and distance correction. Further details on adjustments are provided in Appendix C.

3.2.1 Nitrogen Dioxide (NO₂)

Table A.2 in Appendix A compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³.

For diffusion tubes, the full 2019 dataset of monthly mean values is provided in Appendix B. In addition graphs have been included in Figure A.1 comparing the annual results for the locations monitored. In some locations this data goes back to 2010.

All of the monitoring data has been correctly ratified as required. The results of the passive diffusion tube monitoring have not identified any exceedances of the annual threshold of 40ug/m³. Reviewing the data for 2019 against previous years has shown that in the Broadland area at most locations there is a decline in NO₂ concentrations. The exceptions to this are at BN6 (Breck Road) with an increase of 0.8ug/m³, BN10 (Yarmouth Road) with an increase of 2.1ug/m³ and BN13 (Milecross

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Lane at the Boundary junction) with an increase of $1.2\mu\text{g}/\text{m}^3$. The increase at BN6 is slight ($0.8\mu\text{g}/\text{m}^3$) and further monitoring is required to see if this is a sustained increase, or rather a sign of a local variation due to anthropogenic activity in the area. The increases at BN10 and BN13 will also require further monitoring and a review of traffic flow data to assess whether there has been an increase in traffic levels at these points. This data was not available at the time of writing this report. In all locations it is possible that road works elsewhere may have caused changes in traffic flow at the monitoring locations which could result in these variations.

Other increases have been noted at BN22 (Wroxham Road at Blue Boar Lane), BN23 (Dussingdale Drive) and BN24 (Fifers Lane).. In these cases the data is limited to 2 years and it is not possible to determine any clear trend from this limited data. Further data is required for these three locations and therefore monitoring will continue.

The locations where elevated concentrations were noted in the screening report last year have not seen an increase this year, indicating the change was not sustained.

The data for NO_2 in the South Norfolk District area is more varied with a slight increase (below $1.0\mu\text{g}/\text{m}^3$) noted at DT1, DT5, DT7, DT9, DT10, DT18, and DT23 the locations of which are shown in Table A.1. Other increases were noted at DT8 (Fairland Street Wymondham) $2.4\mu\text{g}/\text{m}^3$, DT15 (Harleston Hotel) $5.4\mu\text{g}/\text{m}^3$, DT19 (Long Stratton traffic Lights east) $6.4\mu\text{g}/\text{m}^3$ and DT29 (Broad Street Harleston) $12.6\mu\text{g}/\text{m}^3$. In all of the locations (except DT6) where an increase was noted, the previous years results do not show this to be a trend. At all locations the past results have seen a decrease. As stated above the increases may be due to localised changes in the area such as changes in traffic movement and/or traffic management. Periods of road works or other events that have caused a change in traffic movements may also have occurred in these locations. Again a review of traffic count data (where available) may show a change but the data was not available when this report was written. The monitoring points have not been relocated so a comparison of this data with the data for 2020 may show whether this change is sustained. There have been fluctuations in NO_2 emissions at DT6 (Church Plain) since 2015 but the concentration recorded for 2019 is below the highest concentration recorded in 2017 and is therefore perceived as an overall

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improvement. In addition the increase on the 2018 data was $1\mu\text{g}/\text{m}^3$ to $19.85\mu\text{g}/\text{m}^3$, well below the threshold of $40\mu\text{g}/\text{m}^3$.

3.2.2 Particulate Matter (PM₁₀)

PM₁₀ monitoring is not undertaken by either Broadland or South Norfolk District Councils. A review of potential pollutants by both authorities in the past did not highlight PM₁₀ as potentially significant and therefore monitoring was not required. This was agreed with DEFRA at the time of the review.

3.2.3 Particulate Matter (PM_{2.5})

Broadland and South Norfolk District Councils do not currently undertake monitoring for PM_{2.5} but have undertaken an initial review of the DEFRA background concentration data. The review has looked at the background concentration data from the DEFRA website. There is currently no UK air quality threshold for PM_{2.5} so this review has used the EU threshold of $25\mu\text{g}/\text{m}^3$. The initial assessment against the EU threshold has not identified any locations within the authority areas where the background concentrations exceed the threshold. However, there may be locations where the introduction of anthropogenic sources of PM_{2.5} to the background concentrations could require further assessment. Broadland and South Norfolk District Councils will therefore continue to review this parameter in order to determine whether there are locations that may benefit from monitoring. Broadland and South Norfolk Planning departments will also consider air quality (including PM_{2.5}) as part of the planning application process on large scale developments.

Appendix A: Monitoring Results

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

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) ⁽¹⁾	Distance to kerb of nearest road (m) ⁽²⁾	Tube collocated with a Continuous Analyser?	Height (m)
Broadland District Council										
BN1	A47 Nth Burlingham	Roadside	635997	310021	NO2	NO	8	2	NO	1.8
BN4	Hillside Avenue Thorpe St Andrew	Suburban	626911	308738	NO2	NO	10	1	NO	3
BN6	Breck Road Sprowston	Suburban	626313	311010	NO2	NO	13	2	NO	2.5
BN7	Heath Crescent Hellesdon	Suburban	621539	312522	NO2	NO	0	7	NO	1.5
BN8	Hansell Road Thorpe St Andrew	Suburban	627003	309849	NO2	NO	9	1	NO	2
BN9	Chartwell Road Old Catton	Suburban	622938	311399	NO2	NO	10	9	NO	2
BN10	Yarmouth Road Thorpe St Andrew	Suburban	625264	308411	NO2	NO	2	10	NO	3
BN11	Reepham Road Hellesdon	Suburban	621642	311622	NO2	NO	0	8	NO	2
BN12	Boundary Rd Hellesdon	Suburban	621698	311565	NO2	NO	0	8	NO	2

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BN13	Milecross Ln Hellesdon	Suburban	621811	311636	NO2	NO	0	10	NO	2
BN15	Wroxham Library Wroxham	Roadside	630182	318042	NO2	NO	9	1	NO	2
BN16	The Avenue Wroxham	Roadside	630114	318012	NO2	NO	13	2	NO	2
BN17	School Rd Drayton	Roadside	617794	314204	NO2	NO	10	2	NO	3
BN18	Middletons Lane Hellesdon	Suburban	620175	311832	NO2	NO	6	1	NO	3
BN19	Yarmouth Rd Thorpe St Andrew	Suburban	627494	308773	NO2	NO	0	9	NO	2
BN20	The Street Acle	Kerbside	640161	310350	NO2	NO	0	1	NO	3
BN21	Thorpe End	Roadside	627741	310902	NO2	NO	9	2	NO	2
BN22	Wroxham Rd/Ring Road Sprowston	Roadside	624060	311166	NO2	NO	5	1	NO	3
BN23	Dussingdale Drive Thorpe St Andrew	Roadside	627563	309236	NO2	NO	6	3	NO	3
BN24	Fifers Lane Hellesdon	Suburban	621466	312662	NO2	NO	0	16	NO	1.5
BN25	The Market Place Aylsham	Roadside	619333	326894	NO2	NO	0	1	NO	1.5
BN26	Plumstead Road East Thorpe St Andrew	Suburban	616327	310097	NO2	NO	0	13	NO	1.5
BN27	Wroxham Road/Blue Boar Lane Sprowston	Roadside	625502	312470	NO2	NO	18	0	NO	3
BN28	Holt Road Hellesdon	Suburban	621202	312970	NO2	NO	0	13	NO	1.5
BN29	Cawston	Roadside	613480	323804	NO2	NO	0	2	NO	2.5

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BN30	Salhouse Road Sproston	Roadside	626174	311059	NO2	No	12	0	NO	3
South Norfolk District Council										
DT1	Newmarket Rd Cringlesford	Suburban	619243	305645	NO2	NO	0	15	NO	1.5
DT2	Longwater Ln Costessey	Suburban	616797	310477	NO2	NO	0	15	NO	1.5
DT3	The Street Poringland	Suburban	626803	302092	NO2	NO	0	5	NO	1.5
DT4	Denmark St Diss	Suburban	611223	279637	NO2	NO	0	3	NO	1.5
DT5	Victoria Rd Diss	Suburban	611945	279572	NO2	NO	0	3	NO	1.8
DT6	Church Plain	Suburban	636192	298751	NO2	NO	0	3	NO	1.5
DT7	A140 Long Stratton	Roadside	619722	292745	NO2	NO	3	1	NO	2.1
DT8	Fairland Street Wymondham	Kerbside	611129	301425	NO2	NO	0	3	NO	2.1
DT9	Kirby Bedon Rd Bixley	Kerbside	625439	305944	NO2	NO	20	2	NO	2.1
DT10	Norwich Road Wymondham	Suburban	612515	302652	NO2	NO	0	15	NO	1.5
DT11	Thickthorn Cottages	Rural	618137	305678	NO2	NO	0	10	NO	1.5
DT12	Rightup Lane Wymondham	Suburban	611528	300987	NO2	NO	20	3	NO	2.1
DT13	Norwich Rd Wymondham	Suburban	612663	302751	NO2	NO	0	12	NO	1.5
DT14	Norwich Road Wymondham	Suburban	611380	302751	NO2	NO	0	8	NO	1.5
DT15	Harleston Hotel	Roadside	624484	283276	NO2	NO	5	2	NO	2.1
DT16	Diss Road Scole	Roadside	614895	283276	NO2	NO	8	1	NO	1.8
DT17	West End Costessey	Roadside	616652	311650	NO2	NO	4	1	NO	2.1

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DT18	Long Stratton Chinese	Roadside	619710	292730	NO2	NO	1	1	NO	2.1
DT19	Long Stratton Traffic Lights East	Roadside	619732	292740	NO2	NO	7	1	NO	2.1
DT20	Long Stratton Funeral Directors	Suburban	619642	292346	NO2	NO	0	5	NO	1.5
DT21	Long Stratton South Bound (60M)	Suburban	619694	292653	NO2	NO	0	2	NO	2.1
DT22	Long Stratton Co-op Chemist Swan Lane	Roadside	619710	292722	NO2	NO	5	2	NO	2.1
DT23	Norwich Road Costessey	Suburban	618991	309796	NO2	NO	0	15	NO	1.5
DT24	Station Road Wymondham	Suburban	618823	293032	NO2	NO	0	5	NO	1.5
DT25	Long Stratton Bus Stop	Roadside	619823	293032	NO2	NO	5	4	NO	2.1
DT26	Newmarket Road Cringleford	Roadside	619801	305869	NO2	NO	20	2	NO	2.1
DT27	Lord Nelson Drive Costessey	Roadside	616348	310585	NO2	NO	100	1	NO	2.1
DT28	Riverside Court Costessey	Suburban	616386	310636	NO2	NO	100	1	NO	2.1
DT29	Broad St Harleston	Suburban	615754	310637	NO2	NO	8	0	NO	1.5

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

Table A.2 – Annual Mean NO₂ Monitoring Results

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) ⁽¹⁾	Valid Data Capture 2019 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ^{(3) (4)}				
							2015	2016	2017	2018	2019
Broadland District Council											
BN1	635997	310021	Roadside	Diffusion Tube	100	100	28.4	30.6	24	26.3	24.5
BN2	639713	310237	Kerbside	Diffusion Tube			18.3	19.3	16.6		
BN3	638094	308891	Roadside	Diffusion Tube			13.3	14.4	14.4		
BN4	626911	308738	Suburban	Diffusion Tube	100	100	12.7	14.9	13.6	14.3	12.9
BN5	627755	309440	Suburban	Diffusion Tube			20.2	20.5	16.7		
BN6	626313	311010	Suburban	Diffusion Tube	100	100	12.7	12.5	13.5	13.6	14.4
BN7	621539	312522	Suburban	Diffusion Tube	100	100	13.6	14	15.5	14.2	13.5
BN8	627003	309849	Kerbside	Diffusion Tube	100	100	11.8	12.8	14.4	13.4	12.1
BN9	622938	311399	Roadside	Diffusion Tube	83	83	28.3	29.4	31	26.9	26.7
BN10	625264	308411	Roadside	Diffusion Tube	100	100	20.6	20	19.8	18.7	21.4
BN11	621642	311622	Suburban	Diffusion Tube	100	100	30.1	32	34	29.6	28
BN12	621698	311565	Suburban	Diffusion Tube	100	100	29.2	30.5	30	29.4	29.6
BN13	621811	311636	Suburban	Diffusion Tube	91	91	24.4	24.8	23.4	22.8	24

Broadland and South Norfolk District Councils

BN14	620690	311758	Suburban	Diffusion Tube			16	16.2	15		
BN15	630182	318042	Roadside	Diffusion Tube	100	100	16.6	17.4	15.6	22.0	22
BN16	630114	318012	Roadside	Diffusion Tube	100	100	19.2	17	18.4	18.2	17.3
BN17	617794	314204	Suburban	Diffusion Tube	100	100			19.5	14.0	12.9
BN18	620175	311832	Roadside	Diffusion Tube	91	91			18.1	26.0	23.8
BN19	627494	308773	Suburban	Diffusion Tube	100	100			31.8	27.2	26.3
BN20	640161	310350	Kerbside	Diffusion Tube	100	100				22.5	21.1
BN21	627741	310902	Roadside	Diffusion Tube	91	91				18.7	18.2
BN22	624060	311166	Suburban	Diffusion Tube	100	100				31.7	32.4
BN23	627563	309236	Suburban	Diffusion Tube	100	100				17.7	18.3
BN24	621466	312662	Suburban	Diffusion Tube	100	100				18.1	18.7
BN25	619333	326894	Kerbside	Diffusion Tube	100	100				21.7	16.8
BN26	626327	310097	Suburban	Diffusion Tube	91	91					15.1
BN27	625502	312470	Suburban	Diffusion Tube	83	83					24.4
BN28	621202	312970	Suburban	Diffusion Tube	91	91					16.2
BN29	613459	323912	Roadside	Diffusion Tube	83	83					17.1
BN30	626174	311059	Roadside	Diffusion Tube	75	75					22.9
South Norfolk											

Broadland and South Norfolk District Councils

District Council											
DT1	619243	305653	Suburban	Diffusion Tube	100	100	17.1	20.2	21.2	19.7	19.9
DT2	616797	310477	Suburban	Diffusion Tube	100	100	18.1	21.2	21.6	20.1	19.1
DT3	626803	302092	Suburban	Diffusion Tube	100	100	15.4	19.3	20	18.6	18.2
DT4	611223	279637	Suburban	Diffusion Tube	100	100	21	29.2	26.7	24.8	21.5
DT5	611945	279572	Suburban	Diffusion Tube	100	100	26	30	28.2	26.2	26.9
DT6	636192	298751	Suburban	Diffusion Tube	100	100	10.4	13.5	20.2	18.8	19.8
DT7	619722	292745	Suburban	Diffusion Tube	100	100	32	33.5	37.2	34.6	35.3
DT8	611129	301425	Suburban	Diffusion Tube	100	100	18.4	23.3	22	20.5	22.9
DT9	625439	305944	Suburban	Diffusion Tube	100	100	21.4	25.4	24.9	23.2	23.9
DT10	612515	302652	Suburban	Diffusion Tube	100	100	12	18	16.5	15.3	15.7
DT11	618137	305678	Rural	Diffusion Tube	100	100	12.8	15.8	14.9	13.9	15.0
DT12	611528	300987	Suburban	Diffusion Tube	100	100	16.3	21.9	21.2	19.7	22.7
DT13	612663	302751	Suburban	Diffusion Tube	100	100	11.9	15.9	16.1	15.0	14.2
DT14	611380	302751	Suburban	Diffusion Tube	100	100	13.3	17	16.2	15.1	15.9
DT15	624484	283276	Roadside	Diffusion Tube	100	100	25.1	27.6	26.2	24.4	29.8
DT16	614895	283276	Roadside	Diffusion Tube	100	100	18.1	21.4	26.2	24.4	20.5
DT17	616652	311650	Roadside	Diffusion Tube	100	100	10.8	19.4	20.5	19.1	18.7

Broadland and South Norfolk District Councils

DT18	619710	292730	Roadside	Diffusion Tube	100	100	25.9	29.8	26.6	24.7	25.3
DT19	619732	292740	Roadside	Diffusion Tube	100	100	30.6	36.9	34.3	31.9	38.4
DT20	619642	292346	Suburban	Diffusion Tube	100	100	33.6	32.9	31	28.8	26.7
DT21	619694	292653	Suburban	Diffusion Tube	100	100	26.9	31.1	28.5	26.5	27.9
DT22	619710	292722	Roadside	Diffusion Tube	100	100	23.2	25.2	20.5	19.1	20.8
DT23	618991	309796	Suburban	Diffusion Tube	100	100	13	16.7	15.6	14.5	15.2
DT24	618823	293032	Suburban	Diffusion Tube	100	100	13.9	17.4	16.1	15.0	16.8
DT25	619823	293032	Roadside	Diffusion Tube	100	100	29.3	30.1	29	27.0	28.1
DT26	619801	305869	Roadside	Diffusion Tube	100	100	21.4	25.5	24.1	22.4	20.7
DT27	616348	310585	Roadside	Diffusion Tube	100	100	23.1	28.4	25.4	23.6	16.2
DT28	616386	310636	Suburban	Diffusion Tube	100	100	16.3	14.1	13.9	12.9	12.3
DT29	615754	310637	Suburban	Diffusion Tube	100	100	31.5	27.8	24.2	22.5	35.1

☒ Diffusion tube data has been bias corrected

☒ Annualisation has been conducted where data capture is <75%

☒ 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 adjustment

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

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

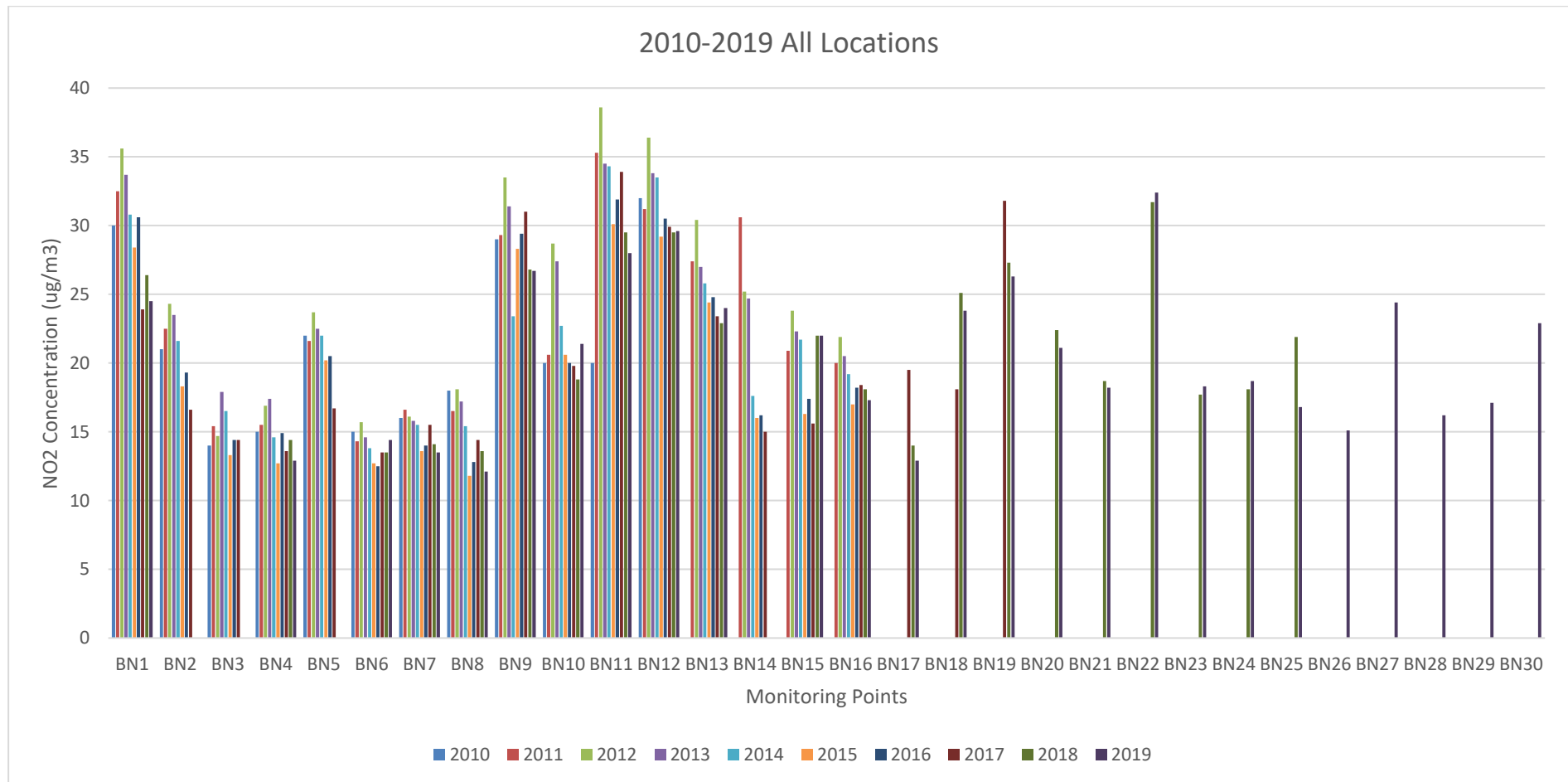
Broadland and South Norfolk District Councils

- (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%).
- (3) Means for diffusion tubes have been corrected for bias. All means have been “annualised” as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.
- (4) Concentrations are those at the location of monitoring and not those following any fall-off with distance adjustment.

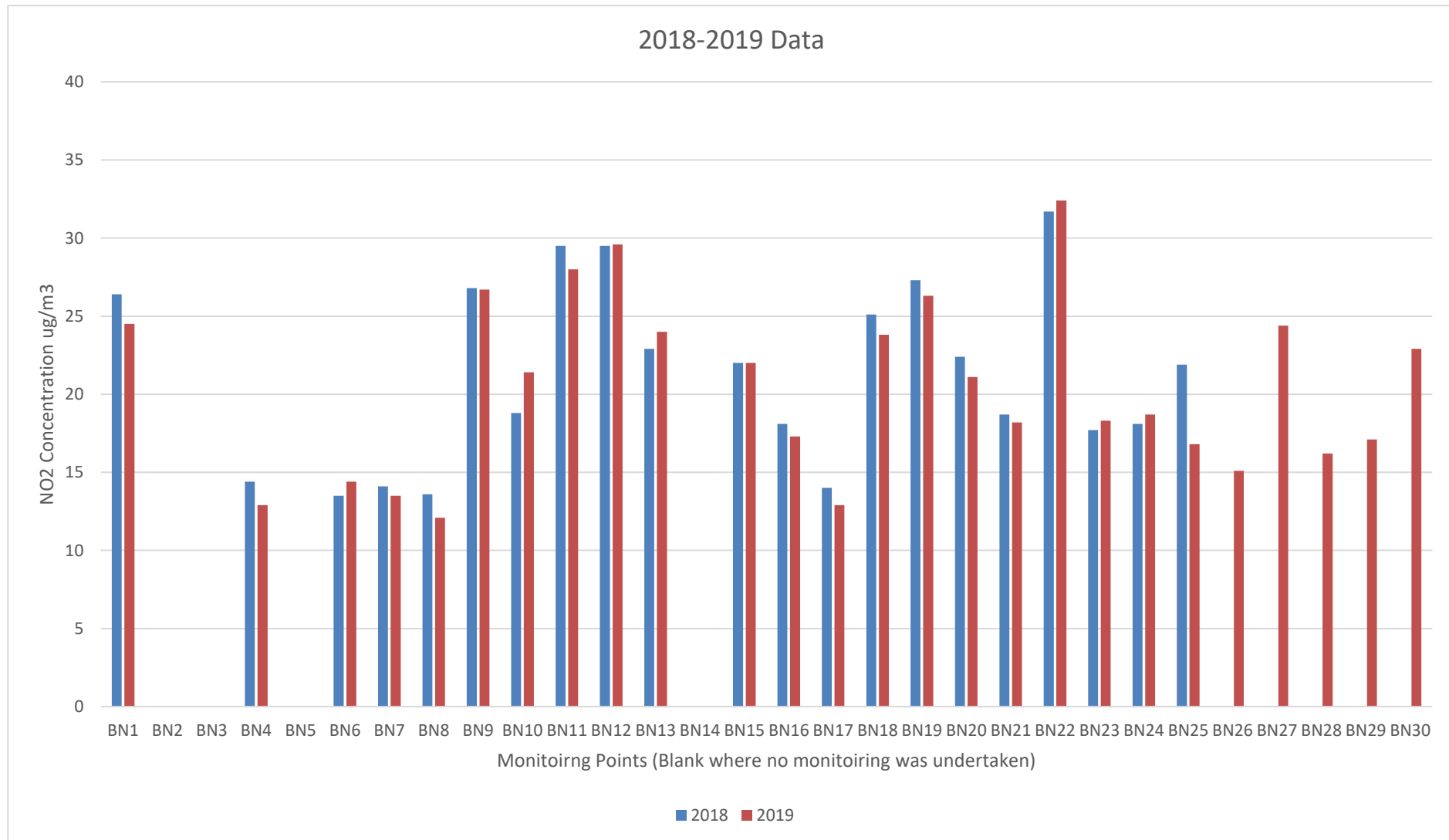
Figure A.1 – Annual Mean NO₂ Concentrations

Broadland District Council Results

Concentrations recorded at Broadland sites.

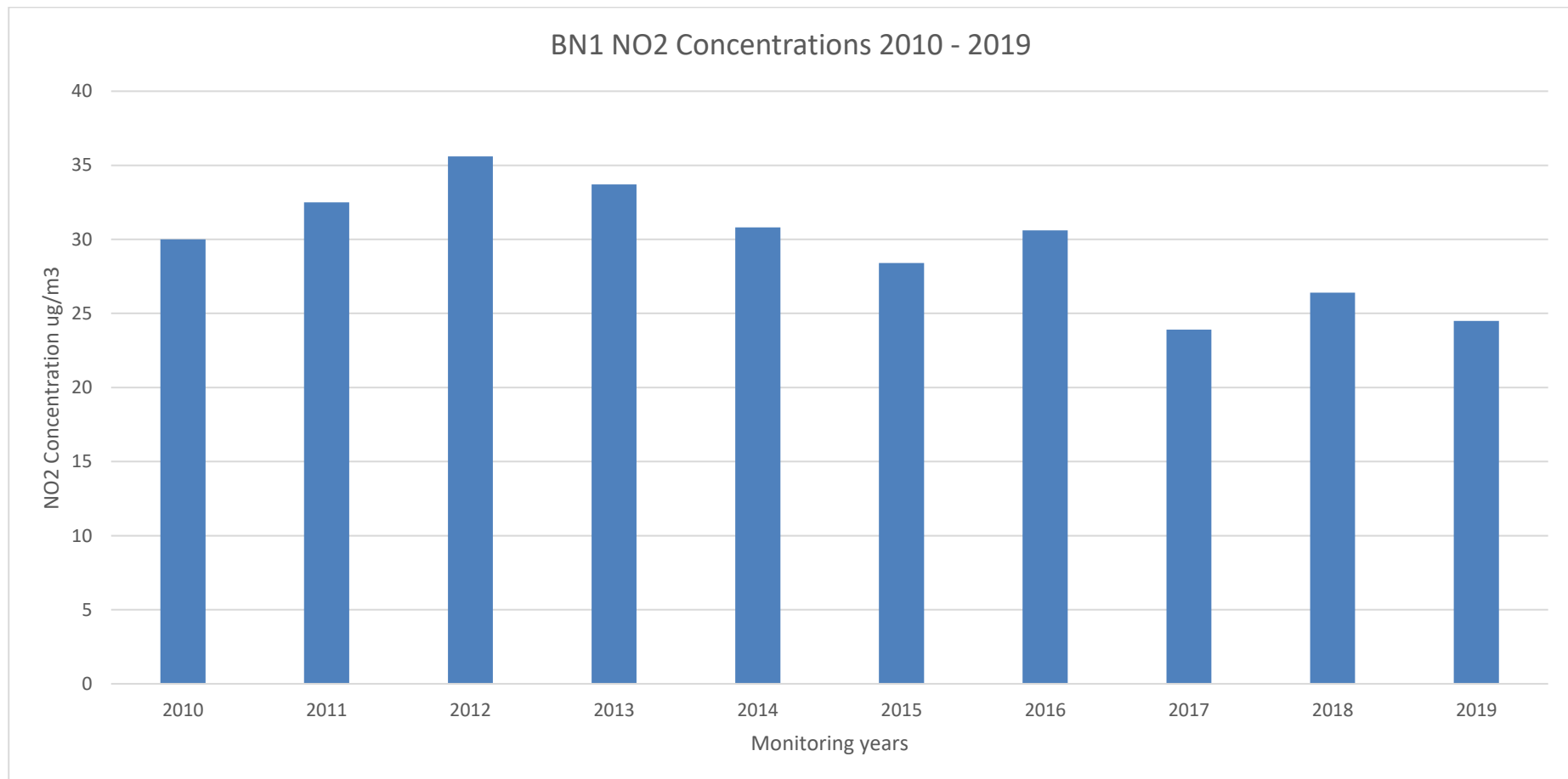


Comparison of results for 2018 and 2019

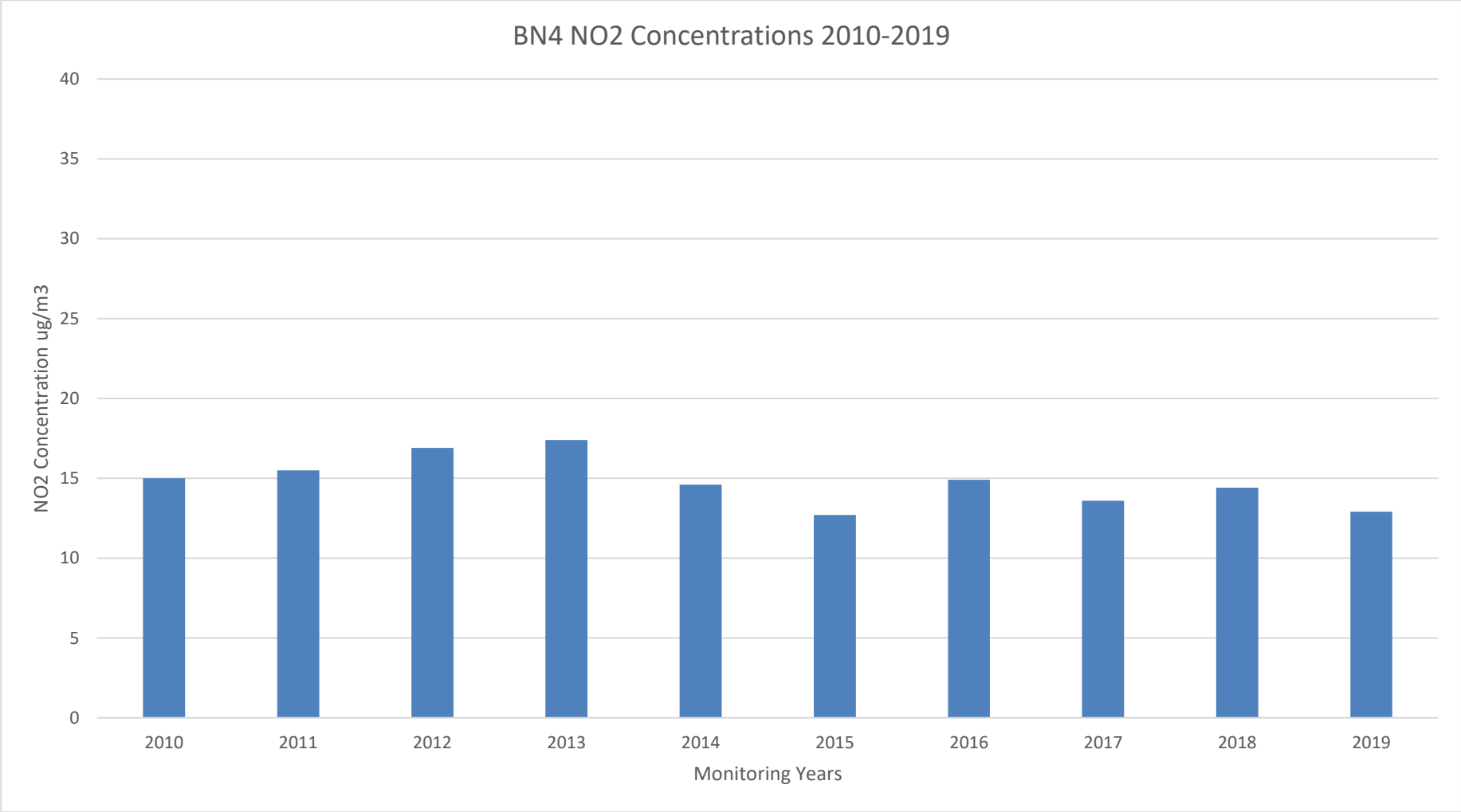


Location results – details of locations in Table A.1 above

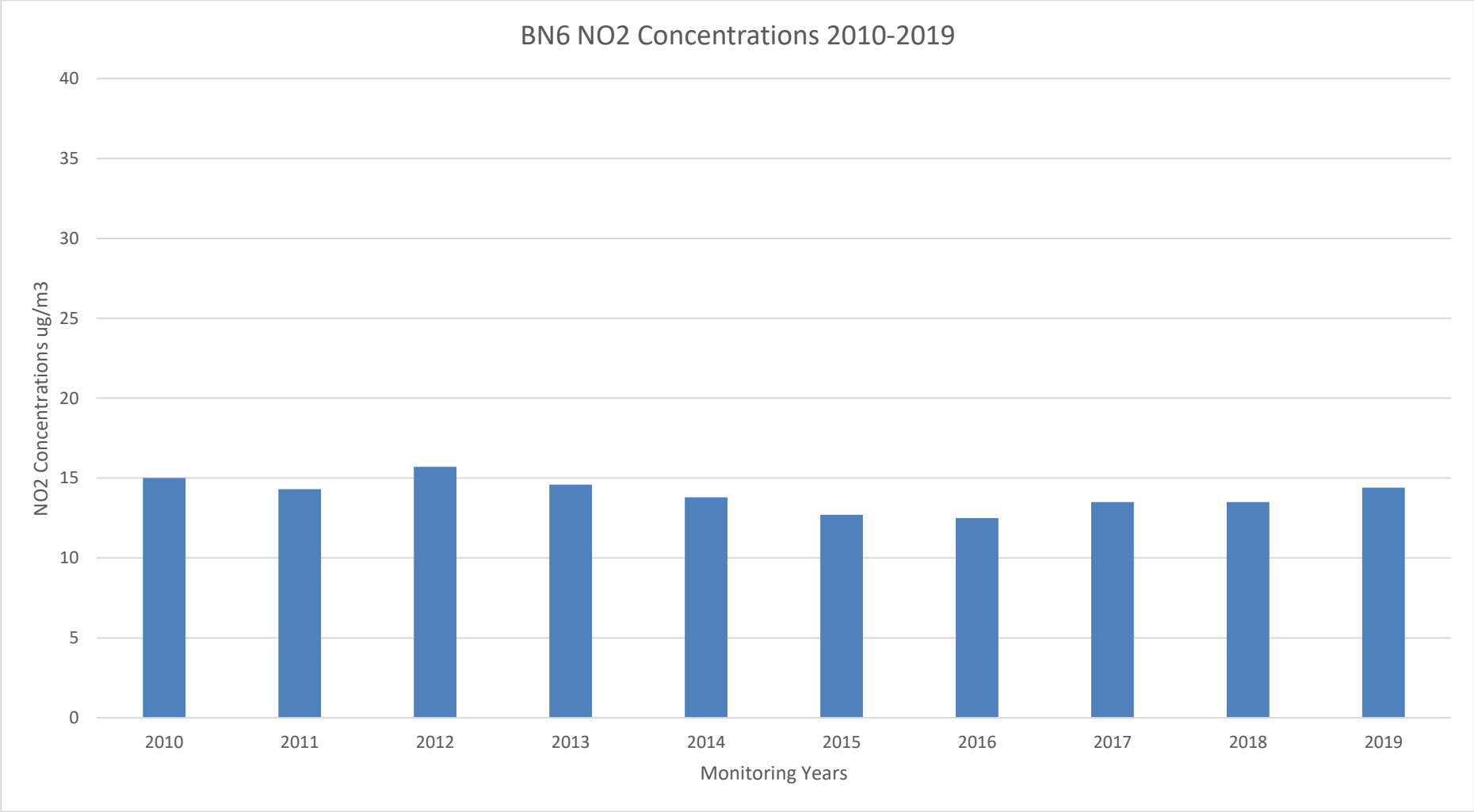
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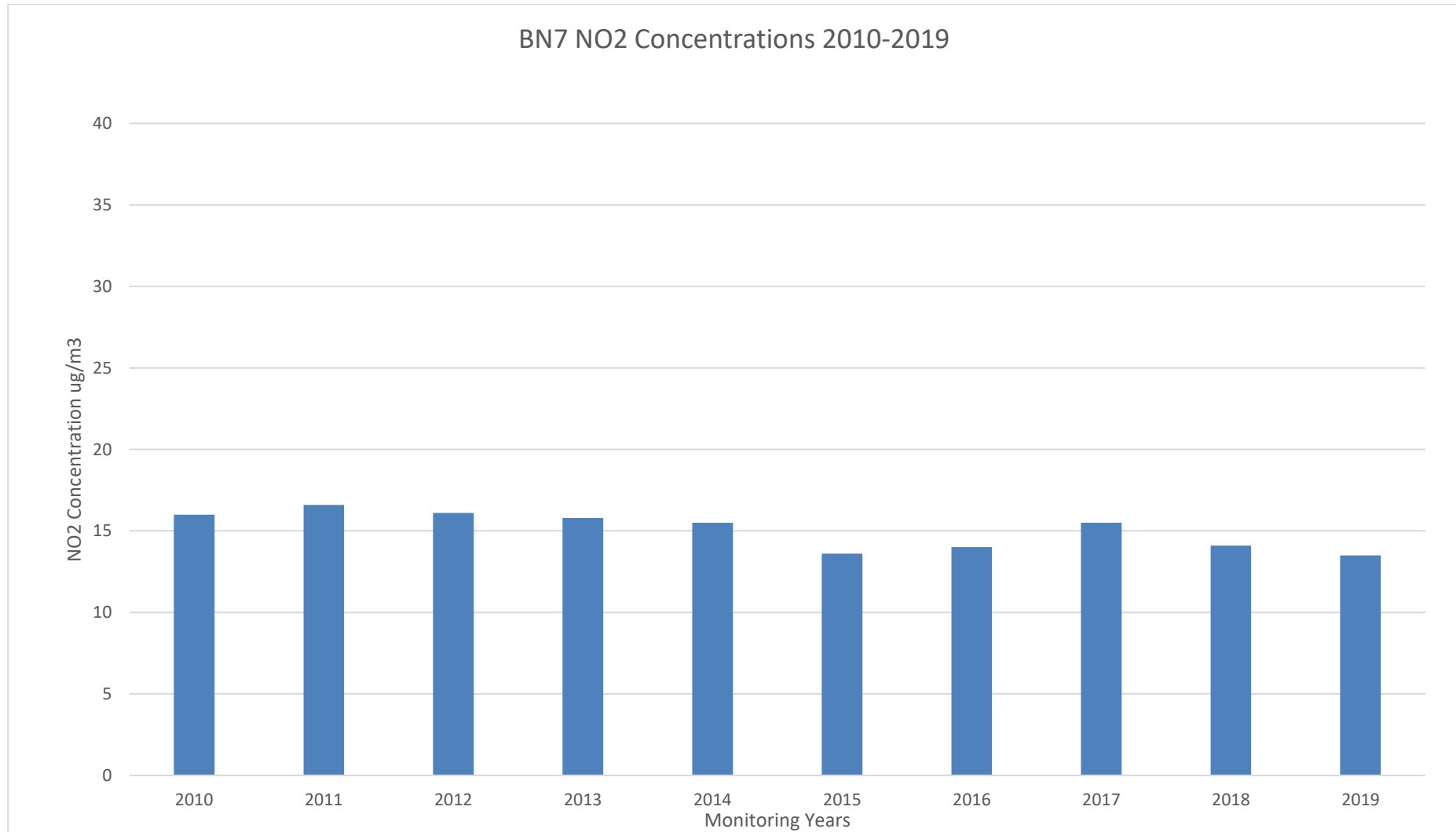
BN4



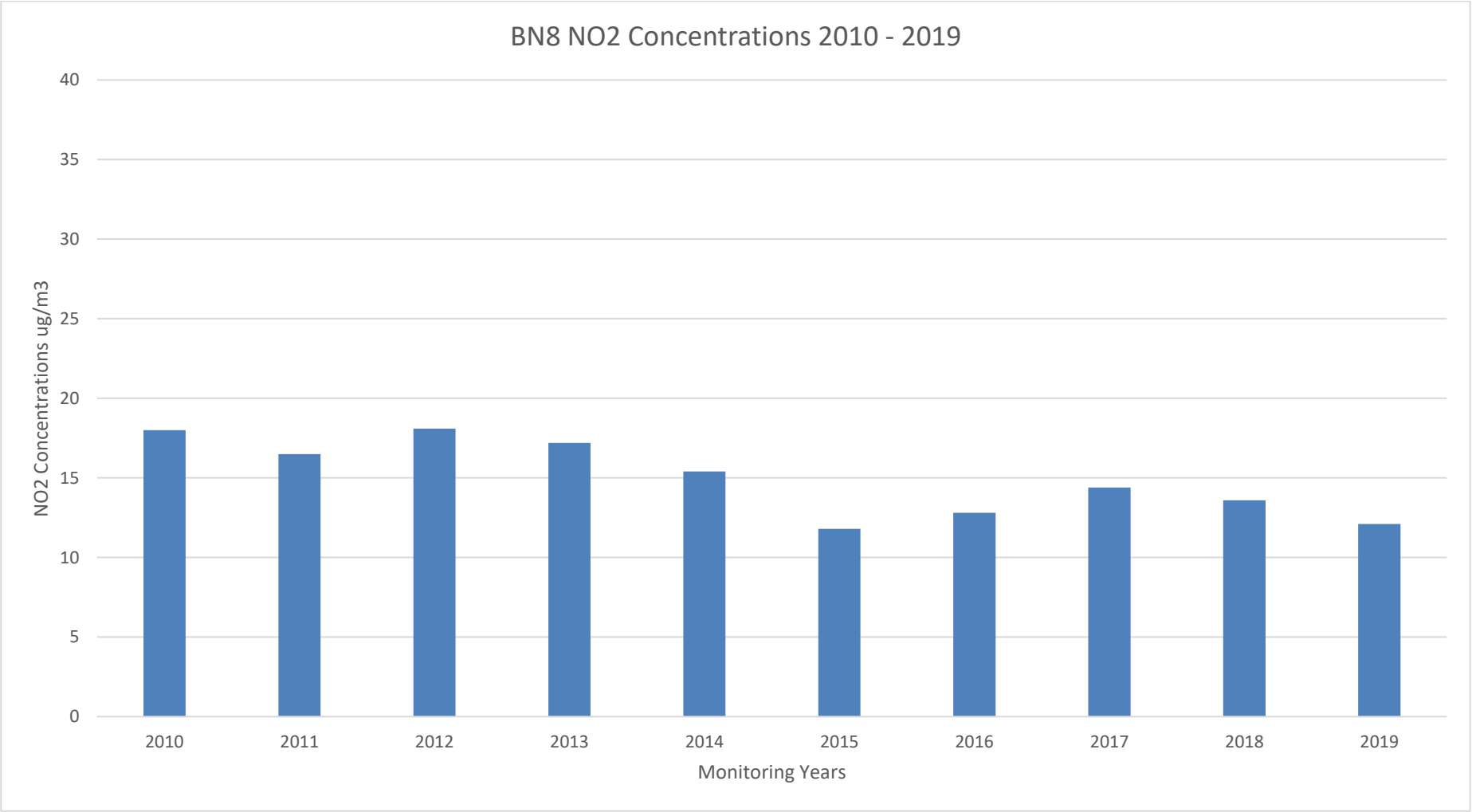
BN6



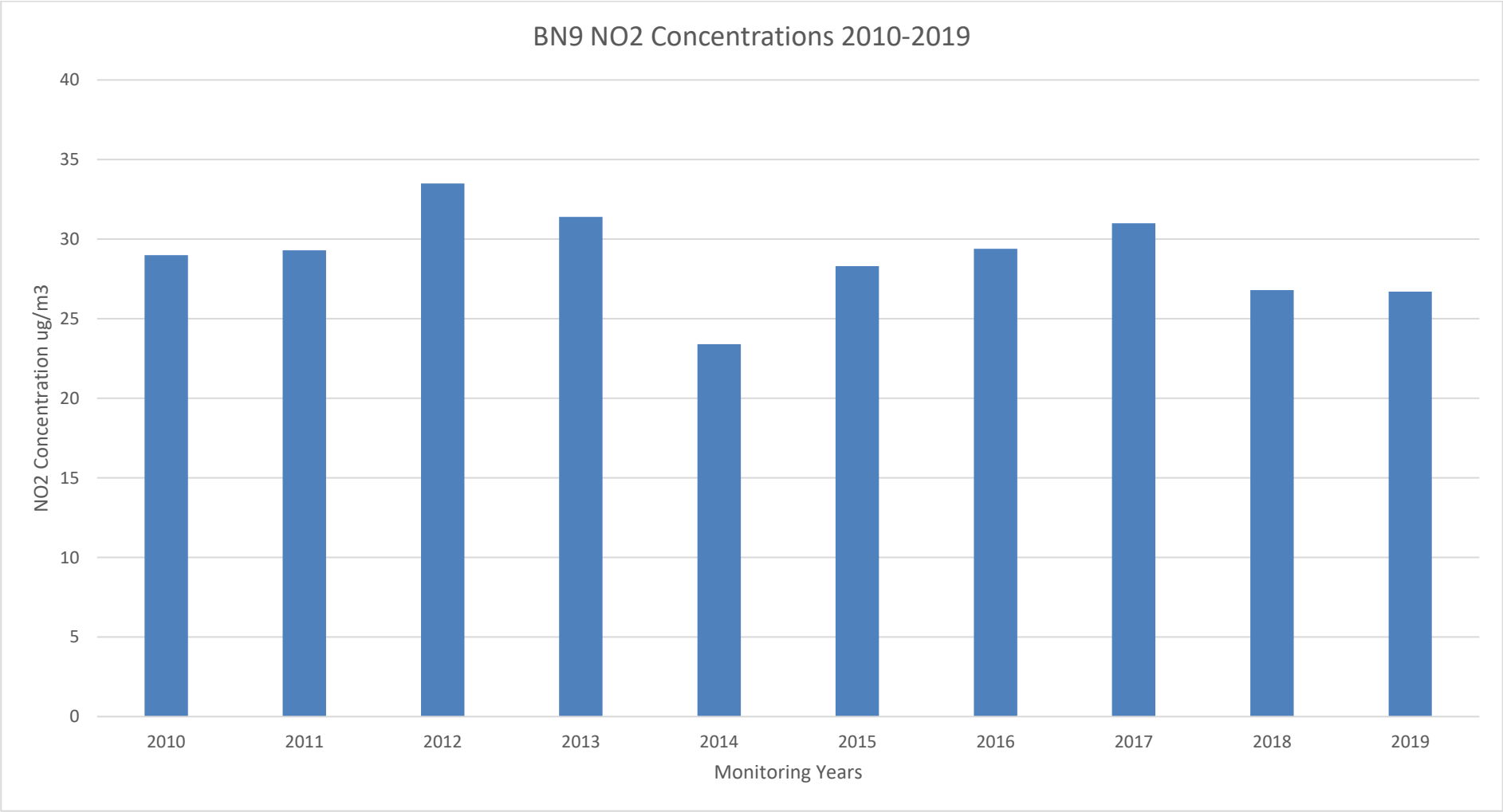
BN7



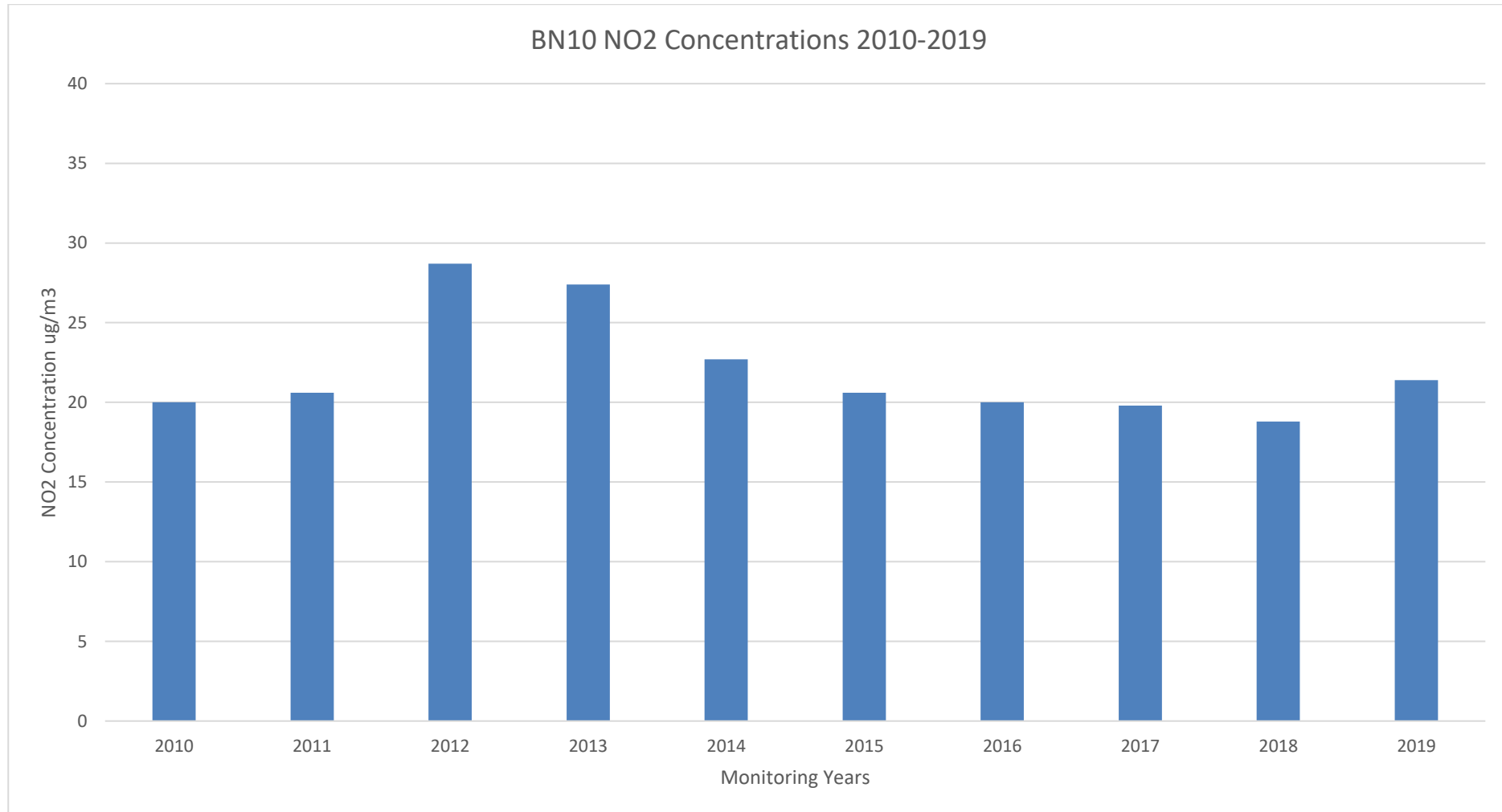
BN8



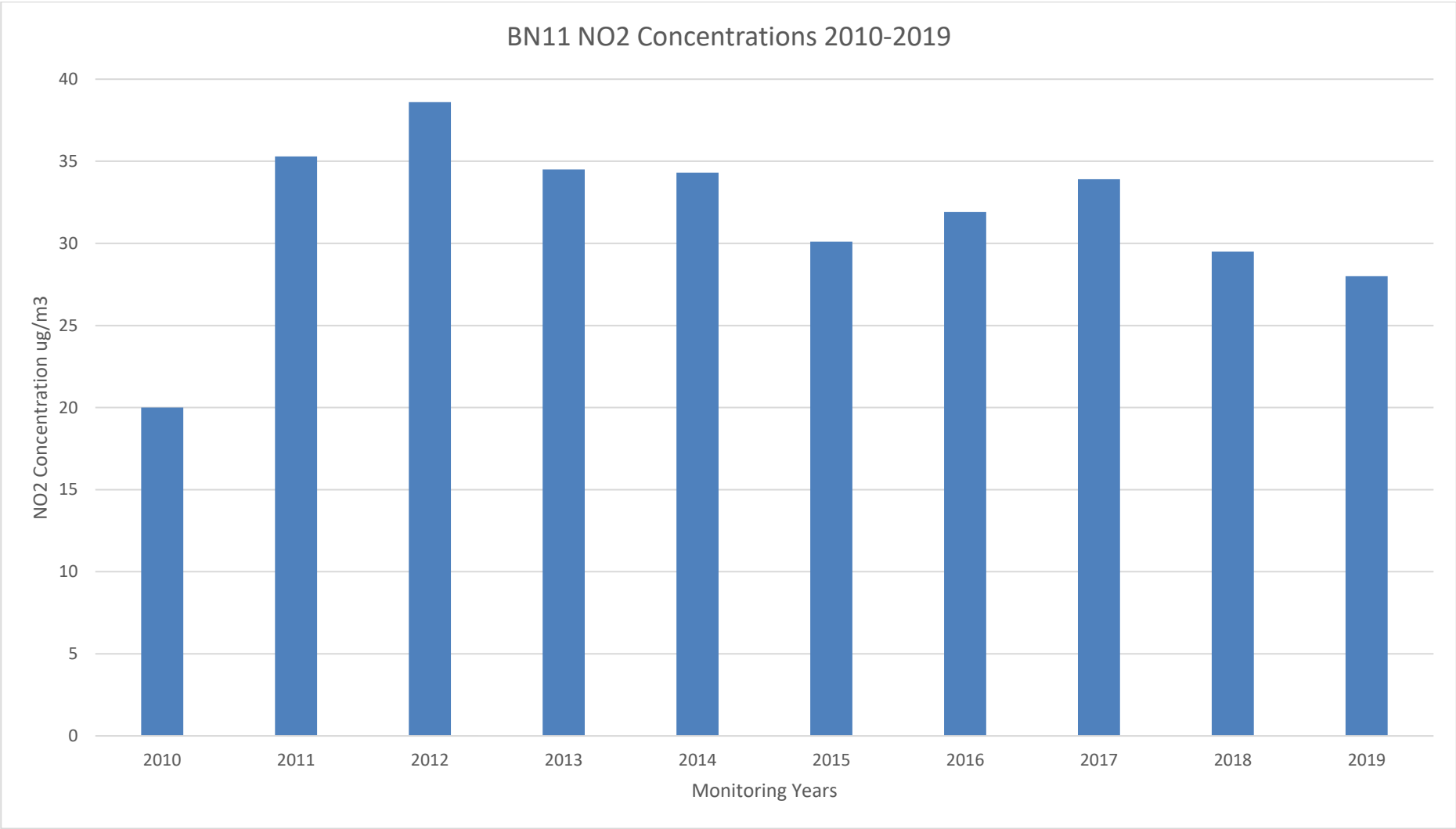
BN9



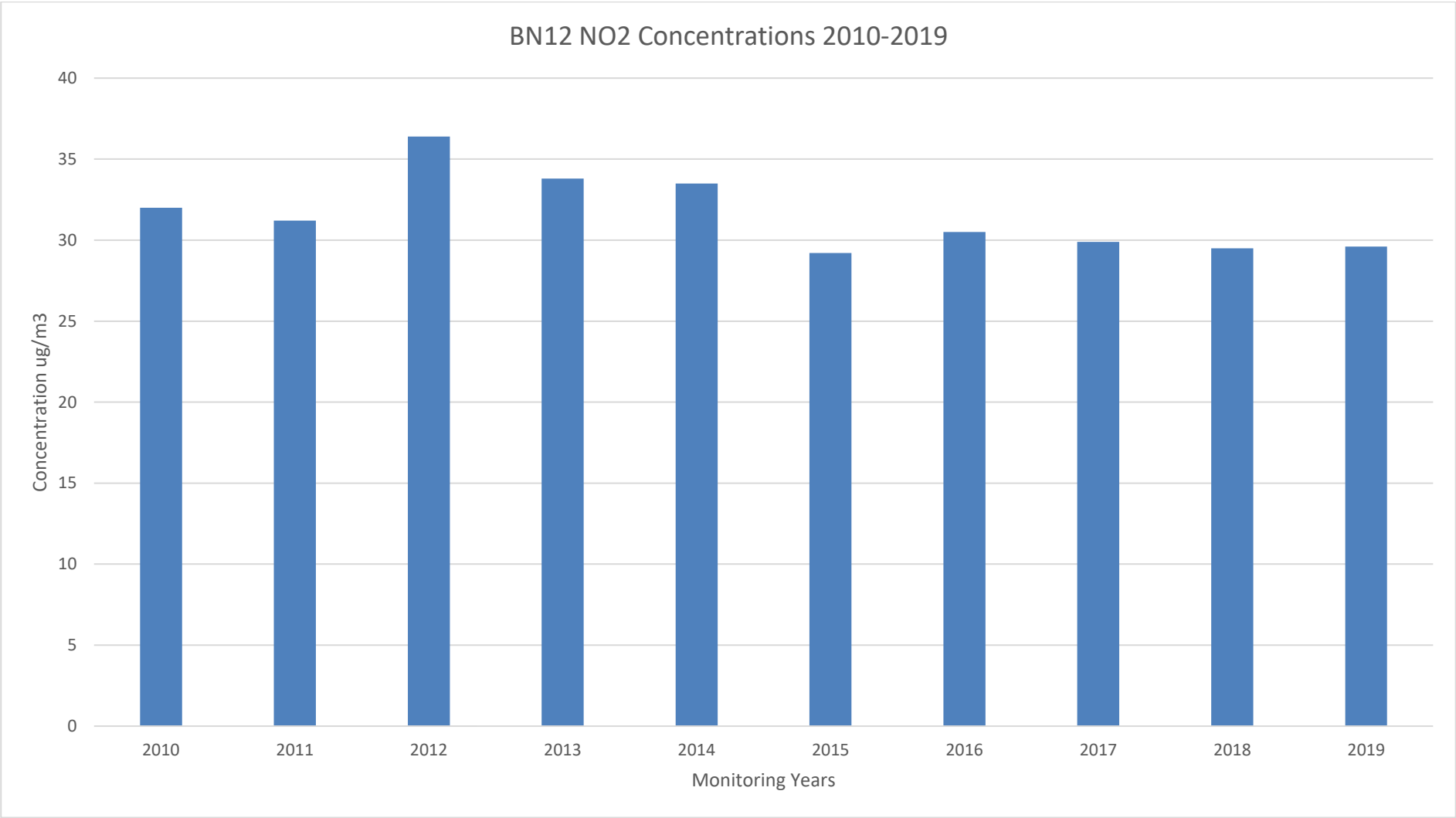
BN10



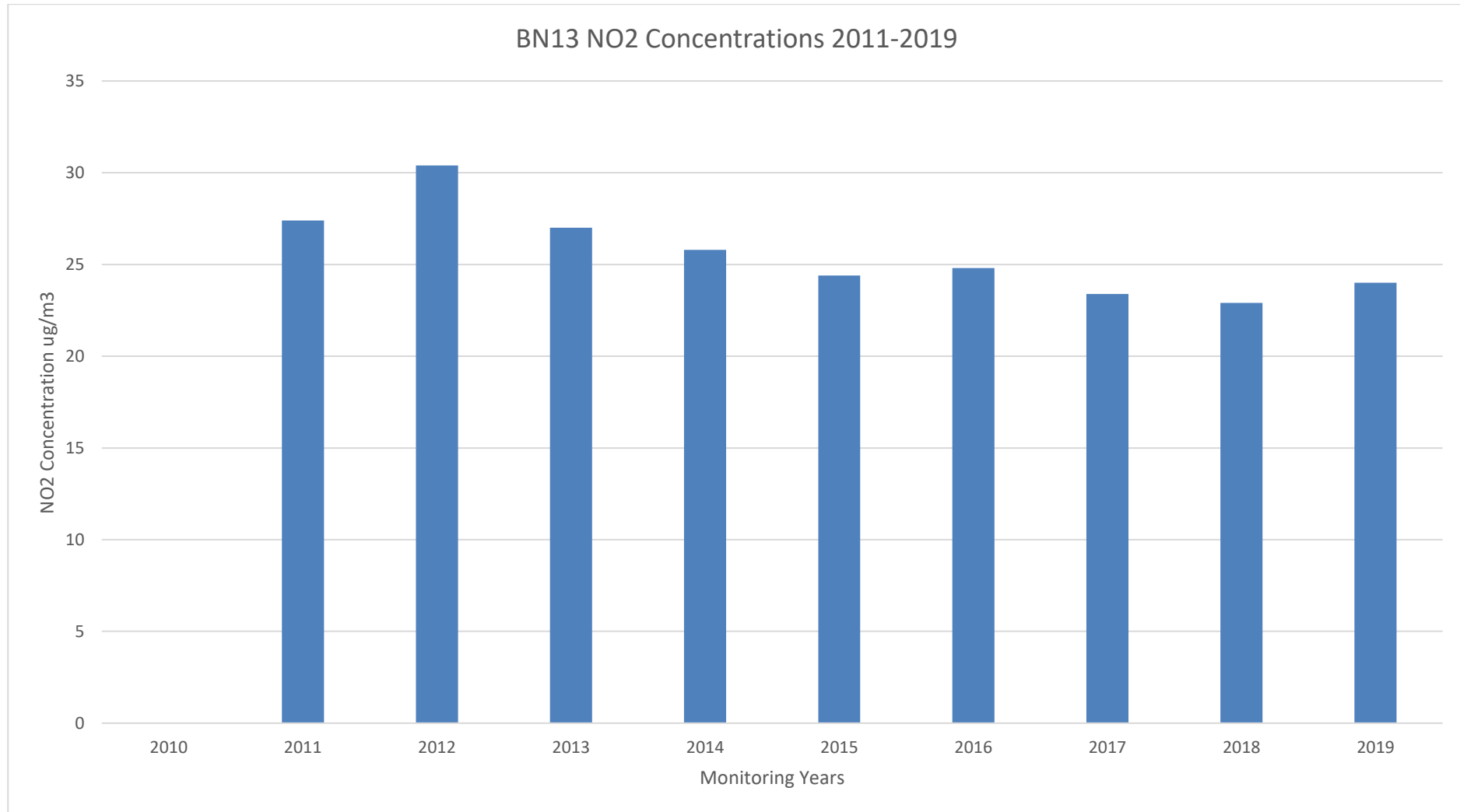
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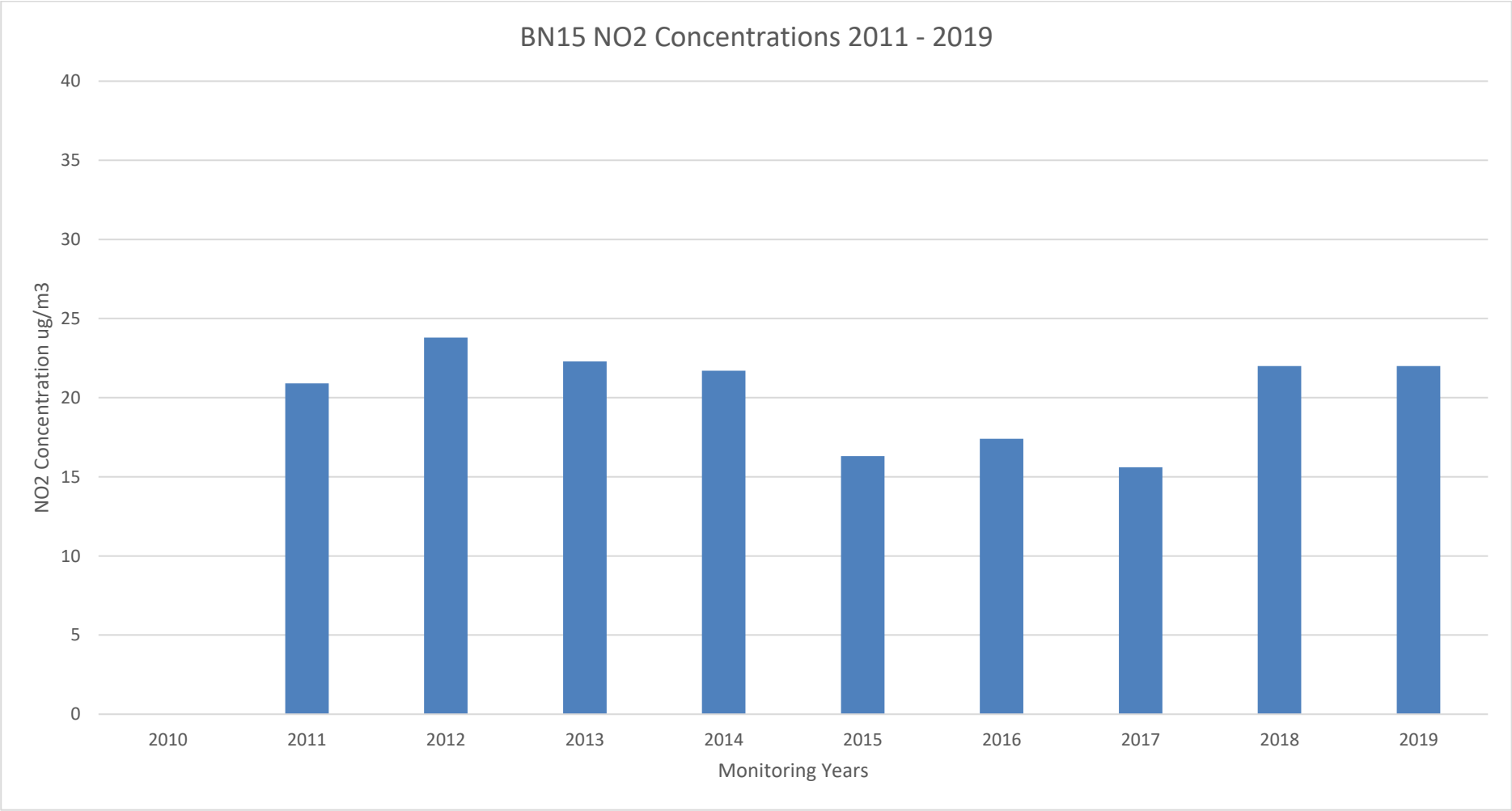
BN12



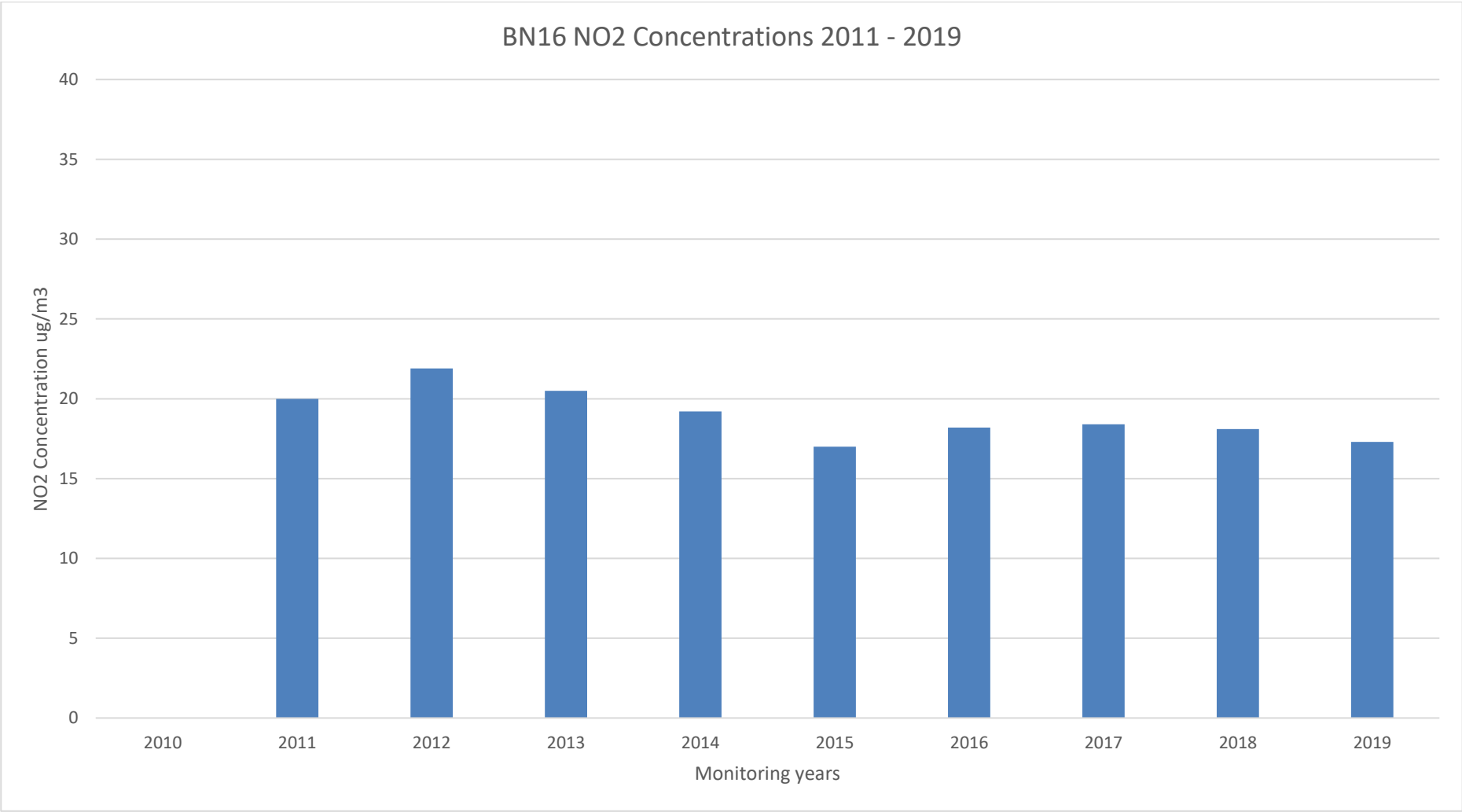
BN13



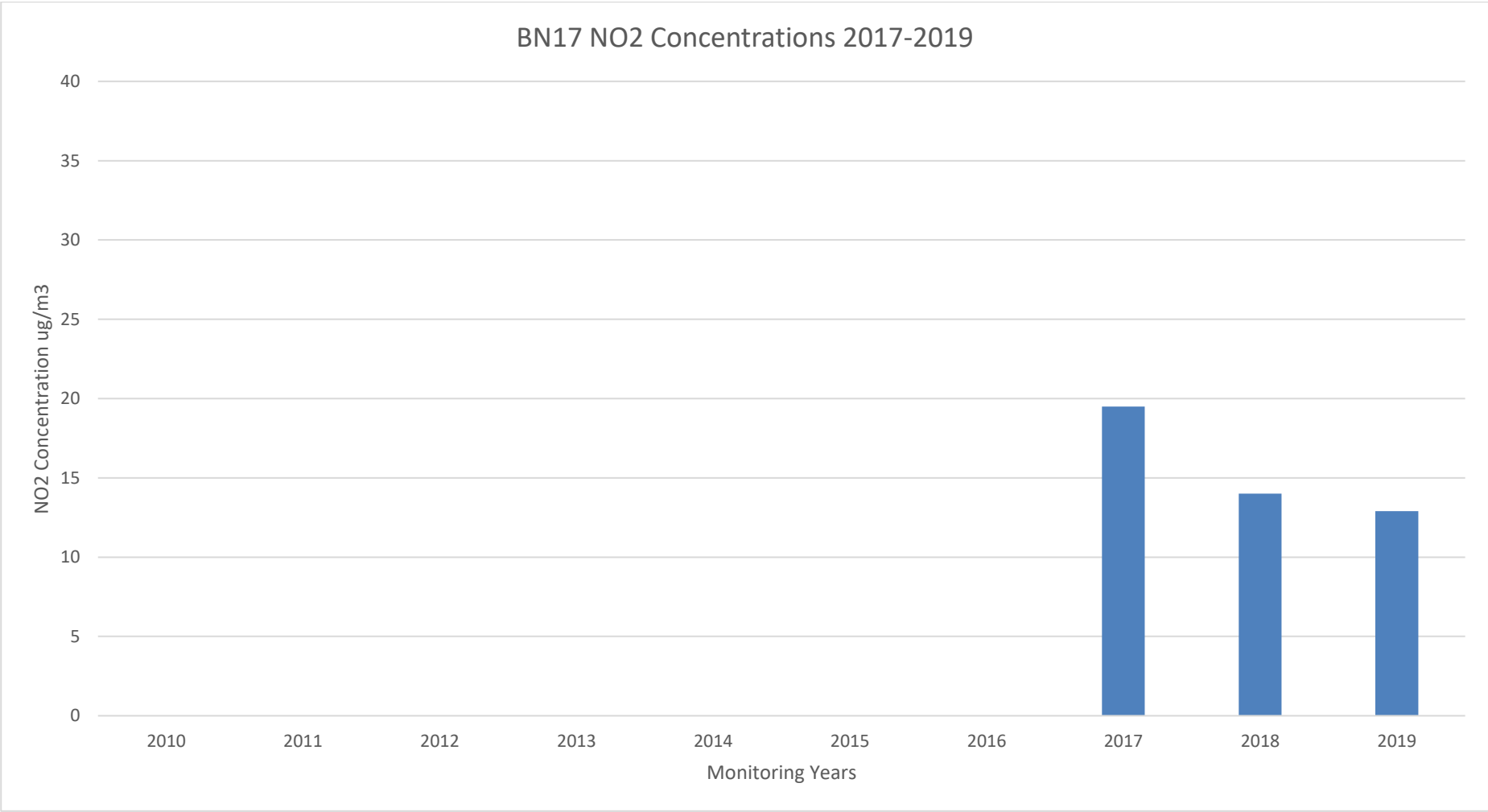
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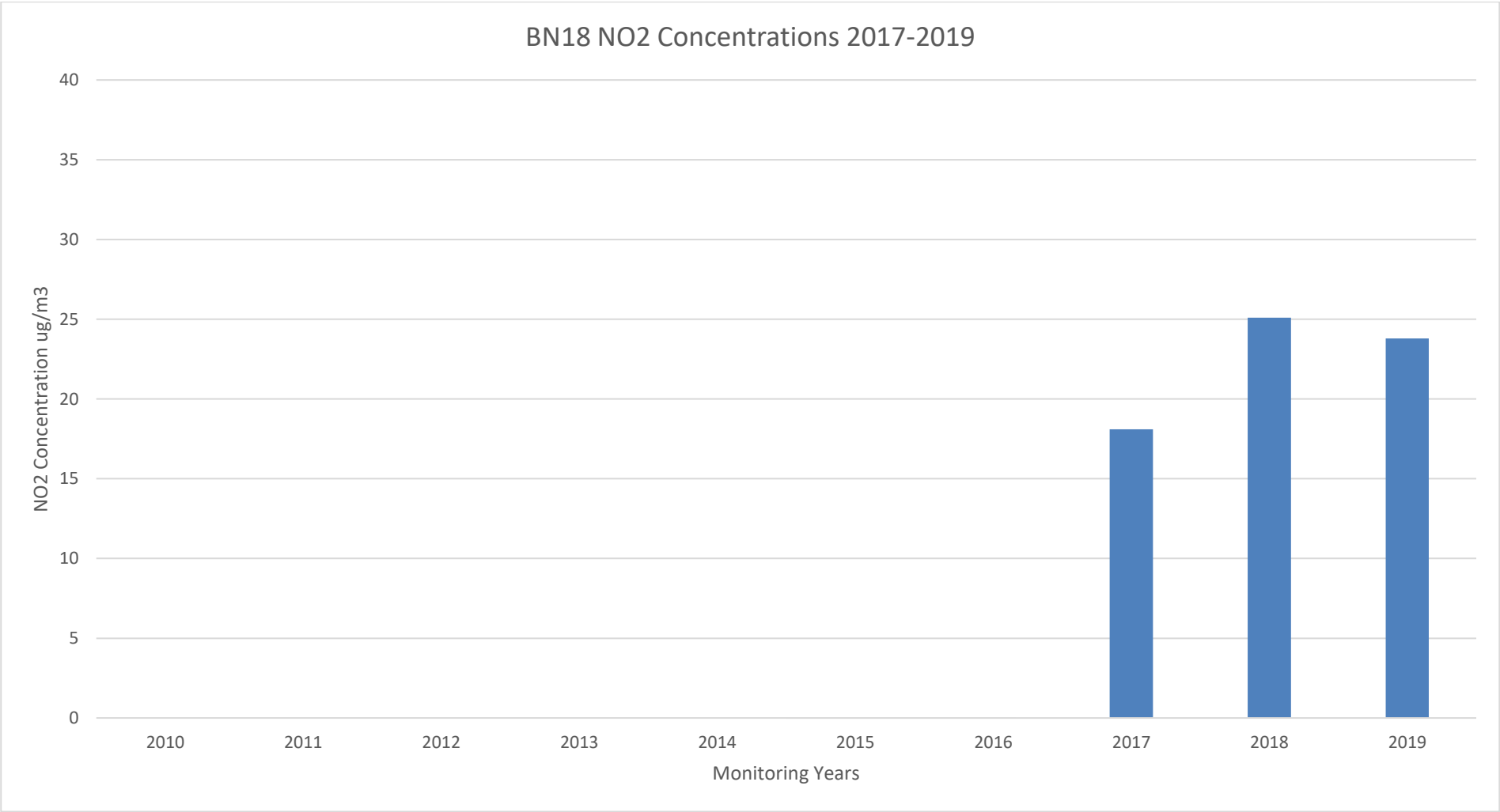
BN16



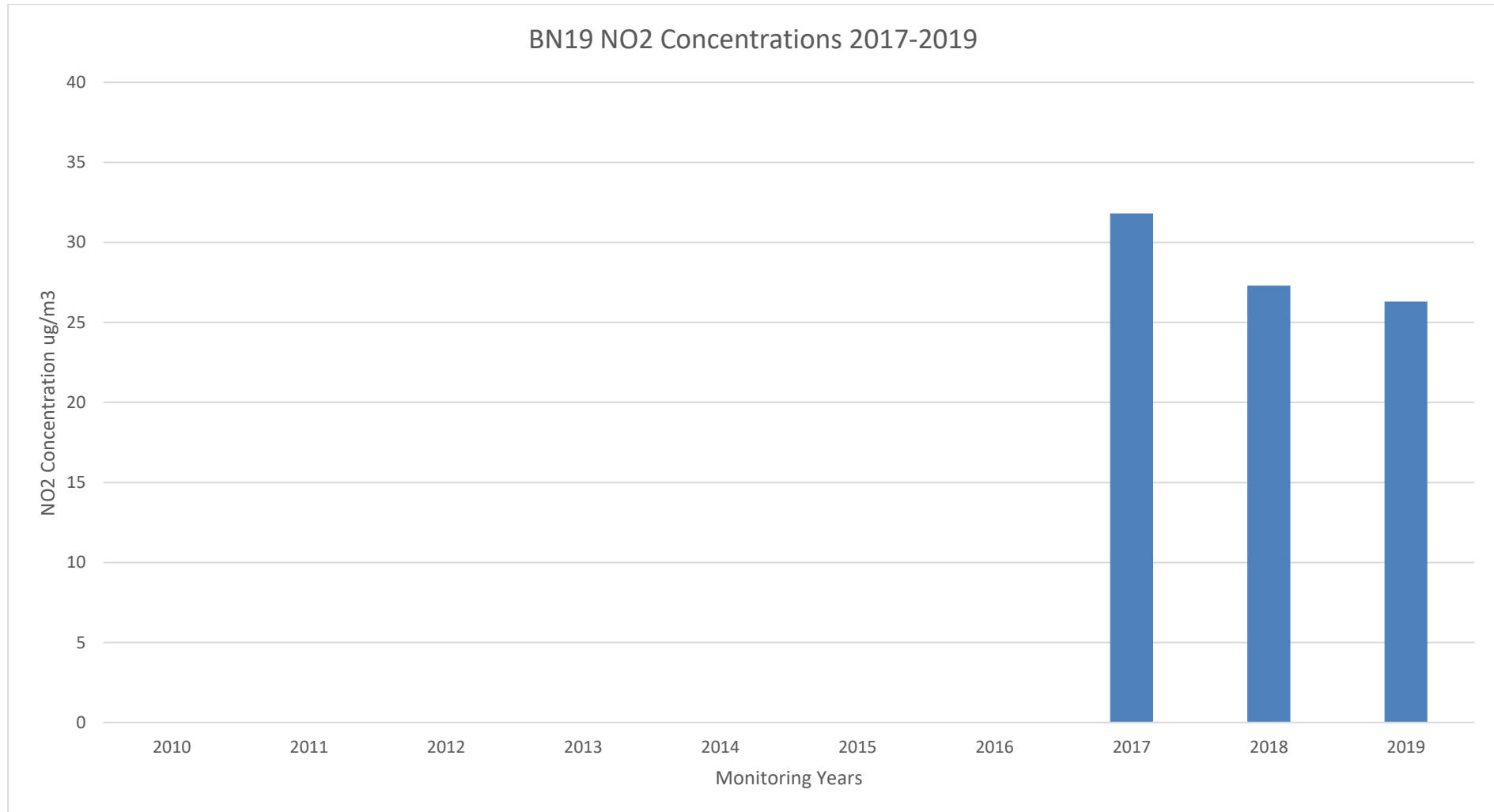
BN17



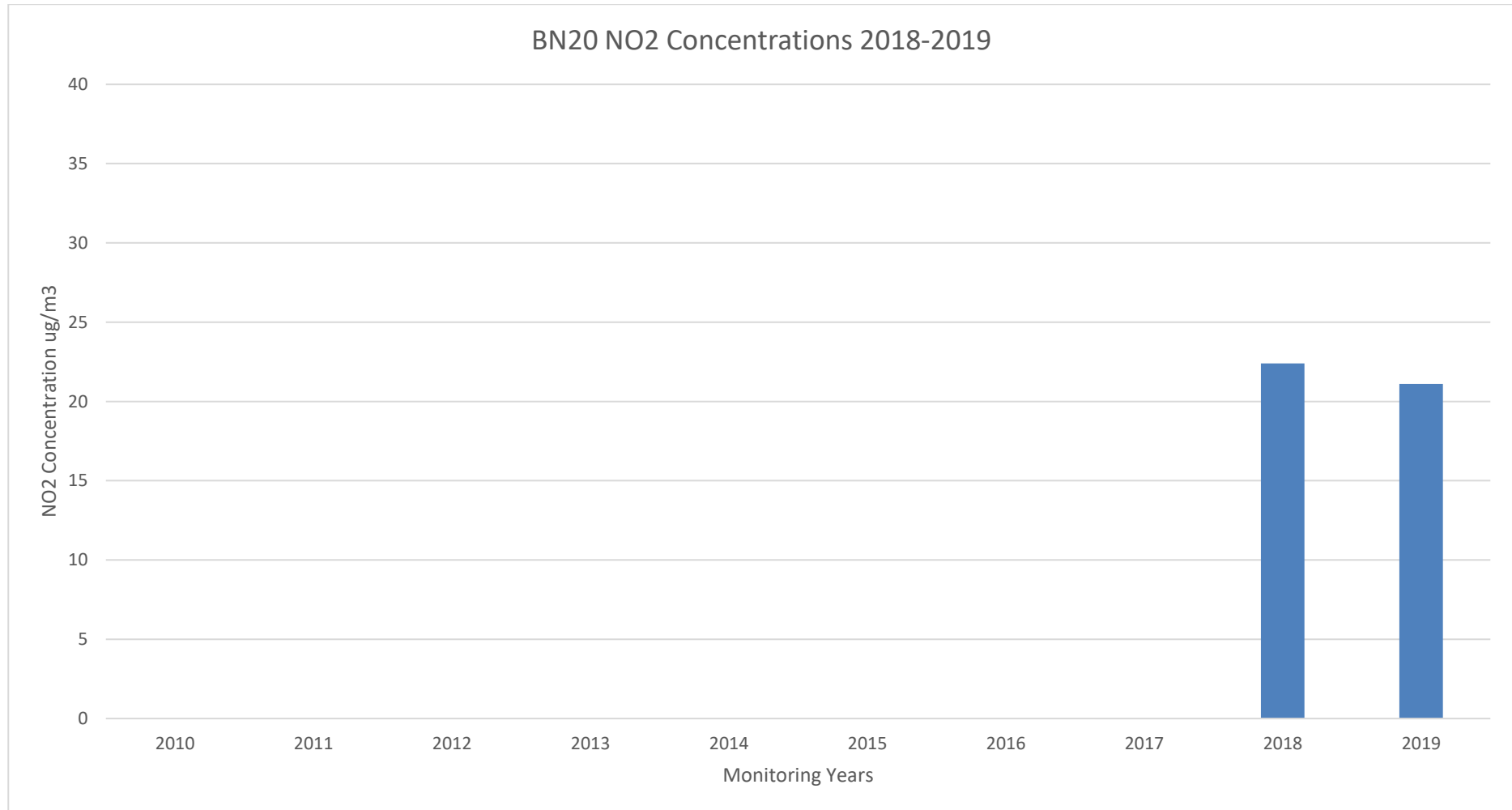
BN18



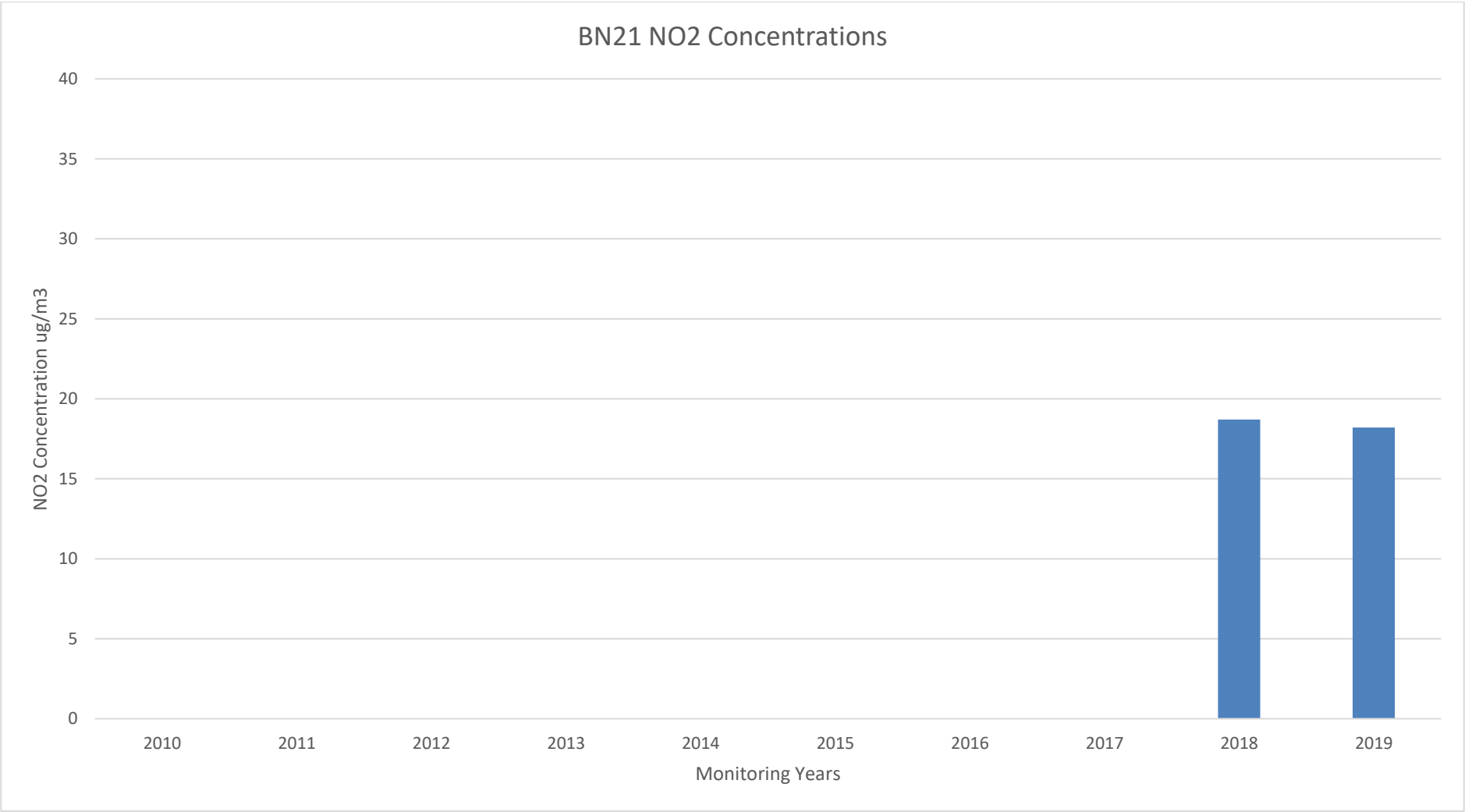
BN19



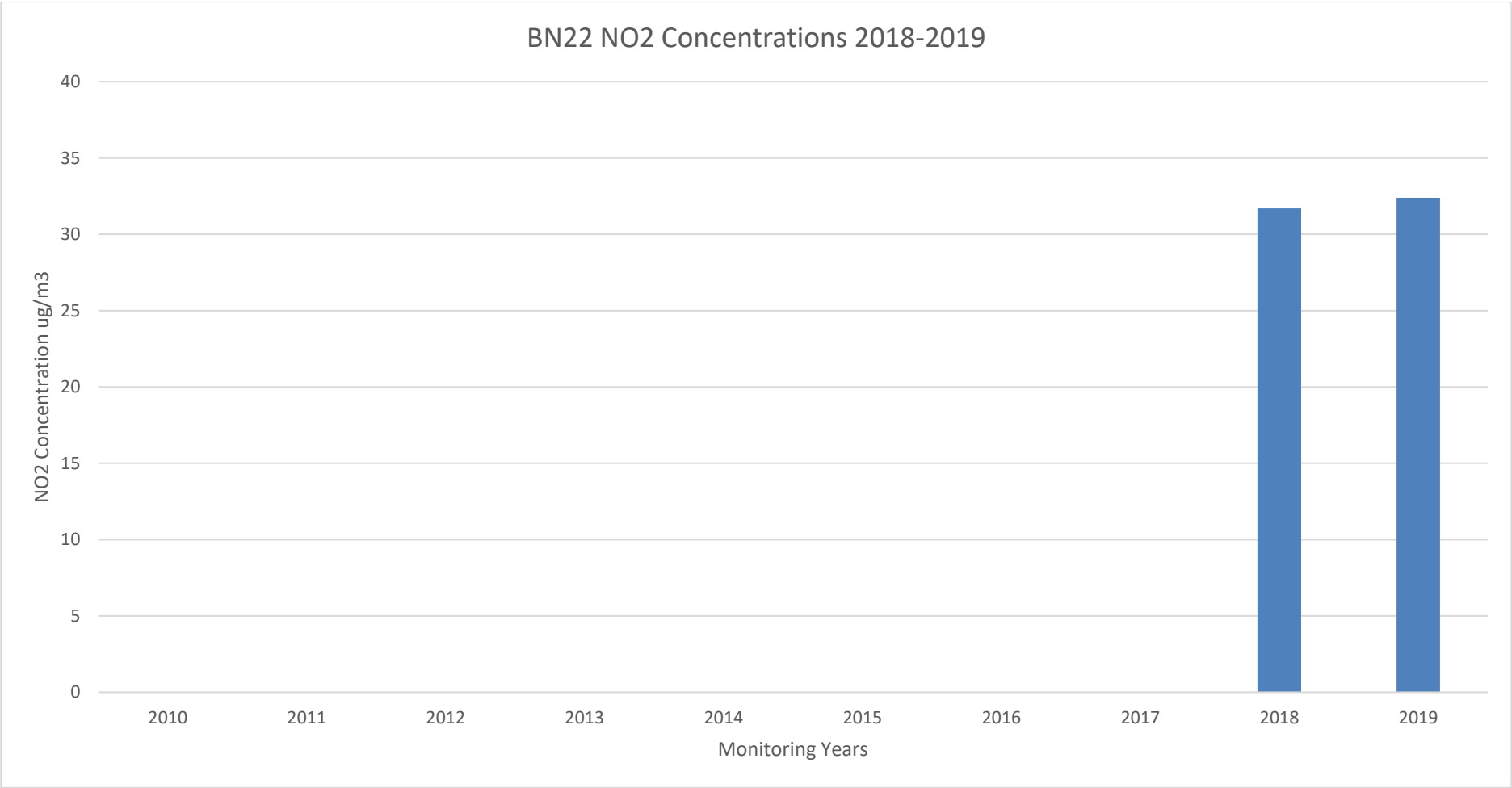
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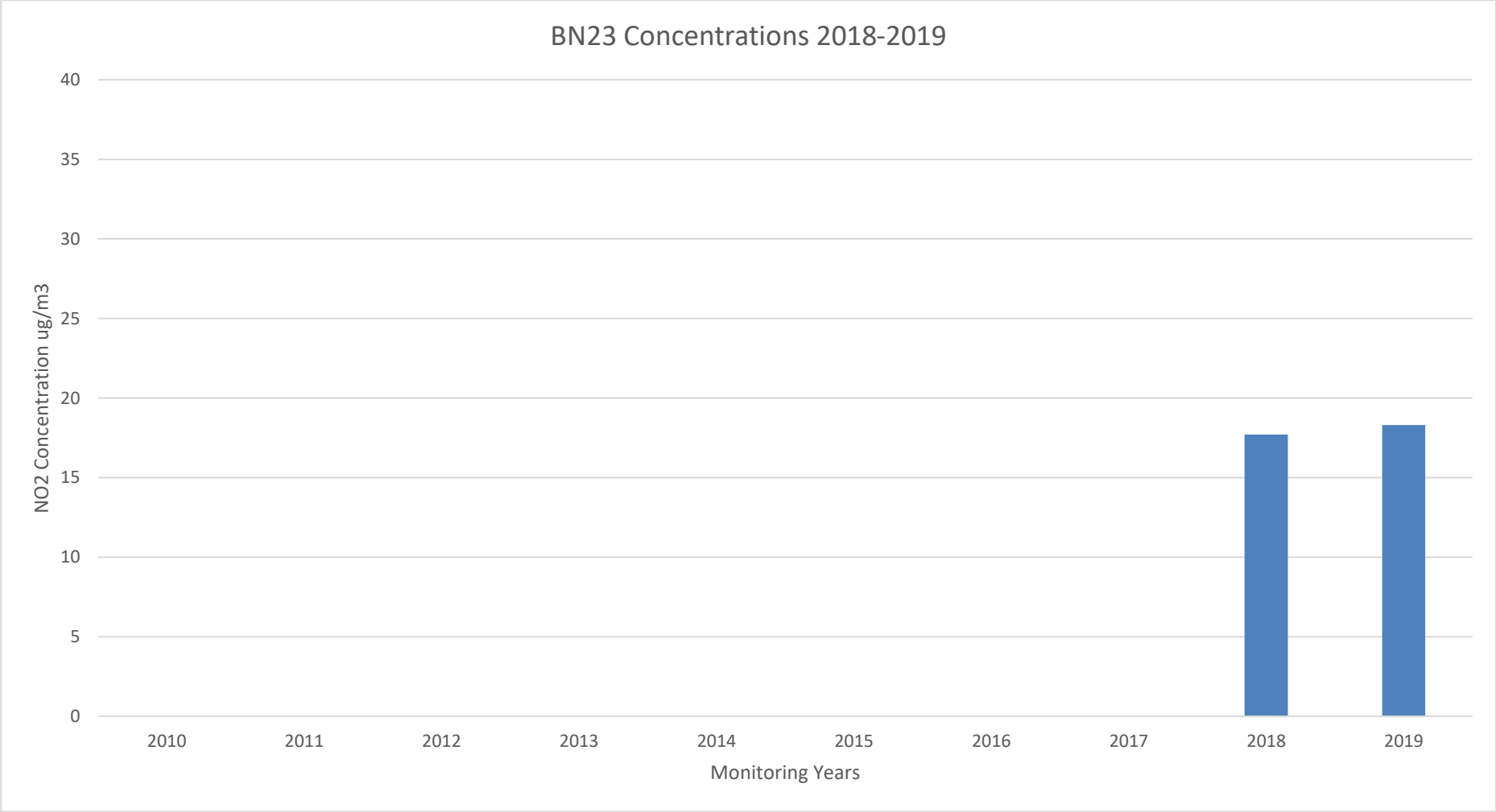
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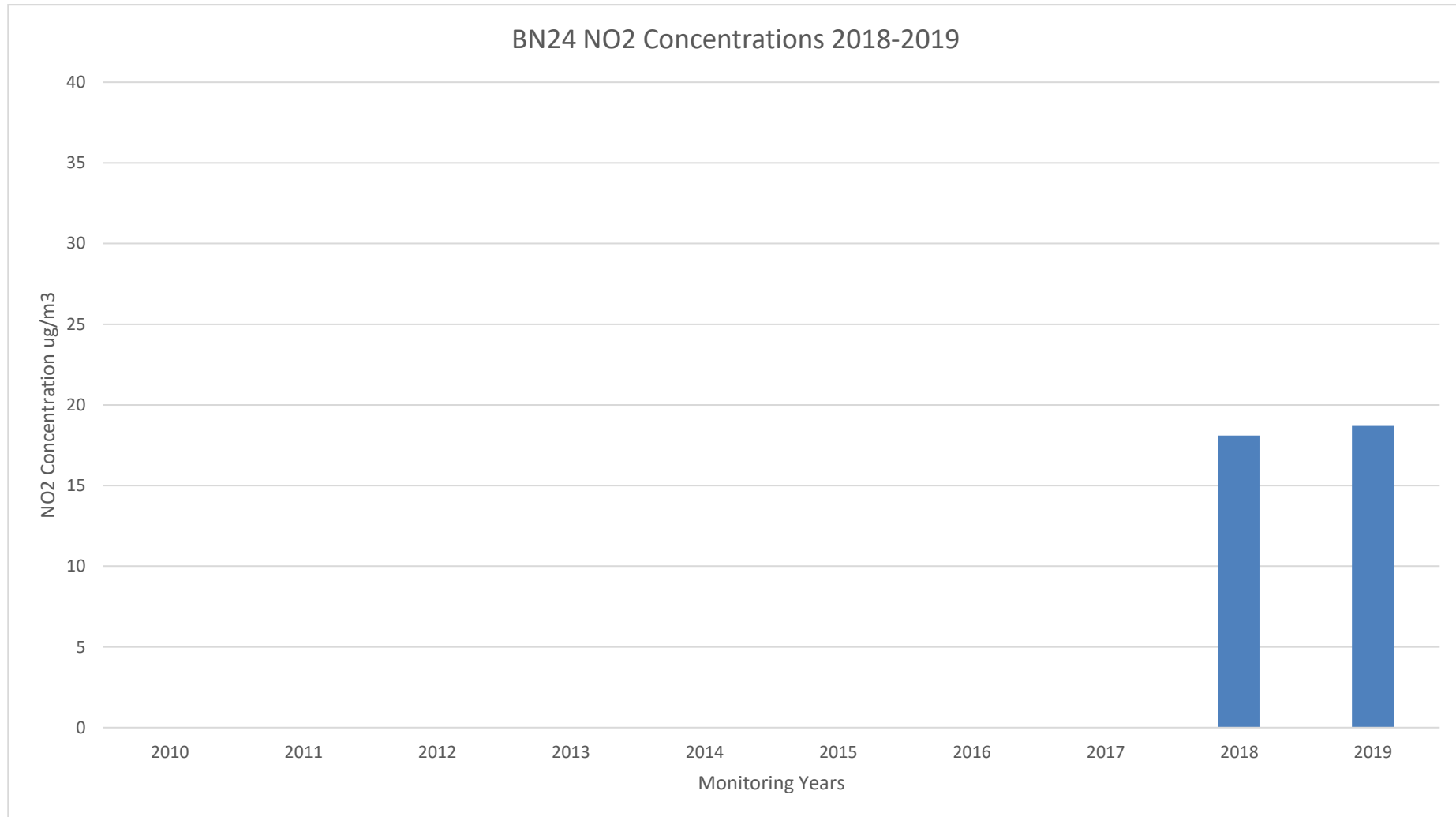
BN22



BN23

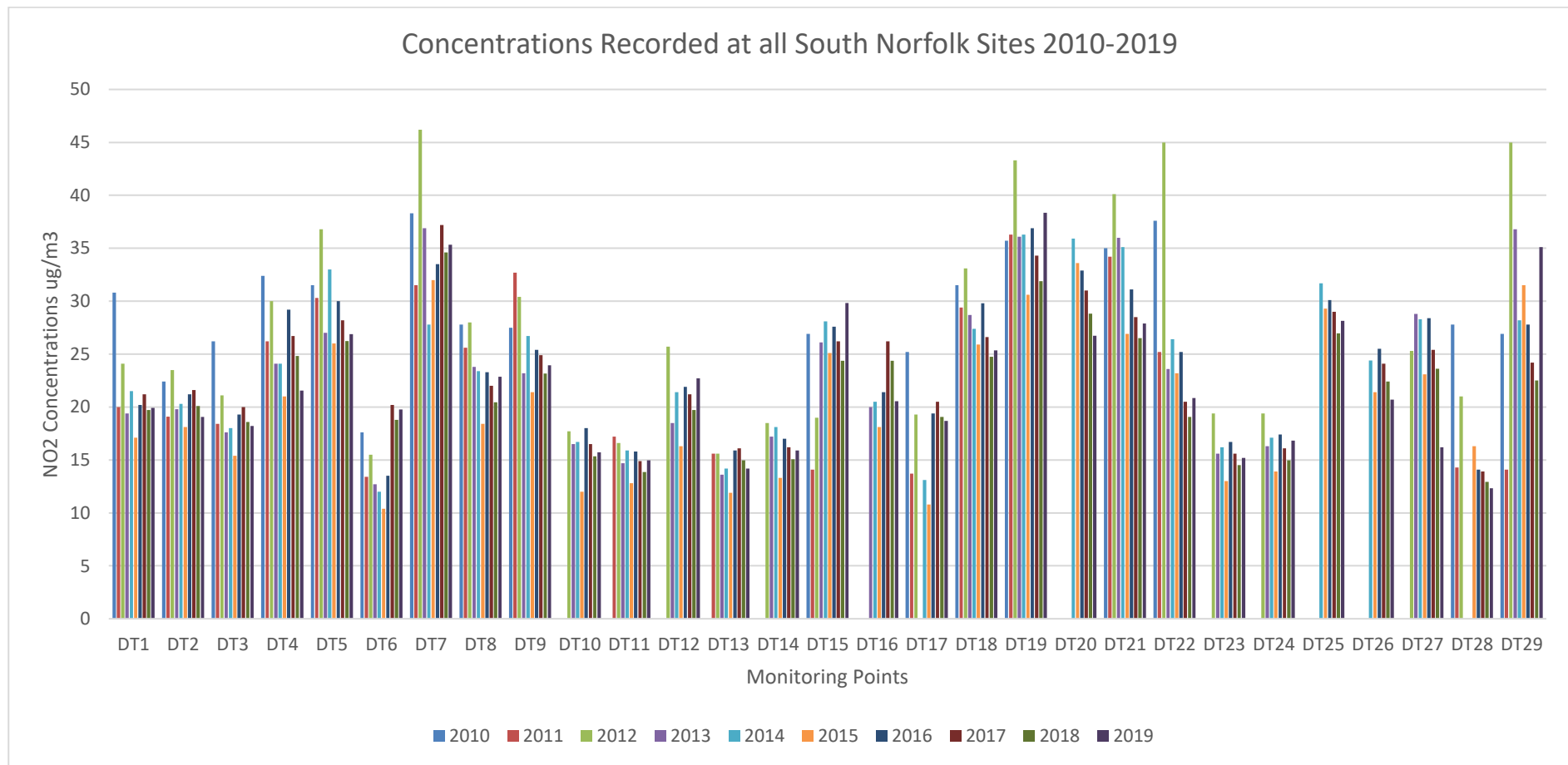


BN24

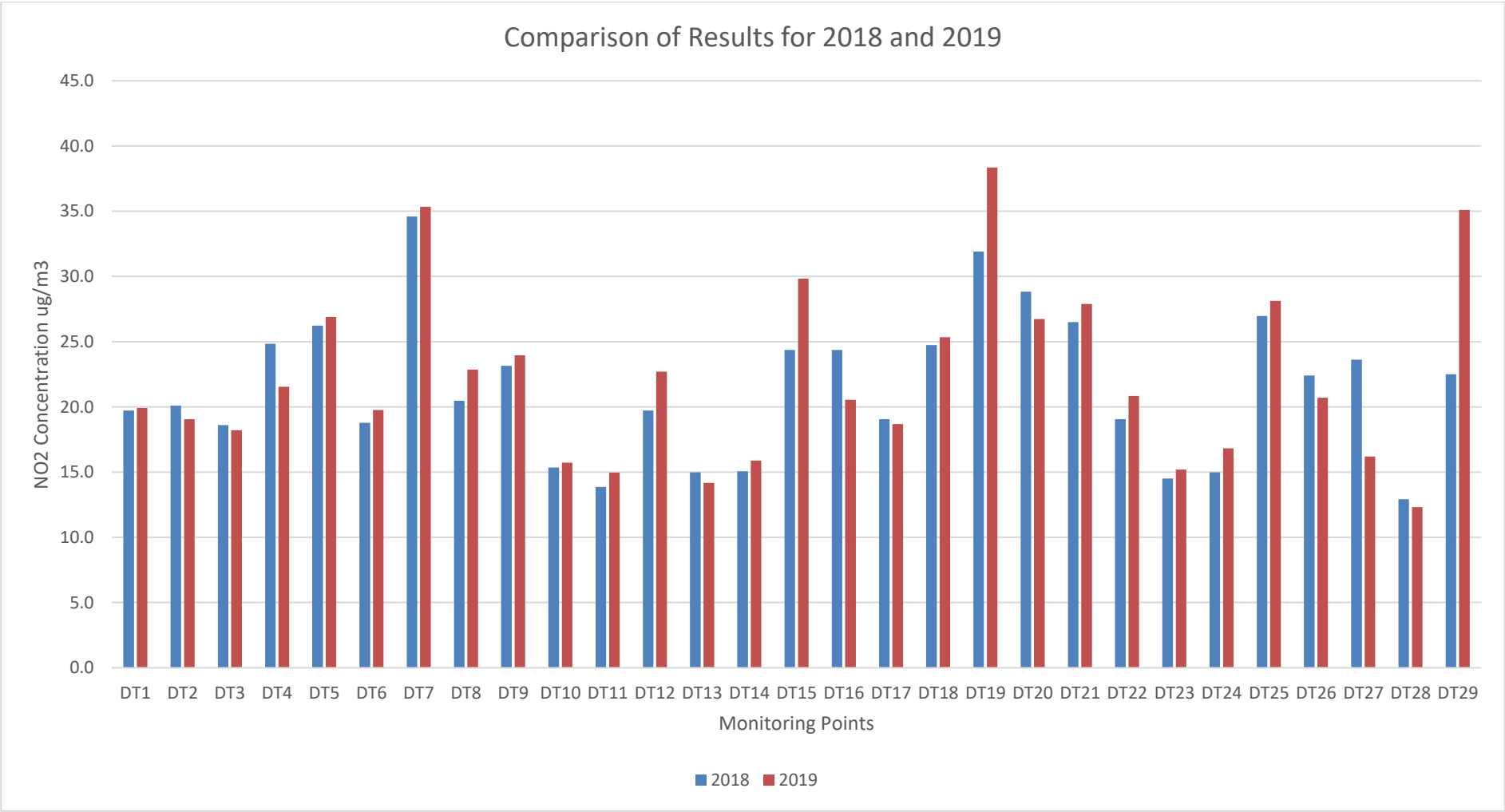


South Norfolk District Council Results

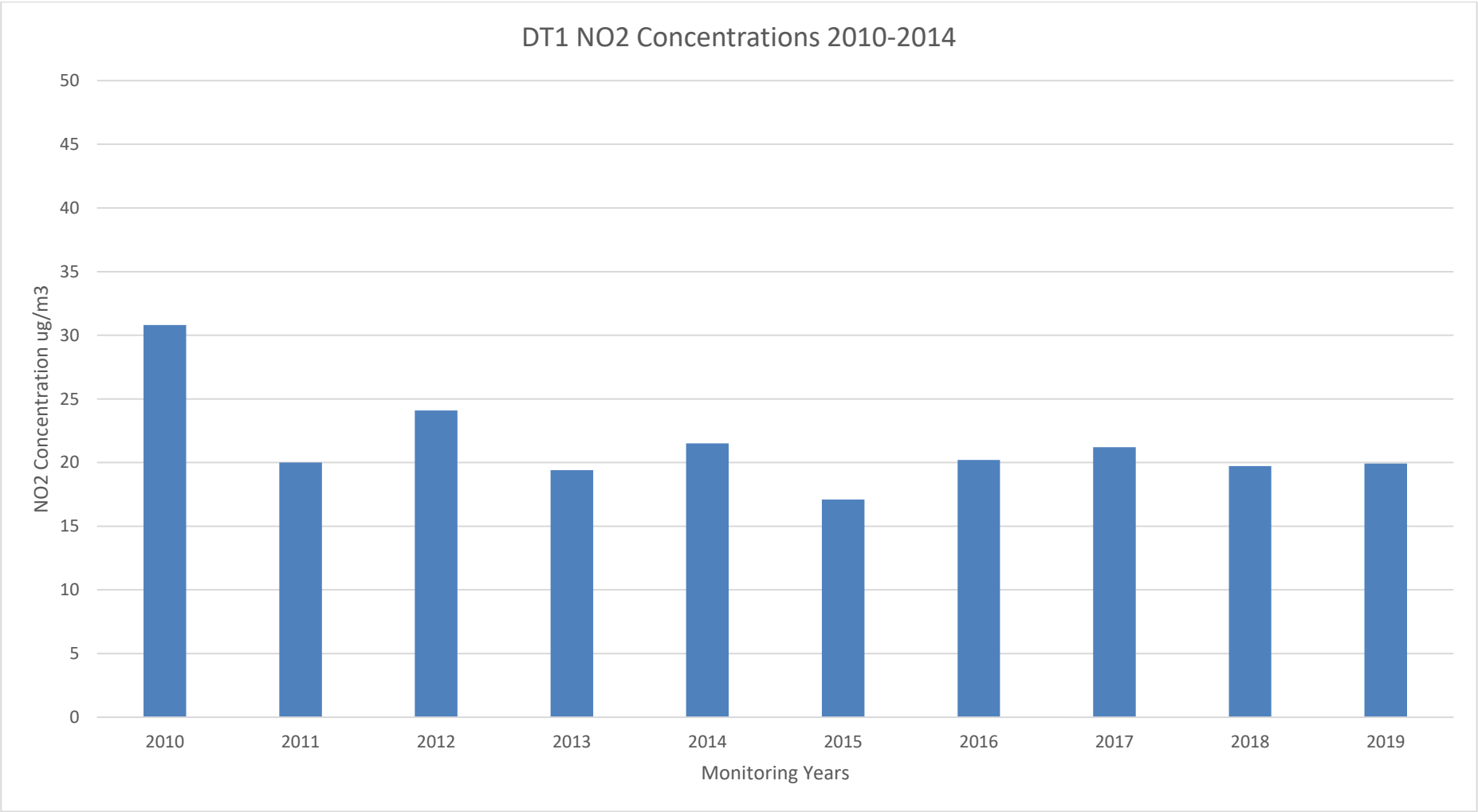
Concentrations recorded at all South Norfolk sites.2010-2019



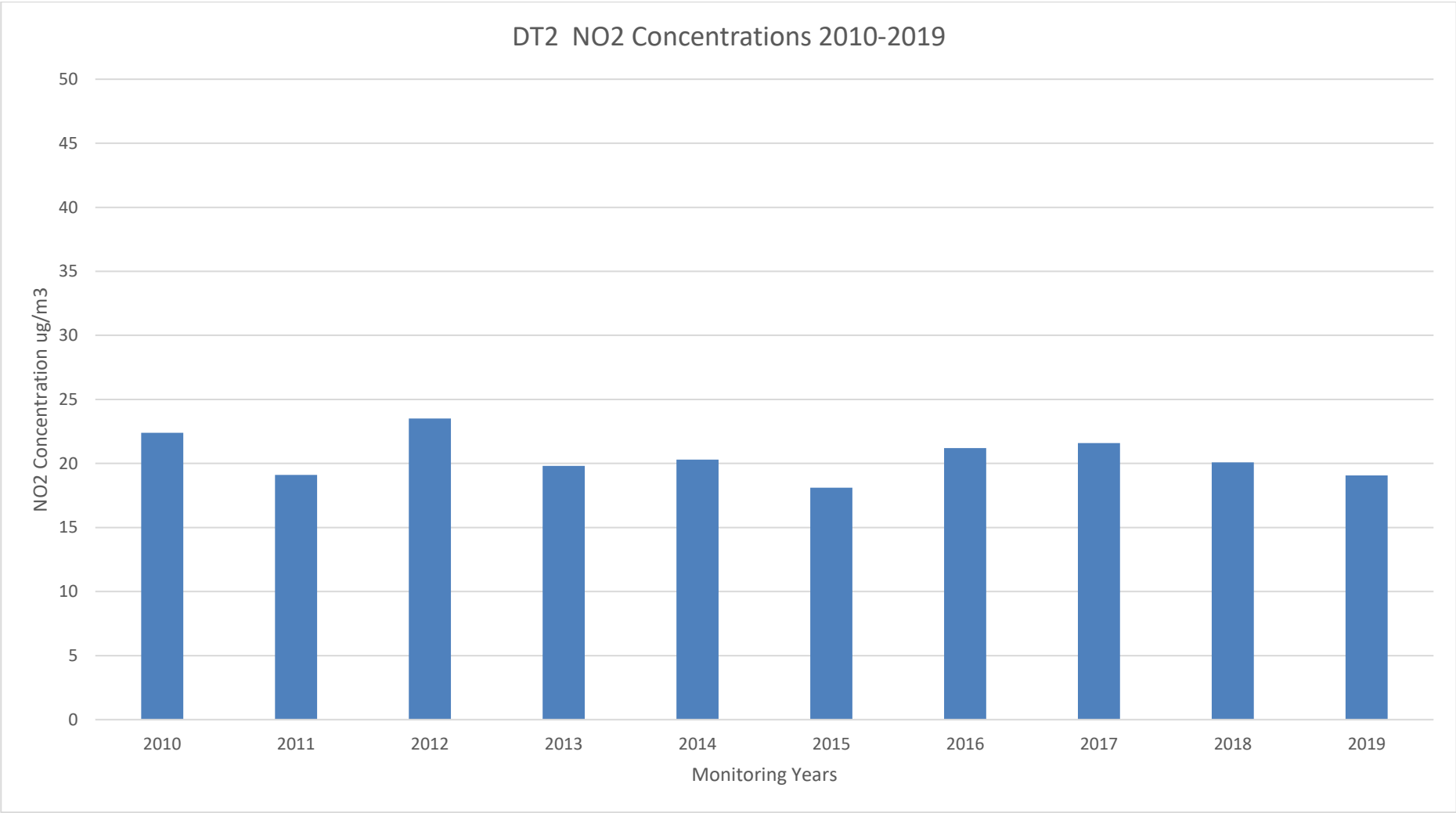
Concentrations recorded at all South Norfolk sites.2018-2019



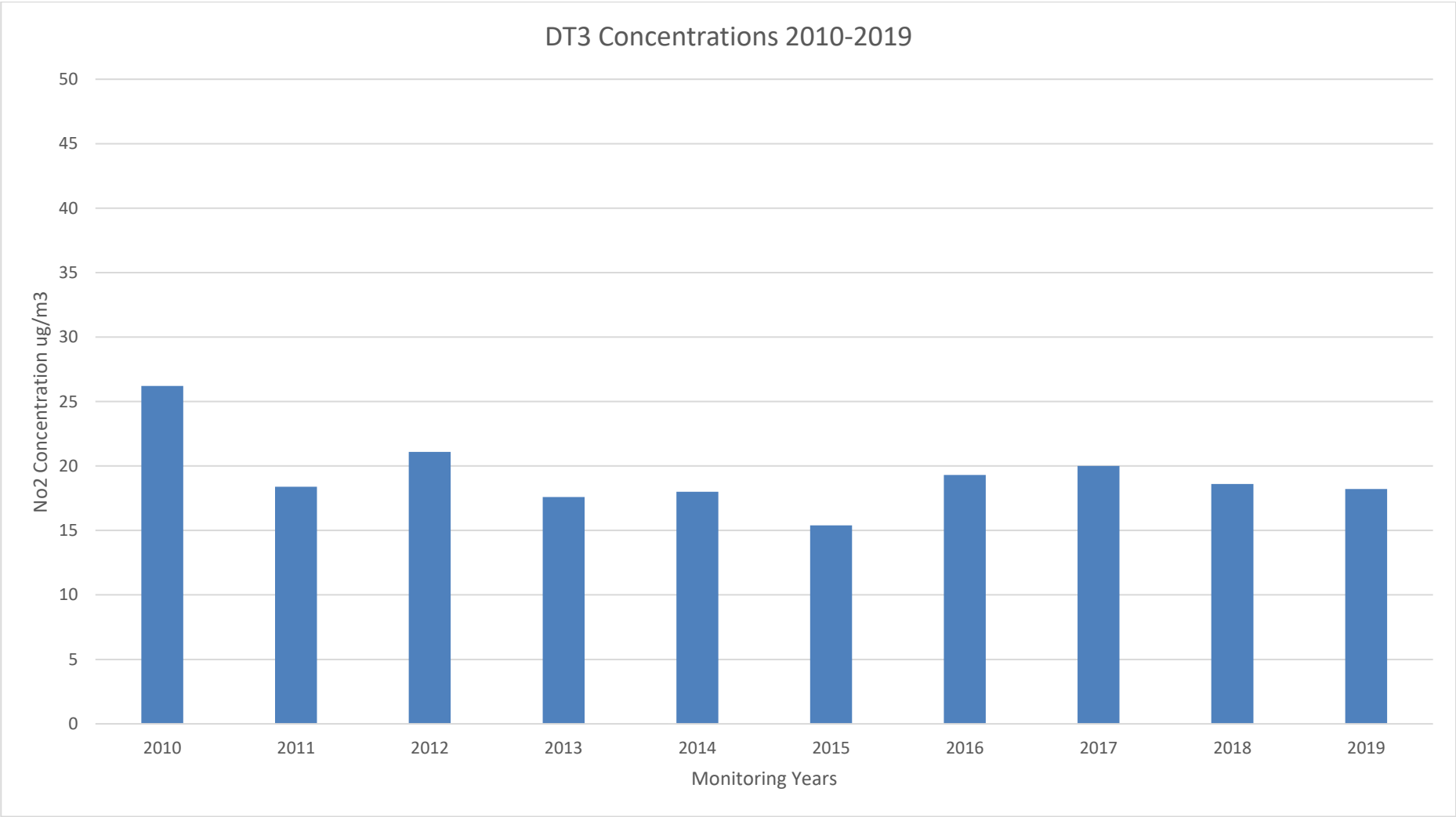
DT1



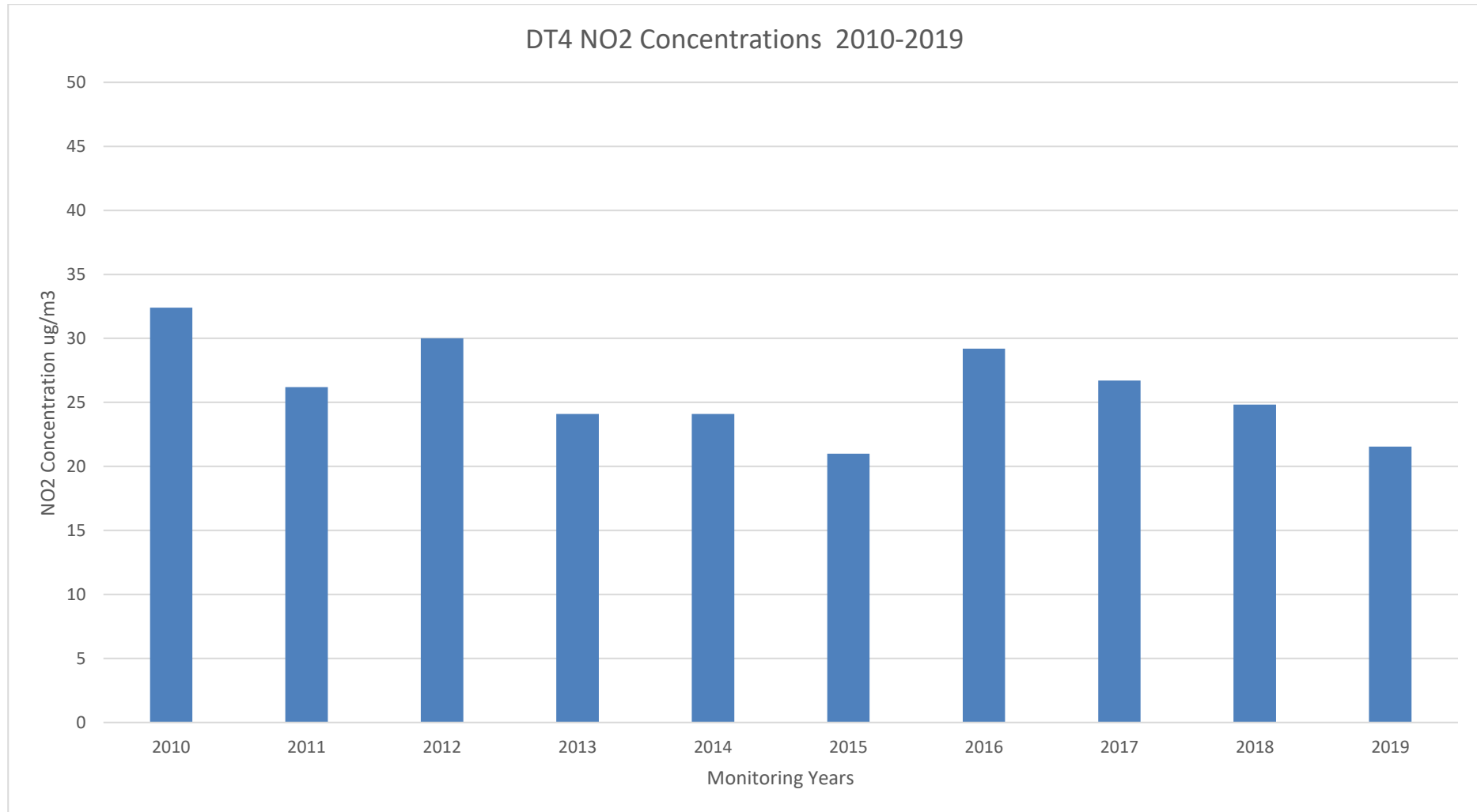
DT2



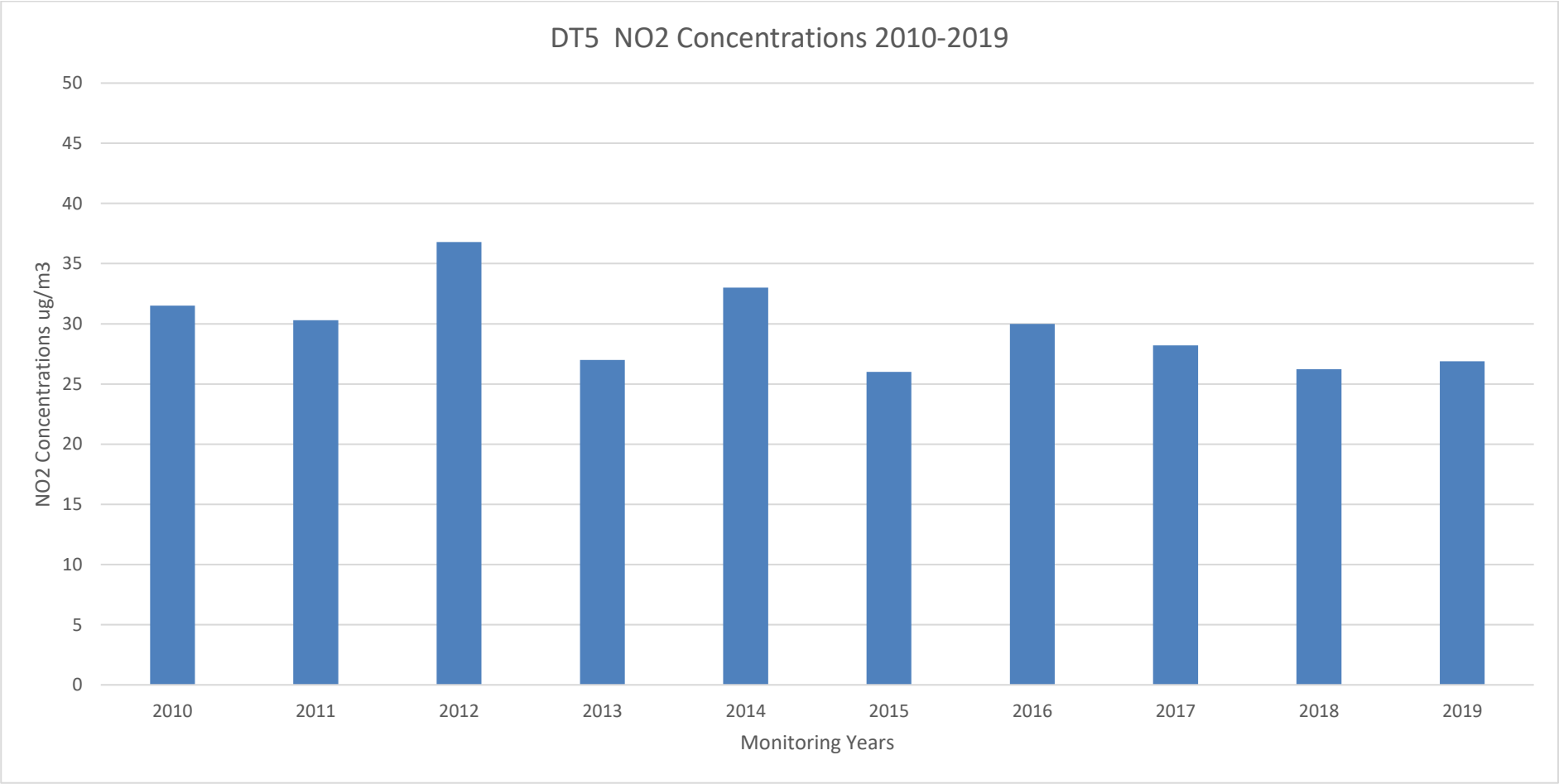
DT3



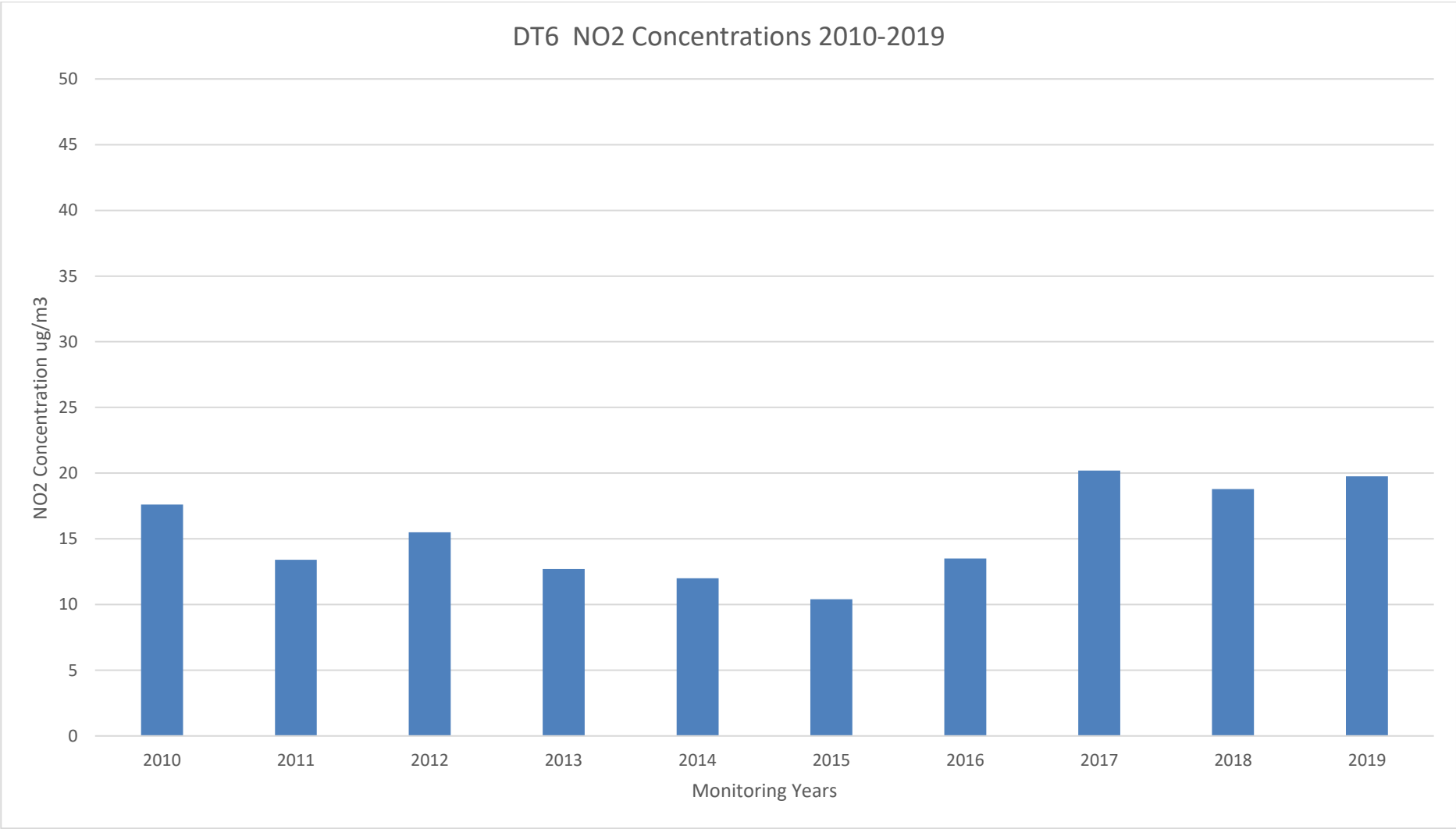
DT4



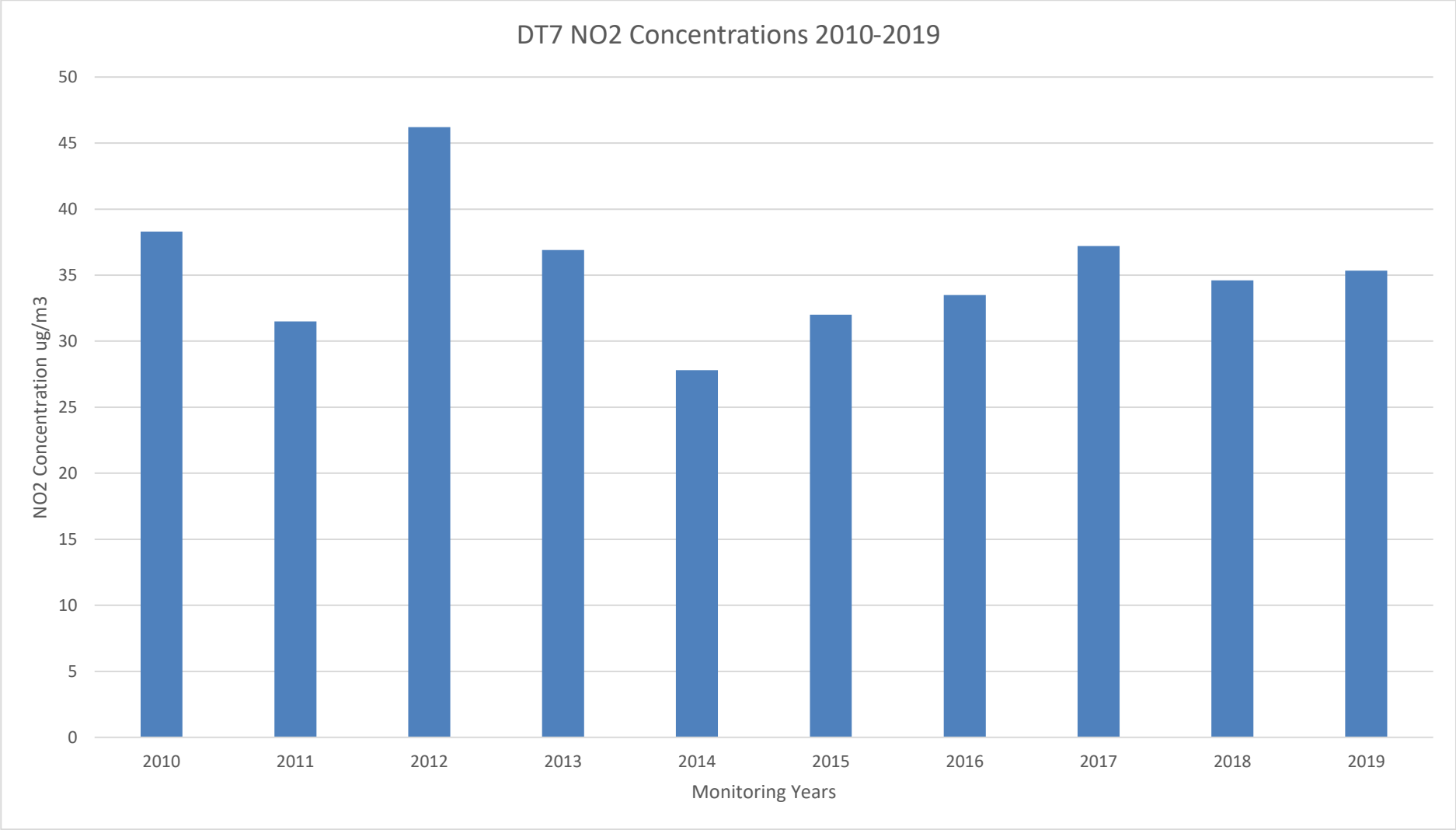
DT5



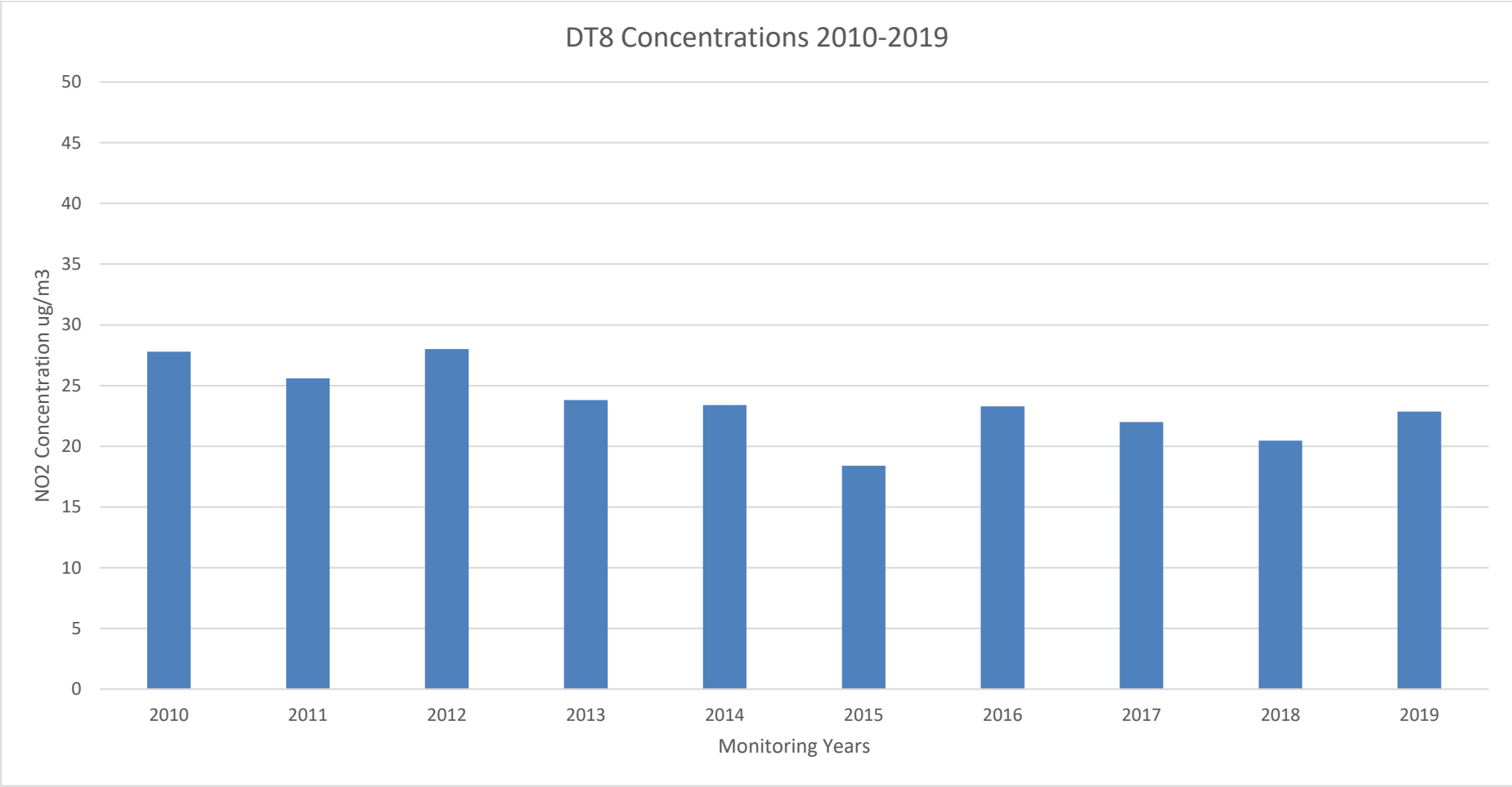
DT6



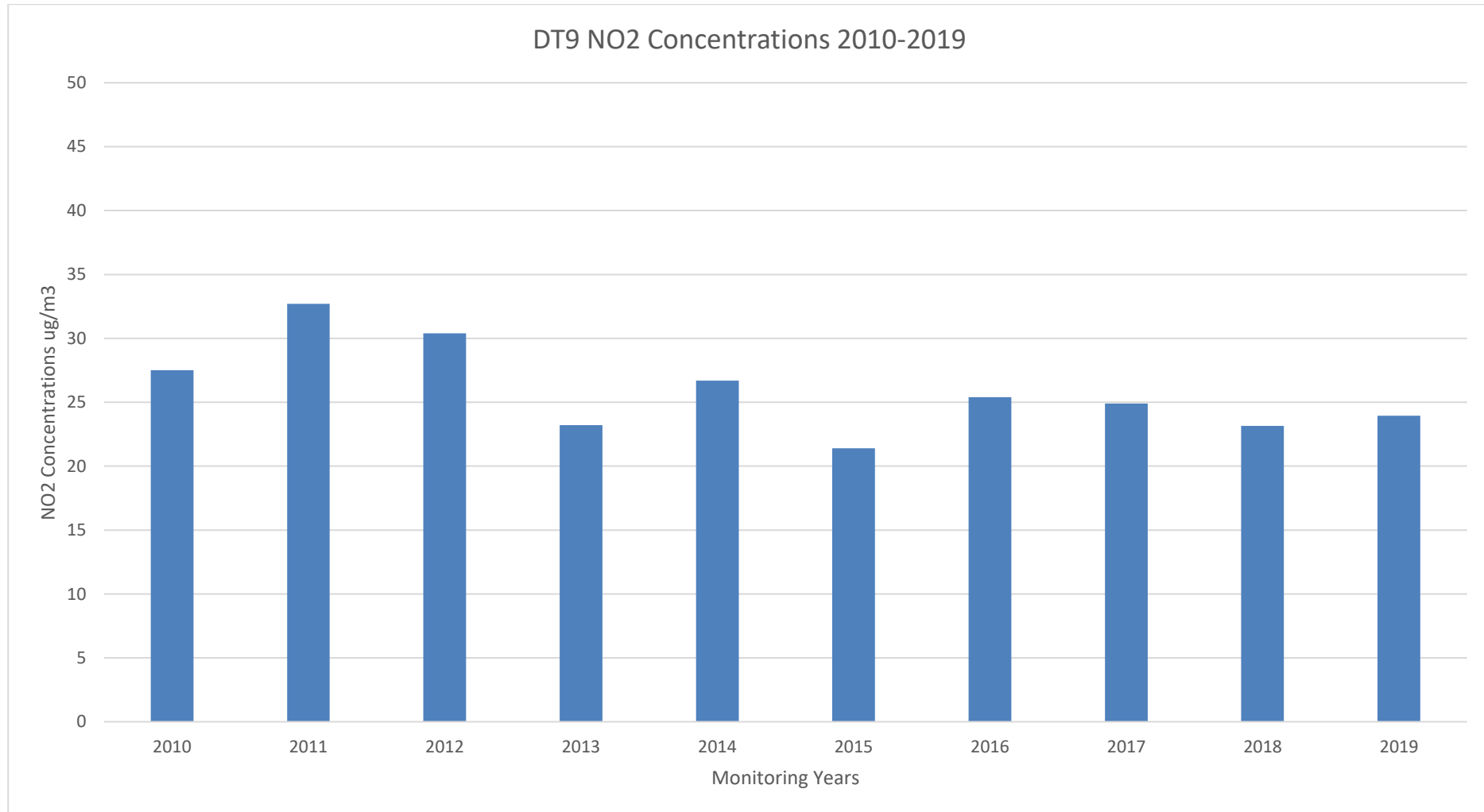
DT7



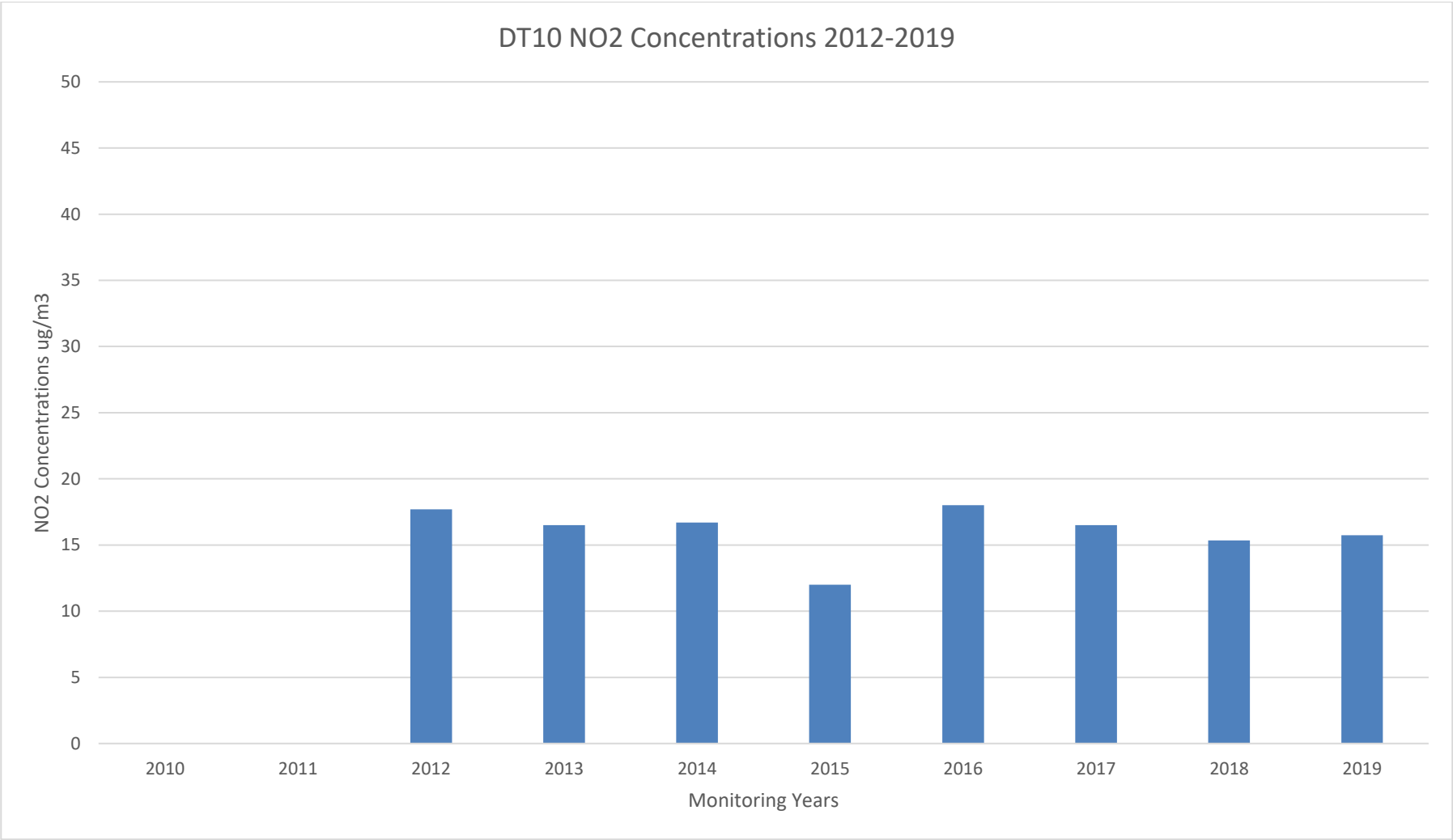
DT8



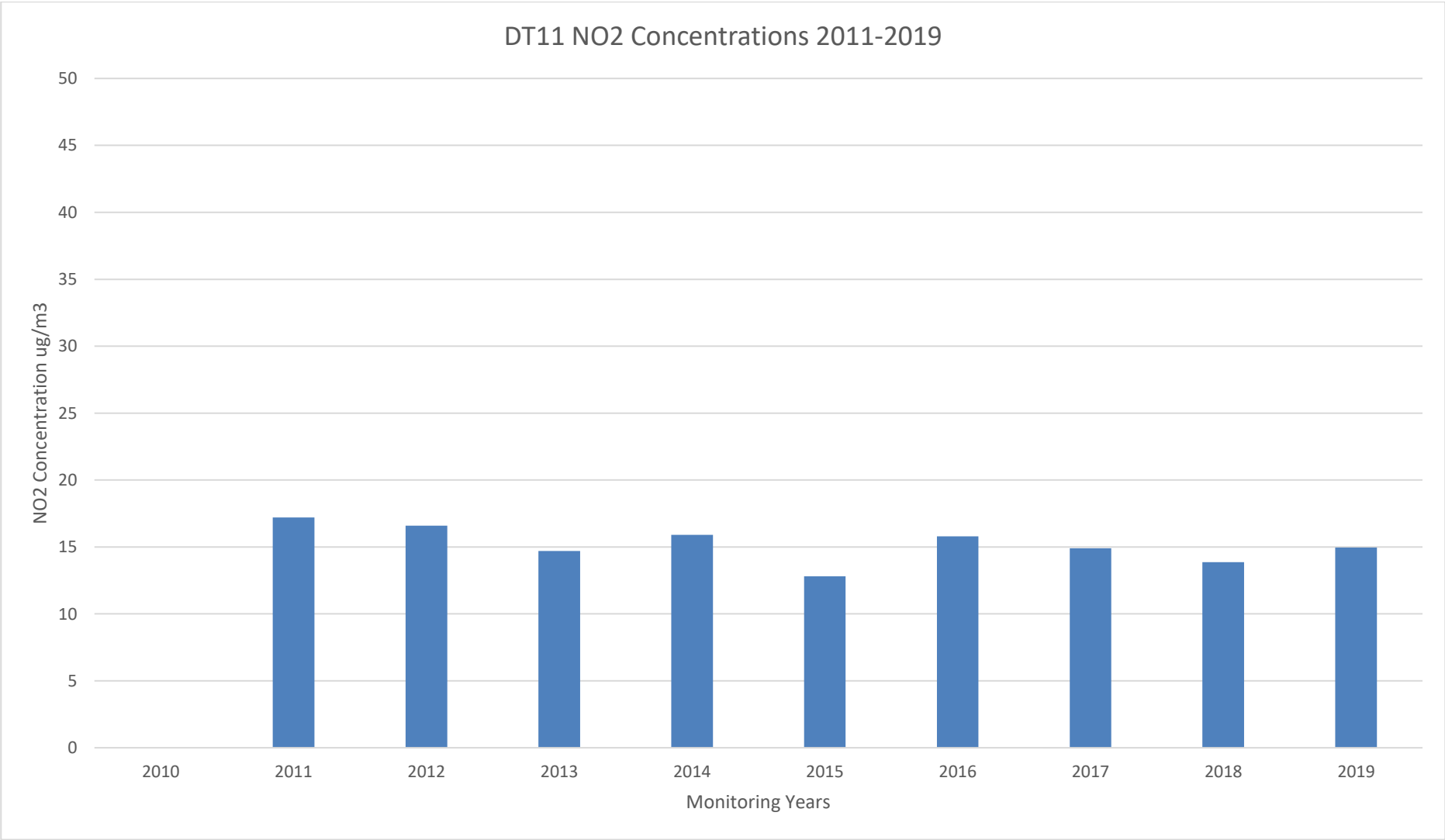
DT9



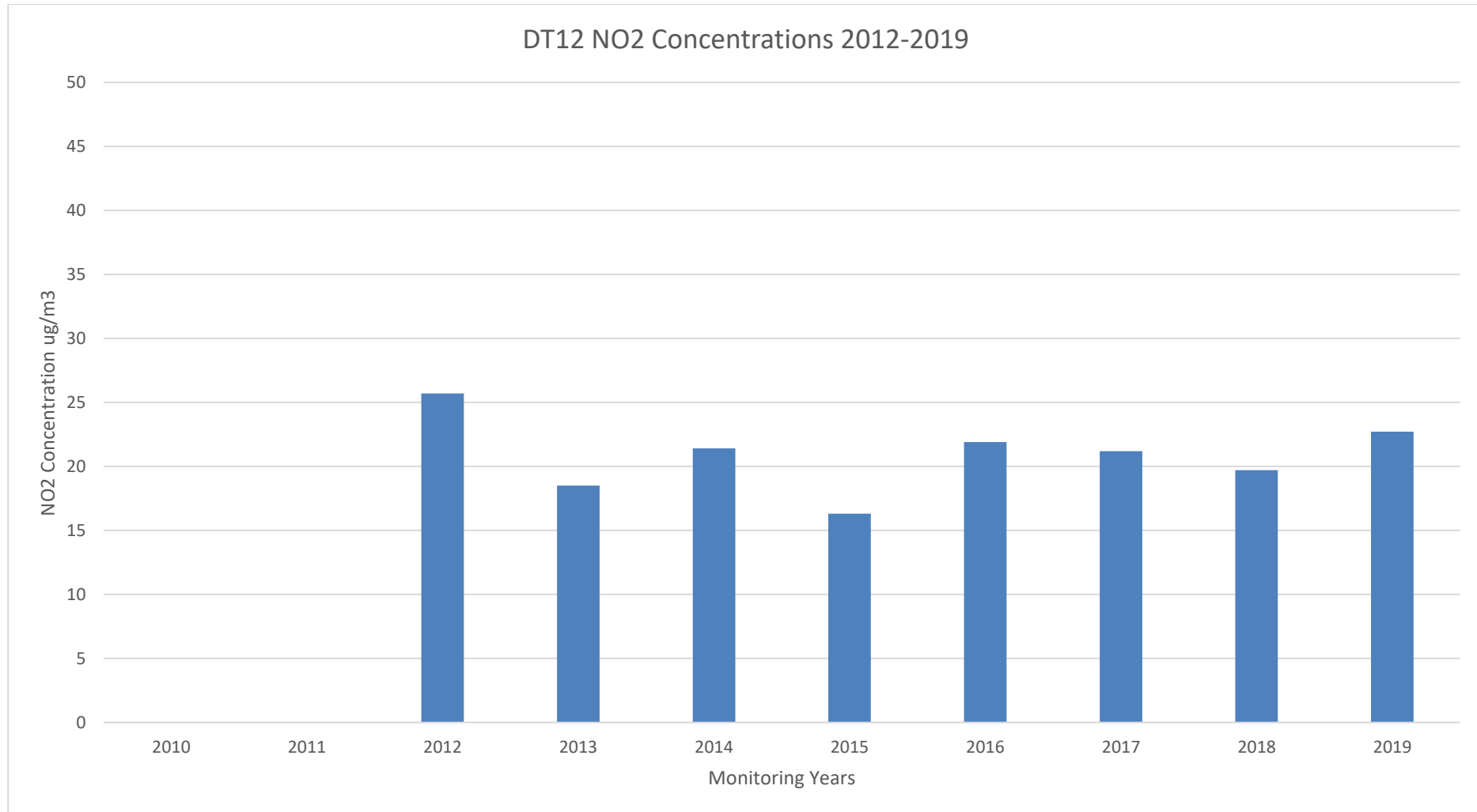
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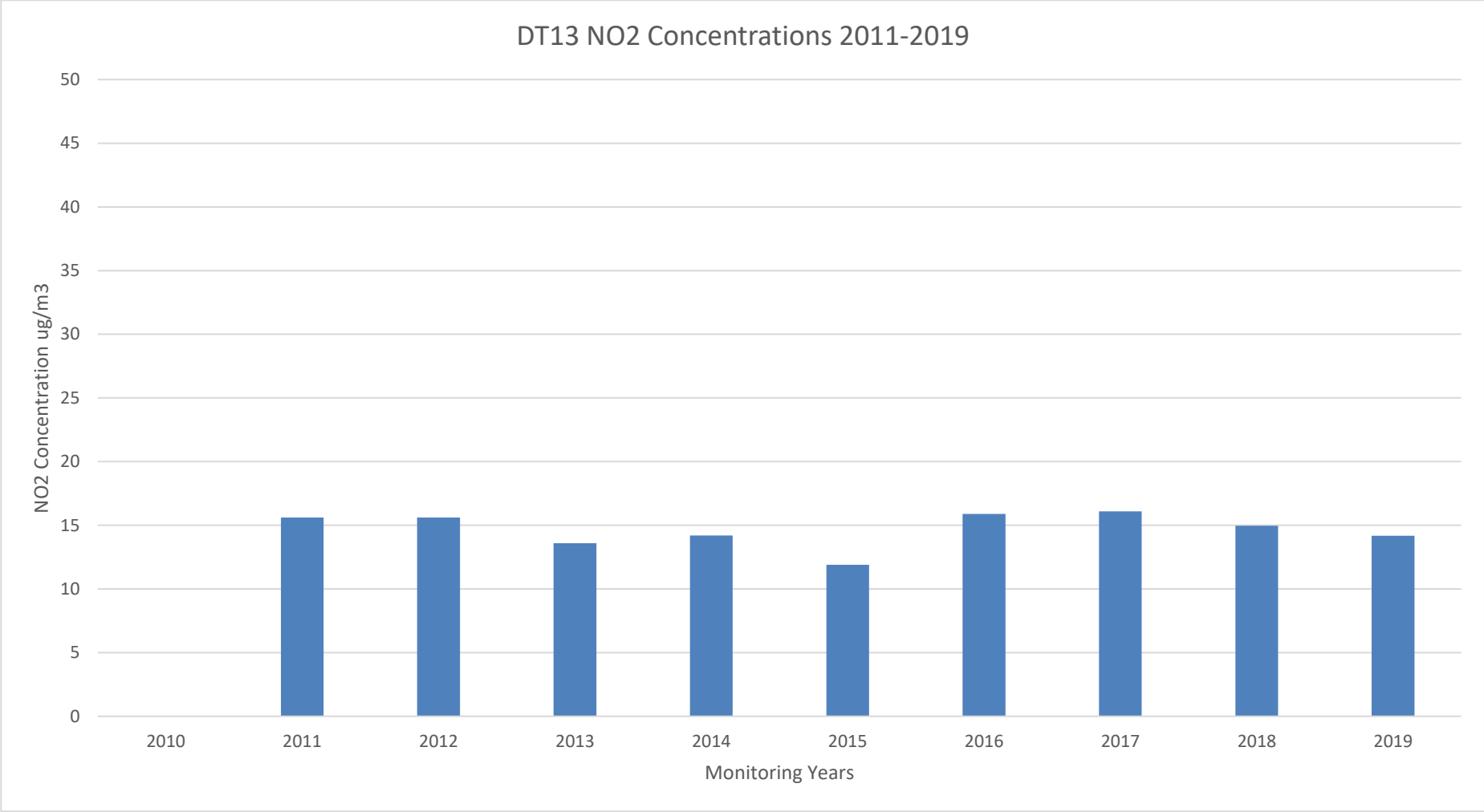
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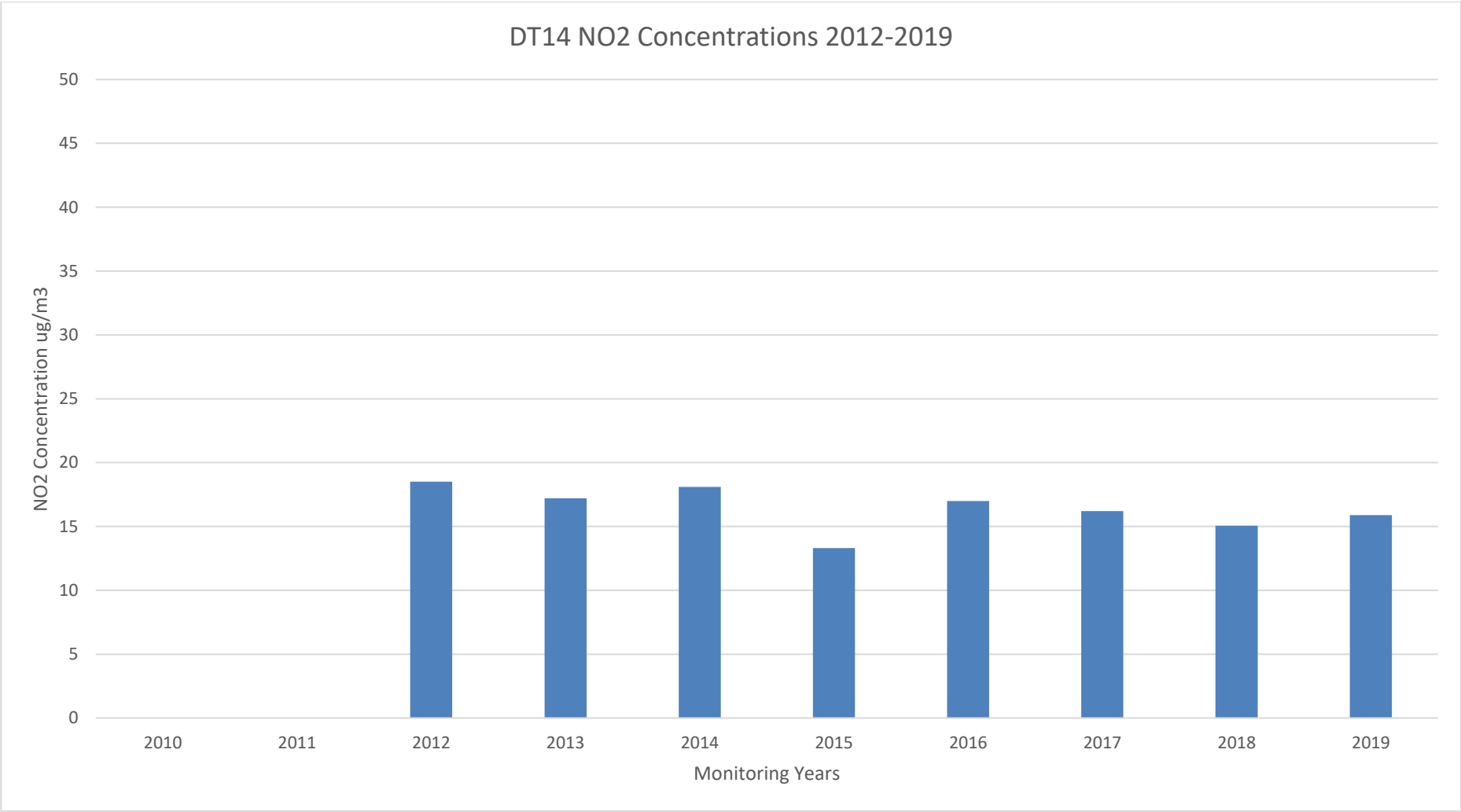
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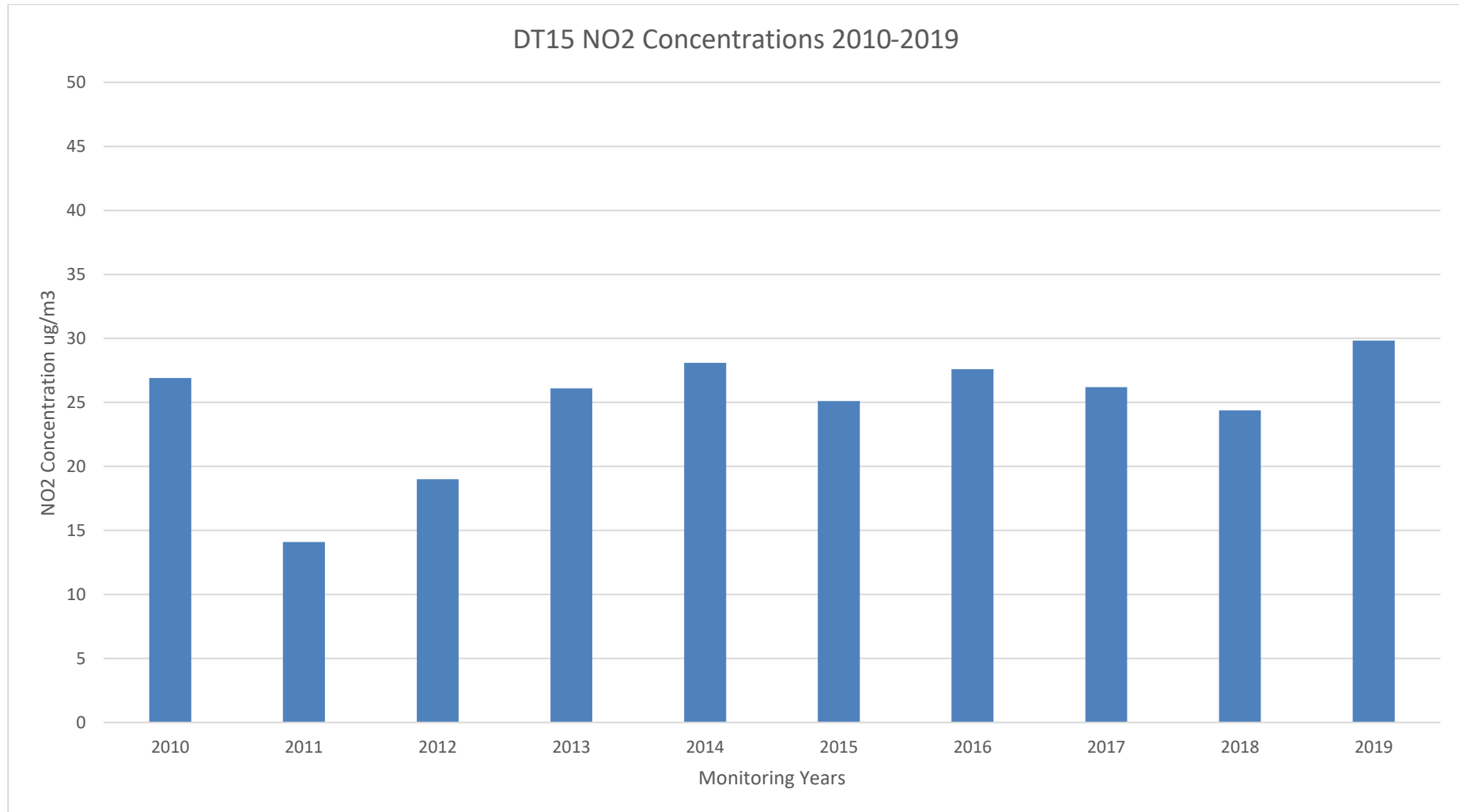
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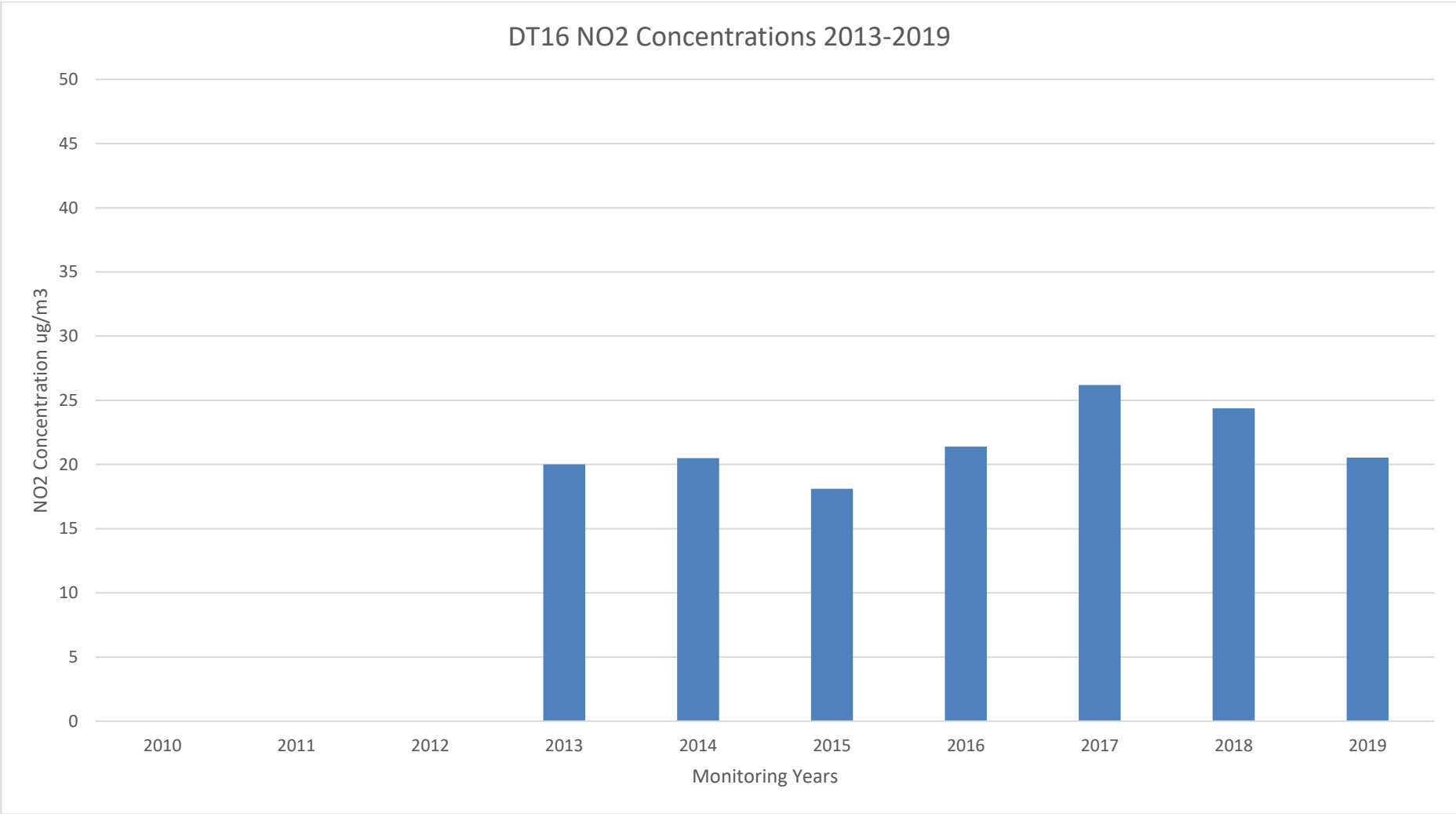
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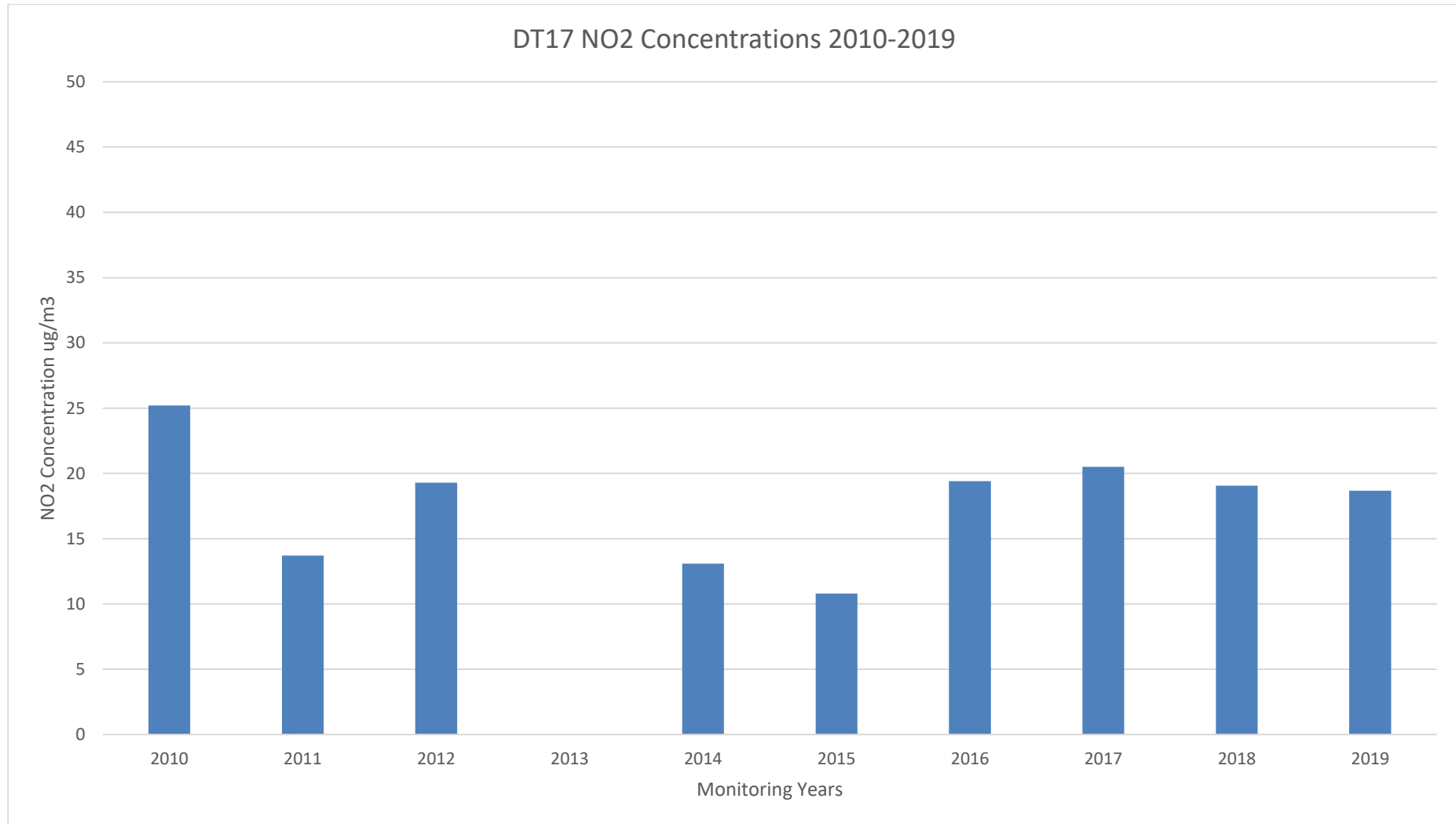
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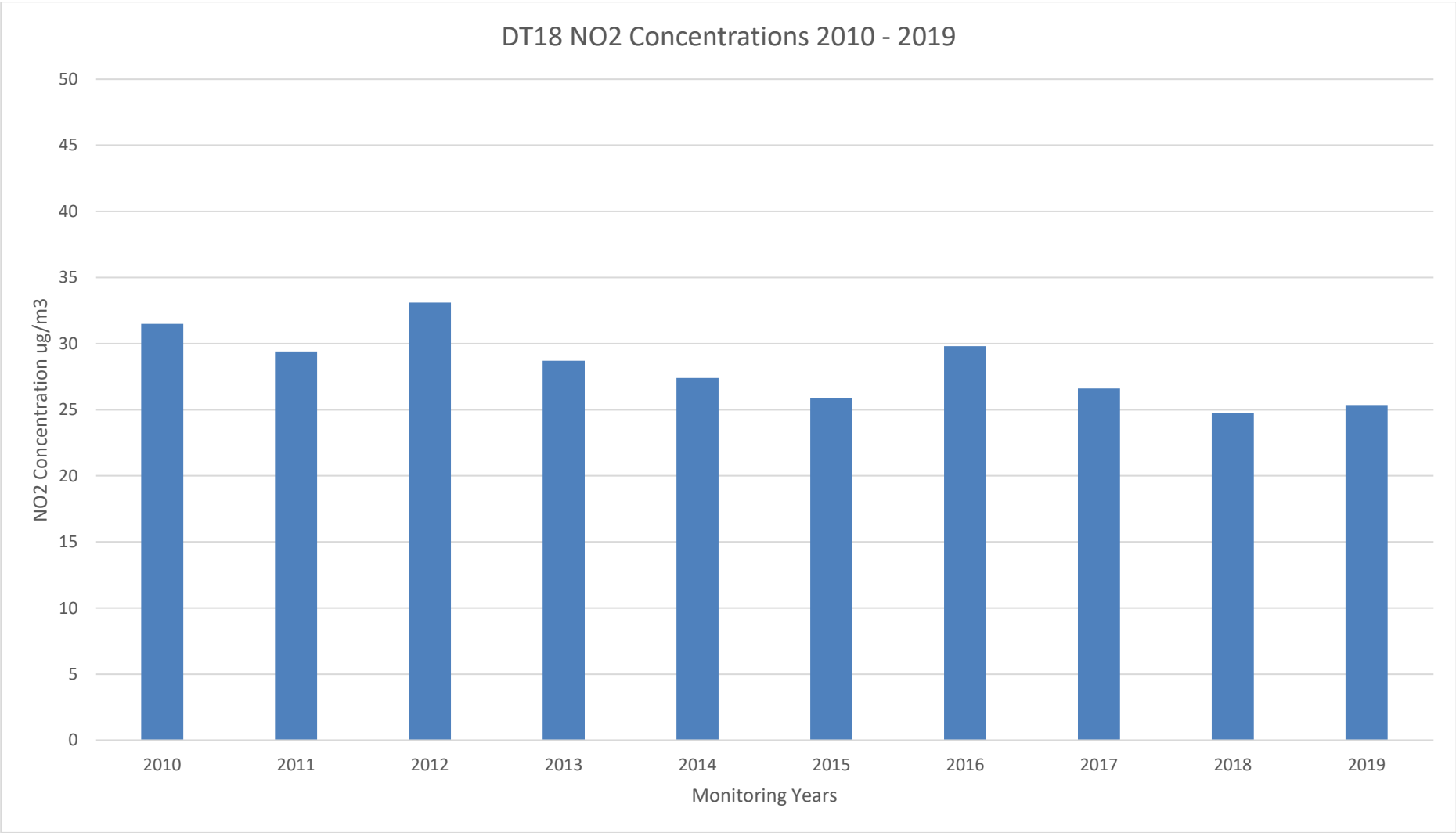
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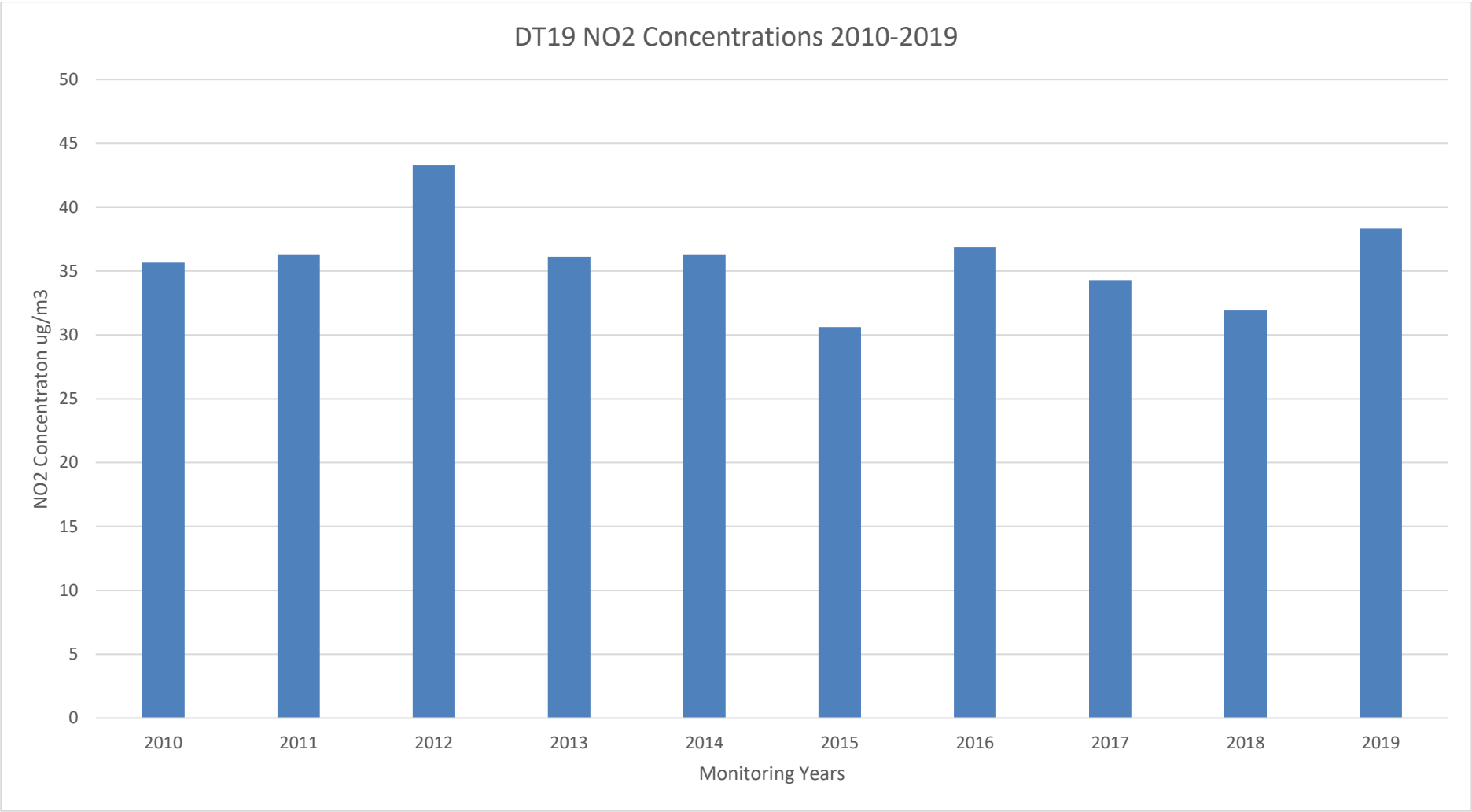
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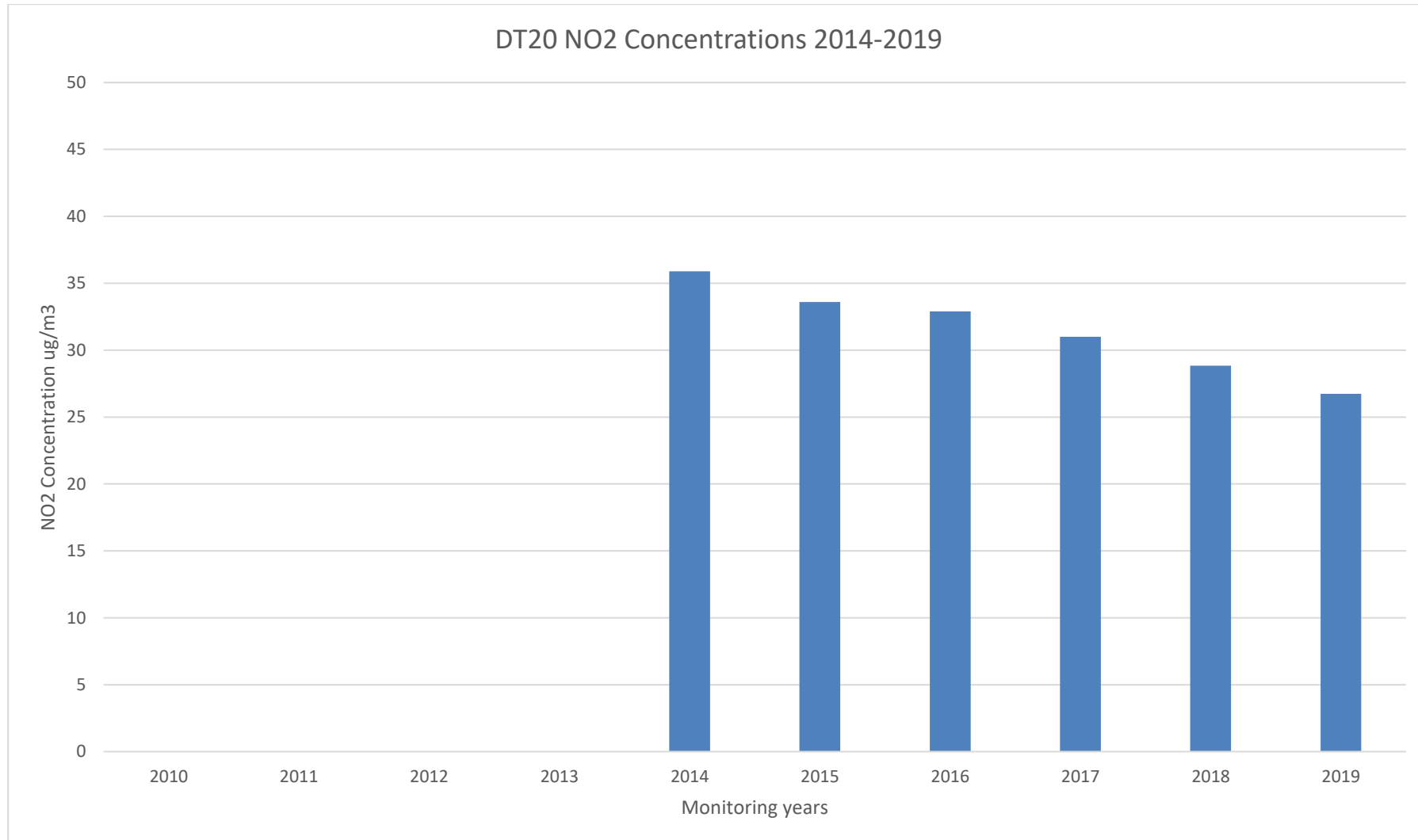
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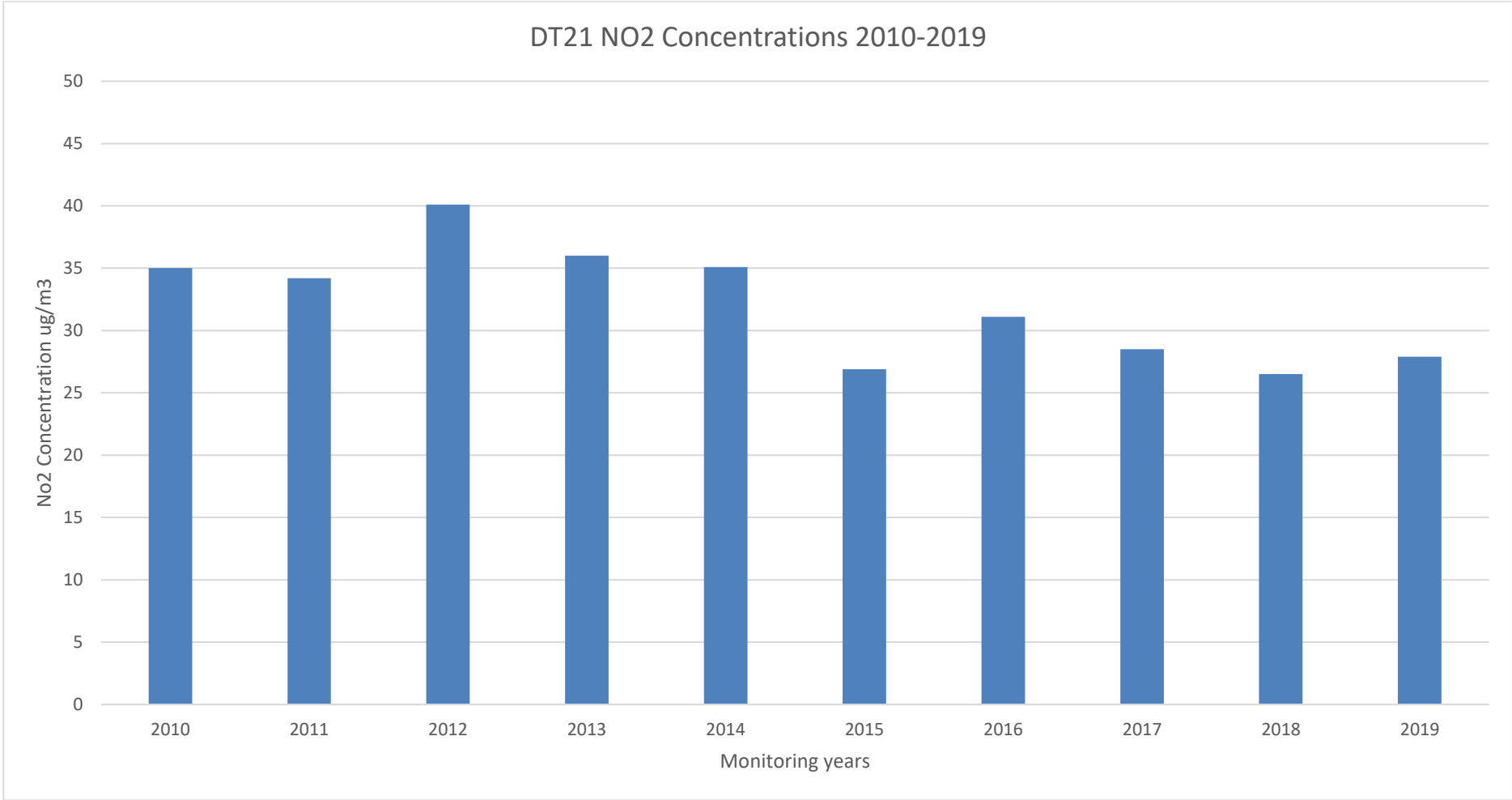
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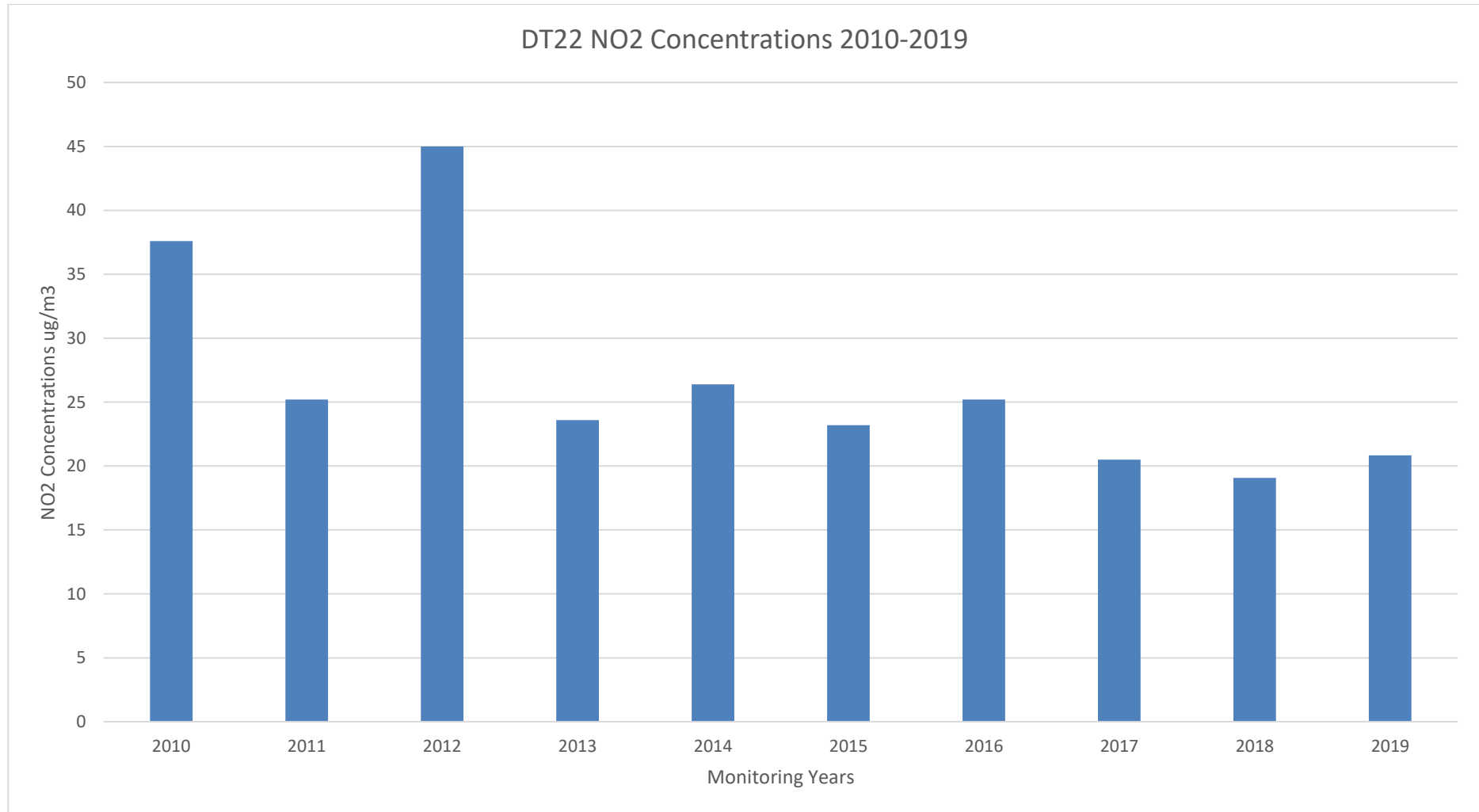
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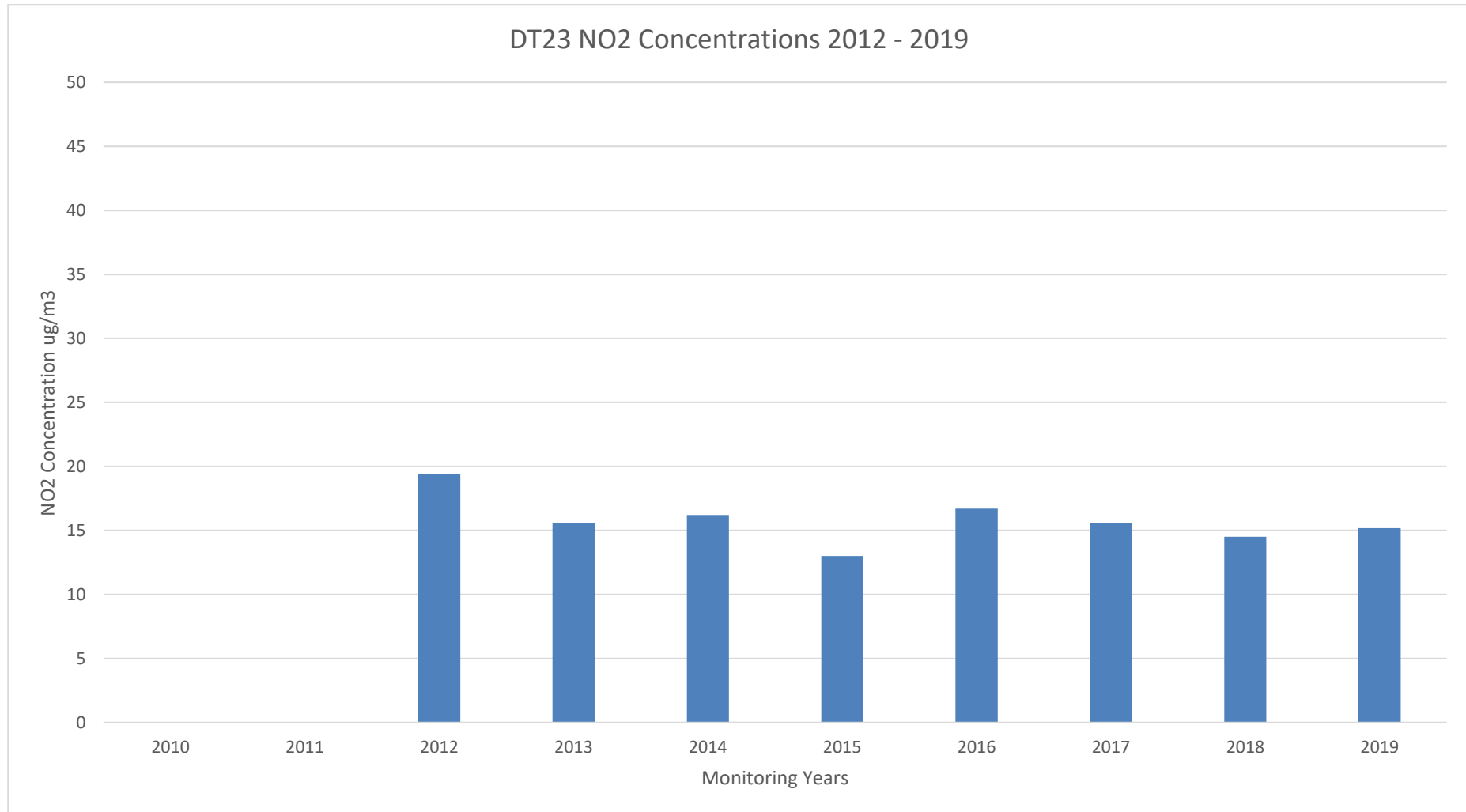
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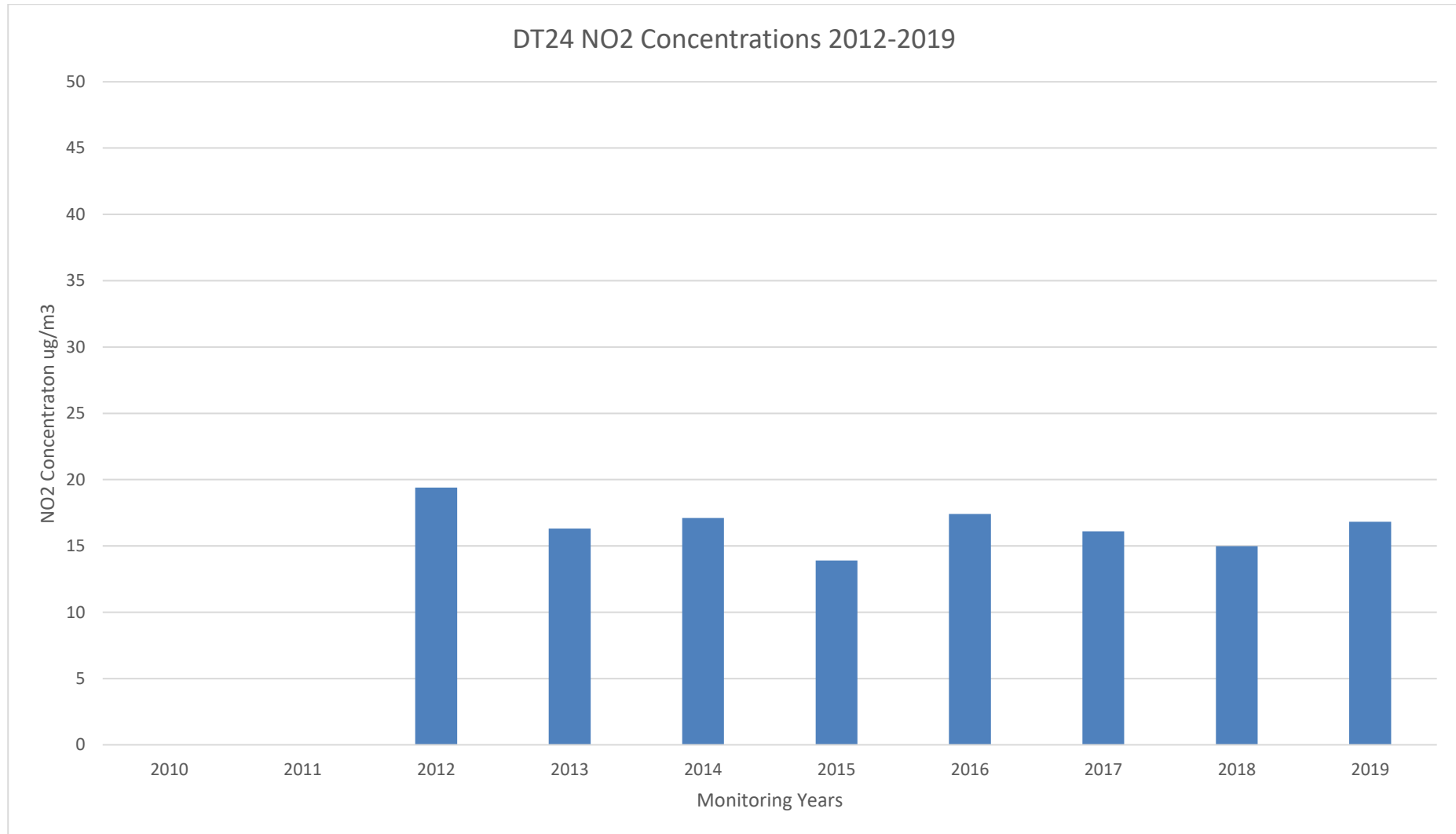
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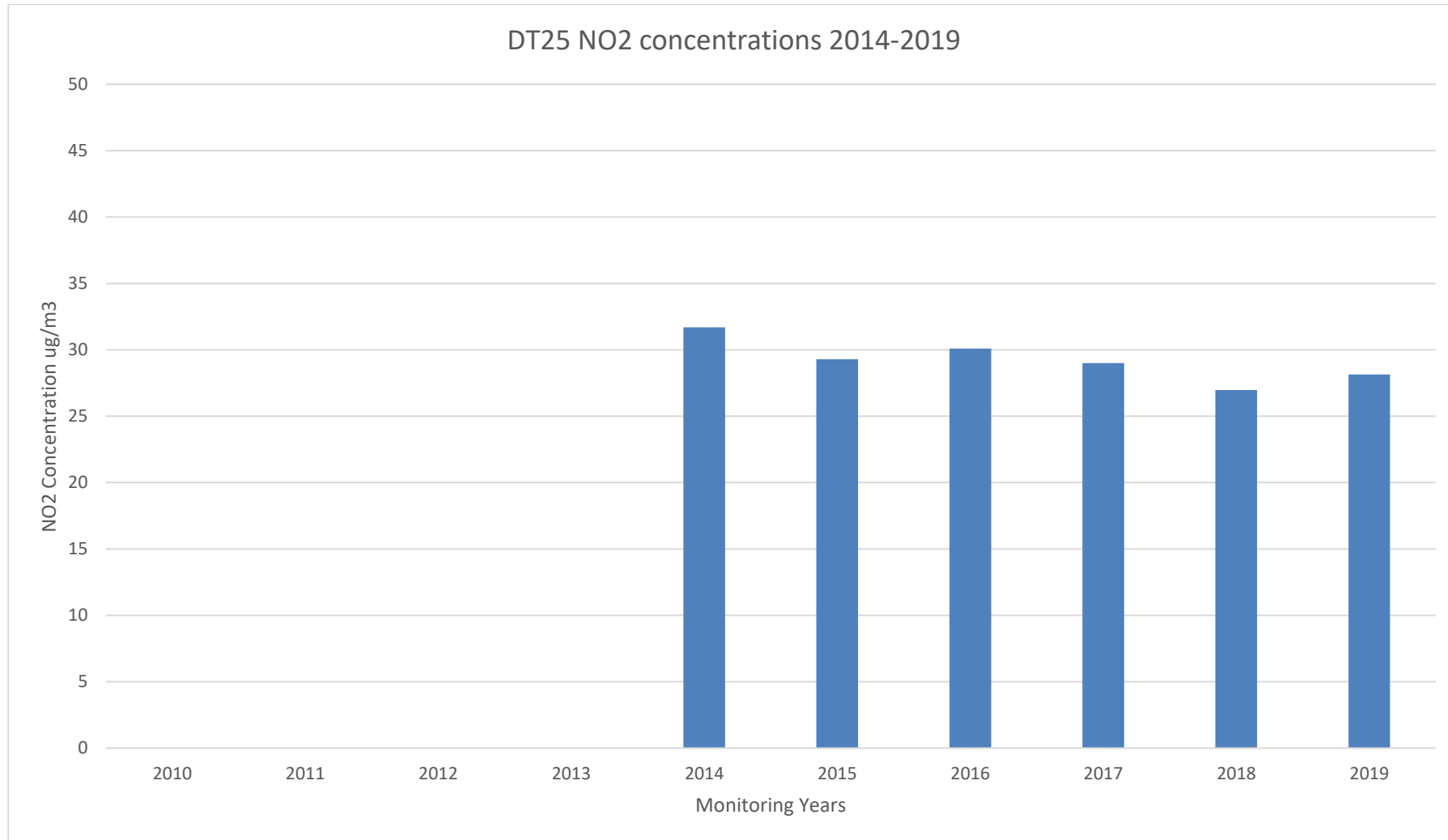
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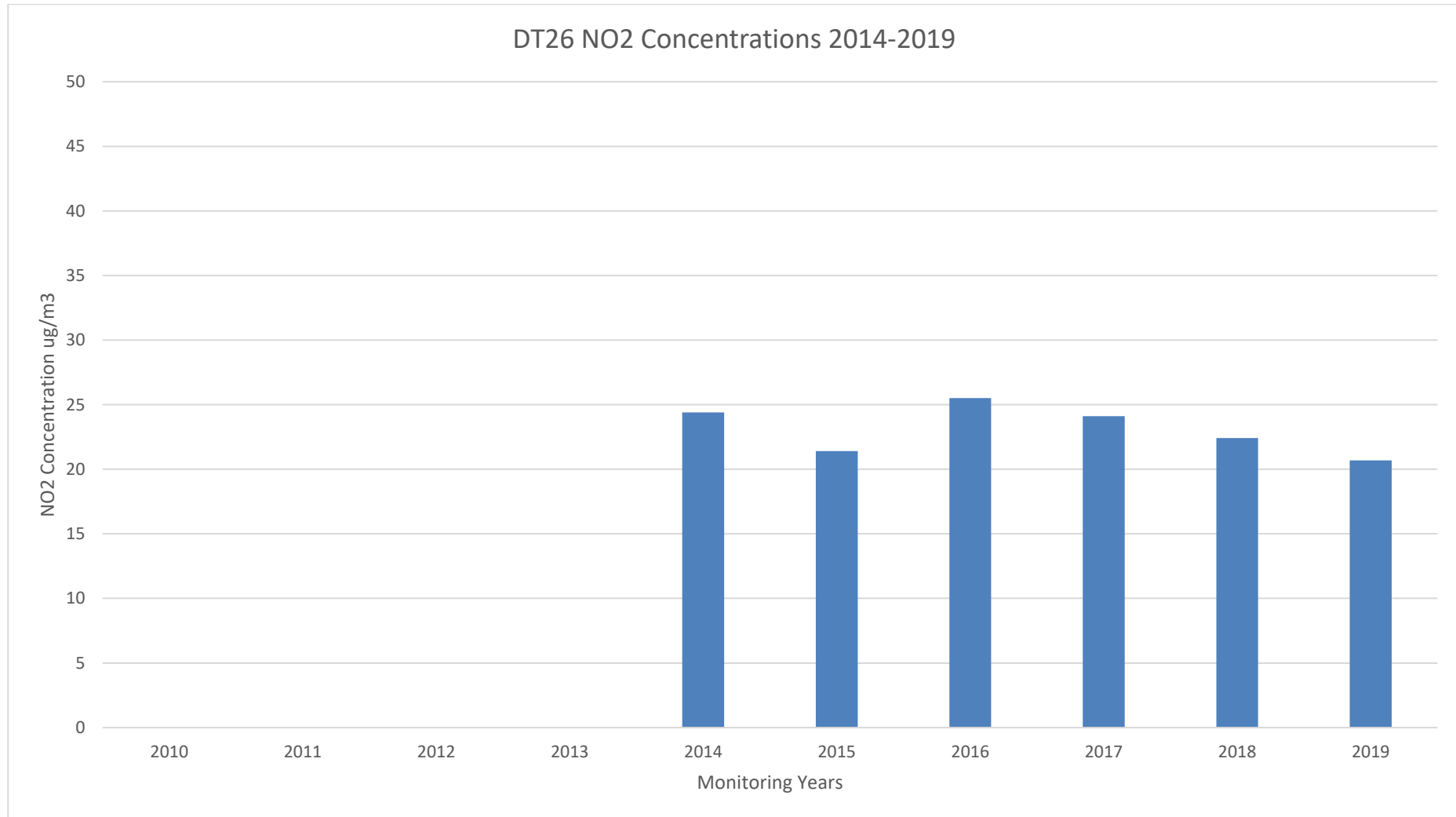
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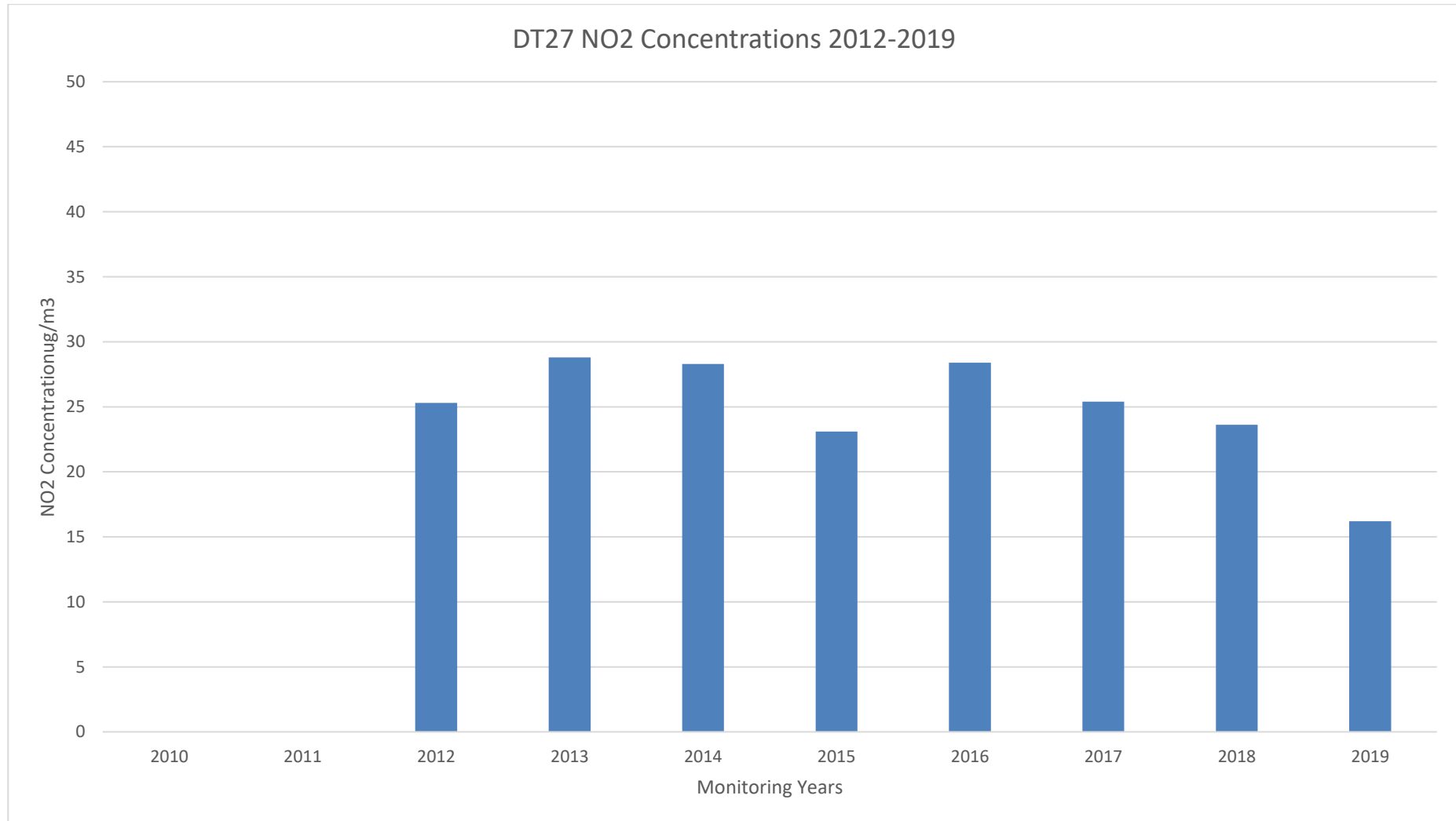
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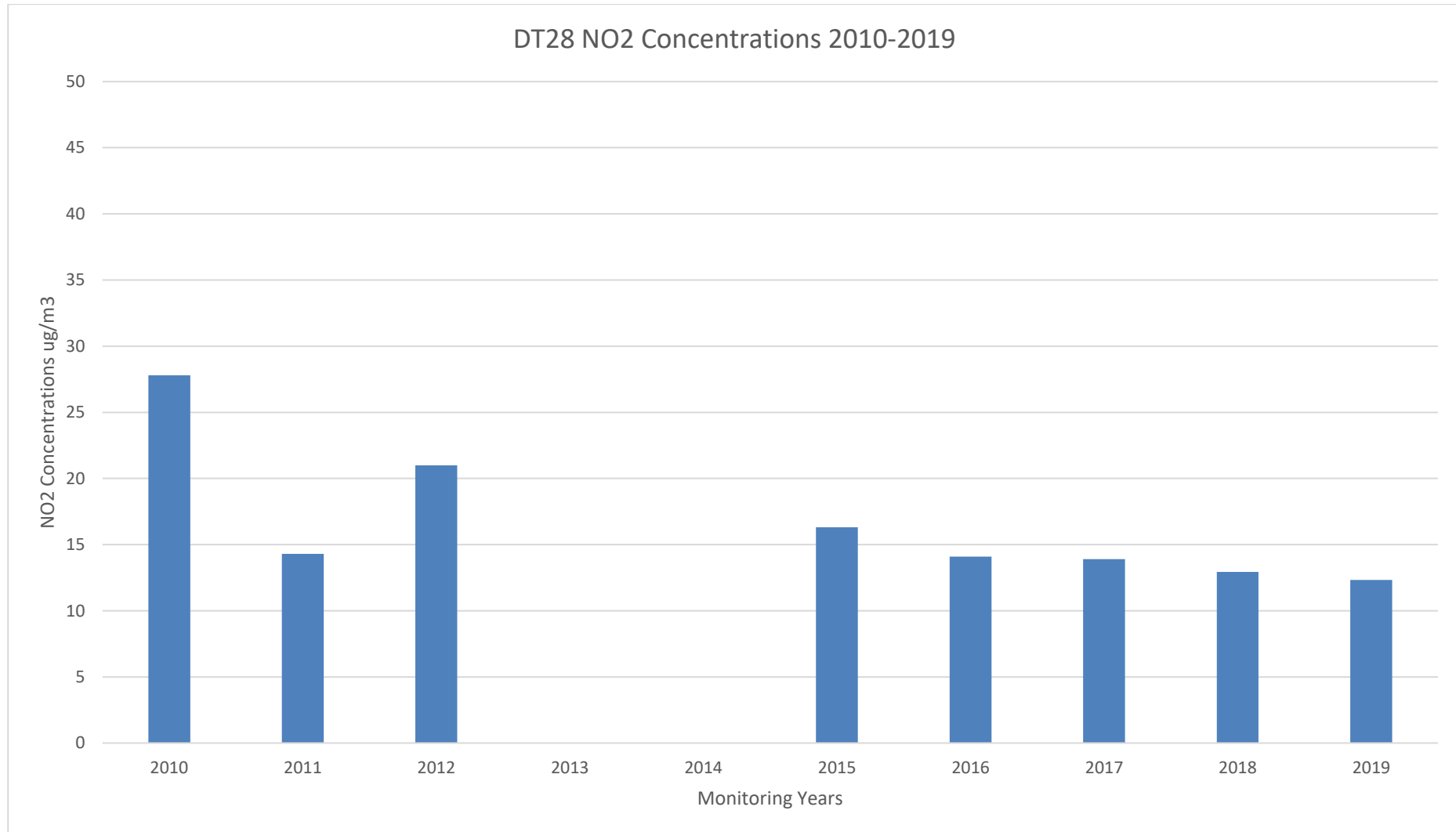
DT26



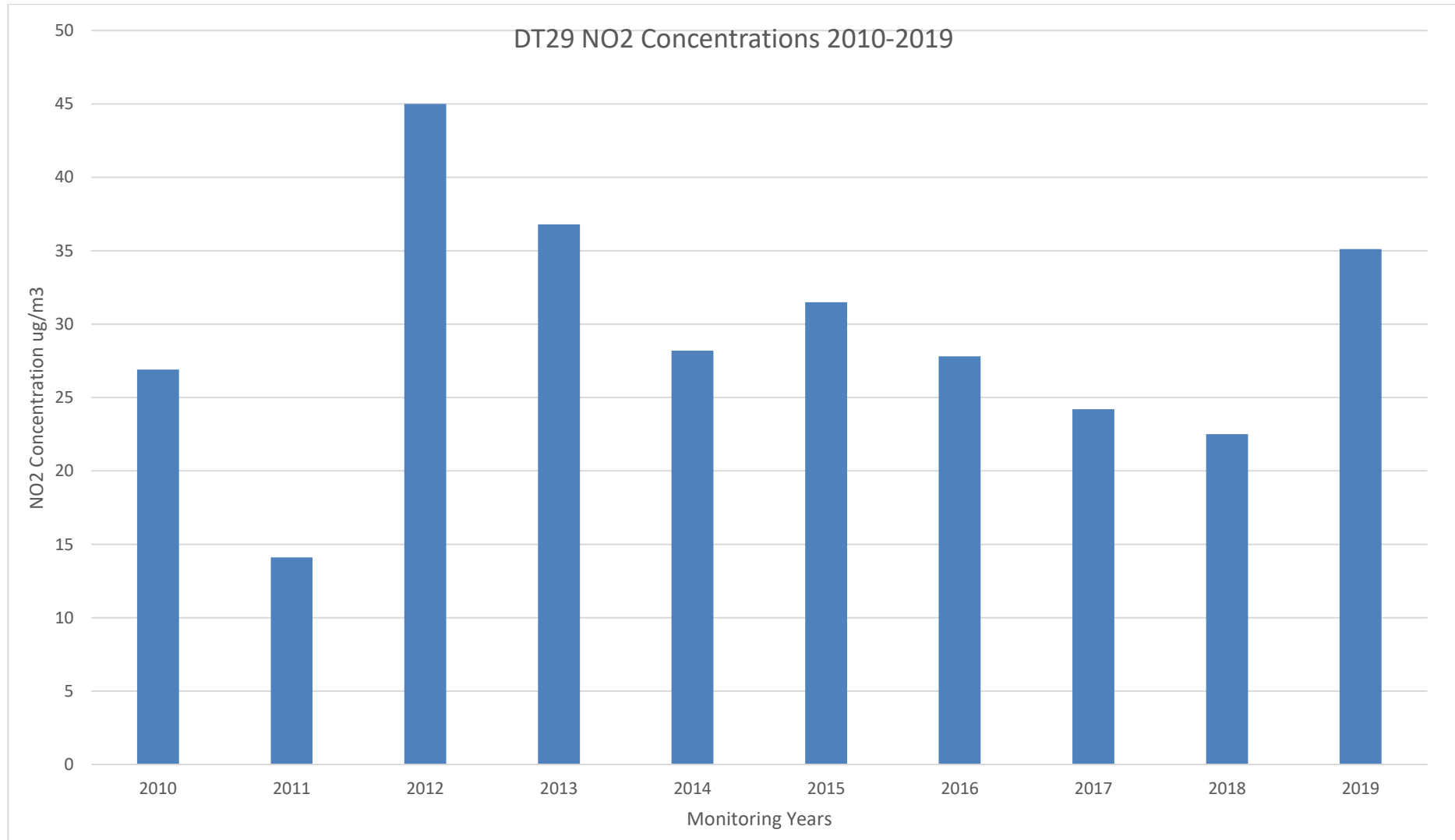
DT27



DT28



DT29



Appendix B: Full Monthly Diffusion Tube Results for 2019

Table B.1 - NO₂ Monthly Diffusion Tube Results - 2019

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	NO ₂ Mean Concentrations (µg/m ³)														
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Mean		
															Raw Data	Bias Adjusted (factor) and Annualised ⁽¹⁾	Distance Corrected to Nearest Exposure ⁽²⁾
Broadland District Council																	
BN1	635997	310021	30.0	37.1	22.1	20.0	20.6	22.8	22.9	22.4	24.6	31.7	32.3	29.2	26.3	24.5	
BN4	626911	308738	20.8	20.4	13.0	8.3	9.1	9.6	8.2	10.6	12.7	17.2	20.5	15.9	13.9	12.9	
BN6	626313	311010	23.5	24.5	13.4	8.0	9.0	9.5	9.7	11.0	16.2	20.2	20.2	21.2	15.5	14.4	
BN7	621539	312522	20.4	21.9	14.0	10.3	8.5	9.6	9.1	9.8	14.7	22.1	17.2	16.5	14.5	13.5	
BN8	627003	309849	21.6	18.7	11.8	7.5	7.9	7.7	7.5	9.2	12.5	17.0	19.3	15.2	13.0	12.1	
BN9	622938	311399	40.5	32.8	25.3	23.3	23.1	28.0	24.5	24.1	31.2		32.4		28.5	26.7	
BN10	625264	308411	46.5	24.6	20.5	17.2	15.4	17.0	18.0	21.1	13.1	28.7	28.0	25.8	23.0	21.4	
BN11	621642	311622	32.1	40.8	2.4	27.6	28.4	29.1	27.7	23.0	36.0	39.9	37.8	36.9	30.1	28.0	
BN12	621698	311565	40.3	33.1	33.8	31.4	24.9	26.1	23.4	28.2	32.7	41.4	37.4	29.9	31.9	29.6	
BN13	621811	311636	32.6	32.1	22.0		18.7	19.5	20.9	20.5	27.1	28.8	31.7	29.7	25.8	24.0	
BN15	630182	318042	28.2	25.3	24.6	20.8	18.7	20.4	17.8	18.9	23.3	31.3	30.8	24.0	23.7	22.0	
BN16	630114	318012	29.1	25.2	15.3	13.9	13.9	15.6	17.1	16.6	20.1	25.5	8.2	22.9	18.6	17.3	

Broadland and South Norfolk District Councils

BN17	617794	314204	21.7	21.4	15.5	9.8	8.4	8.6	8.5	10.9	14.1	19.8	10.8	17.5	13.9	12.9	
BN18	620175	311832	35.1	32.6	21.3	19.8	17.6	22.1	20.0	19.6	25.9	33.0	34.4		25.6	23.8	
BN19	627494	308773	32.2	26.5	30.2	28.7	26.7	24.5	23.3	23.4	27.8	35.9	37.8	23.0	28.3	26.3	
BN20	640161	310350	29.1	28.9	16.3	18.9	17.2	20.9	18.7	21.7	23.5	28.5	22.9	25.6	22.7	21.1	
BN21	627741	310902	23.2	26.0	18.5	14.1	12.1	14.5		14.9	19.3	24.4	27.1	21.1	19.6	18.2	
BN22	624060	311166	28.0	39.8	37.9	37.4	22.5	33.3	31.1	28.4	36.0	45.2	42.5	35.6	34.8	32.4	
BN23	627563	309236	27.1	23.8	15.7	13.1	15.0	14.2	14.0	15.4	19.8	27.9	25.6	24.8	19.7	18.3	
BN24	621466	312662	23.8	25.7	20.4	18.5	13.8	15.2	14.2	17.3	19.6	26.1	26.0	21.1	20.1	18.7	
BN25	619333	326894	31.7	20.0	17.1	12.4	13.8	12.6	12.7	13.9	16.8	22.0	24.0	19.6	18.0	16.8	
BN26	626327	310097		20.8	18.2	13.3	13.1	13.0	12.0	13.3	15.5	21.5	23.2	14.8	16.2	15.1	
BN27	625502	312470			20.9	16.1	27.6	26.3	21.7	23.3	29.9	39.2	29.9	28.1	26.3	24.4	
BN28	621202	312970		21.3	19.4	16.1	13.2	12.8	10.8	14.0	16.8	25.3	23.4	18.6	17.4	16.2	
BN29	613459	323912			19.4	17.5	16.1	14.2	12.6	14.9	17.7	25.3	26.3	20.0	18.4	17.1	
BN30	626174	311059				23.3	22.3	23.4	24.7	22.0	24.3	16.1	34.2	31.1	24.6	22.9	
South Norfolk District Council																	
DT1	619208	304645	27	24	22	18	16	16	16	21	20	23	28	26	21.4	19.9	
DT2	616797	310477	25	25	21	13	17	16	17	22	22	22	24	22	20.5	19.1	
DT3	626803	302092	27	24	20	15	15	15	16	19	18	21	24	21	19.6	18.2	
DT4	611223	279637	27	28	24	28	24	13	21	18	23	23	29	20	23.2	21.5	
DT5	611945	279572	33	35	31	22	26	27	28	29	27	29	33	27	28.9	26.9	
DT6	636192	298751	35	28	24	21	15	15	15	15	16	17	27	27	21.3	19.8	
DT7	619722	292745	43	40	40	33	36	29	38	39	41	37	45	35	38.0	35.3	
DT8	611129	301425	30	28	23	25	22	17	21	17	20	39	33	20	24.6	22.9	
DT9	625439	305944	34	33	27	23	20	20	21	22	24	24	32	29	25.8	23.9	

Broadland and South Norfolk District Councils

DT10	612515	302652	21	19	14	23	13	12	12	12	15	18	27	17	16.9	15.7	
DT11	618137	305678	21	22	14	8	14	14	12	15	16	18	21	18	16.1	15.0	
DT12	611528	300987	27	19	25	20	23	21	24	26	28	26	29	25	24.4	22.7	
DT13	612663	302751	20	20	14	15	11	11	10	12	14	18	19	19	15.3	14.2	
DT14	611380	302751	23	23	17	19	13	12	13	12	15	18	22	18	17.1	15.9	
DT15	624484	283276	43	41	32	30	30	27	25	28	27	32	38	32	32.1	29.8	
DT16	614895	283276	30	27	23	20	18	19	19	20	20	22	28	19	22.1	20.5	
DT17	616652	311650	25	23	21	20	17	15	14	18	20	21	26	21	20.1	18.7	
DT18	619710	292730	28	29	27	36	25	24	25	21	26	27	35	24	27.3	25.3	
DT19	619732	292740	41	41	34	42	34	35	33	35	33	34	33	33	35.7	38.4	
DT20	619642	292346	28	31	29	31	25	28	23	32	29	30	32	27	28.8	26.7	
DT21	619694	292653	36	30	29	37	32	27	28	26	30	31	32	22	30.0	27.9	
DT22	619710	292722	26	27	21	27	18	19	17	19	20	25	28	22	22.4	20.8	
DT23	618991	309796	21	23	16	15	12	12	12	14	15	16	21	19	16.3	15.2	
DT24	618823	293032	22	22	17	21	17	14	14	12	16	19	26	17	18.1	16.8	
DT25	619823	293032	35	37	31	26	26	25	28	27	30	30	39	29	30.3	28.1	
DT26	619801	305869	30	29	23	20	18	16	17	19	20	24	29	22	22.3	20.7	
DT27	616348	310585	24	18	14	24	17	15	14	11	16	16	25	15	17.4	16.2	
DT28	616386	310636	20	20	14	10	10	7	9	11	12	11	18	17	13.3	12.3	
DT29	615754	310637	45	43	38	41	34	32	34	36	39	37	39	35	37.8	35.1	

☒ National bias adjustment factor used

☒ Annualisation has been conducted where data capture is <75%

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

Notes:

Exceedances of the NO₂ annual mean objective of 40µg/m³ are shown in **bold**.

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 1-hour mean objective are shown in **bold and underlined**.

(1) See Appendix C for details on bias adjustment and annualisation.

(2) Distance corrected to nearest relevant public exposure.

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

Diffusion Tubes Bias Adjustment Factors

Broadland and South Norfolk District Council's diffusion tubes are prepared and analysed by Gradko International using 20% TEA in water. No automatic monitoring was undertaken in either council area. The Bias adjustment factor used in this document was derived from the latest version of the national database co-location studies available on the LAQM website at:

https://laqm.defra.gov.uk/assets/Database_Diffusion_Tube_Bias_Factors_v03_18%20FINAL.xls

The results from the above spreadsheet gave an adjustment factor of 0.93 for 2019.

No locations produced than 75% of the results in this monitoring period. Therefore no data adjustment was required for any location. If adjustment was required it would be carried out as specified in LAQM TG16 paragraph 7.78.

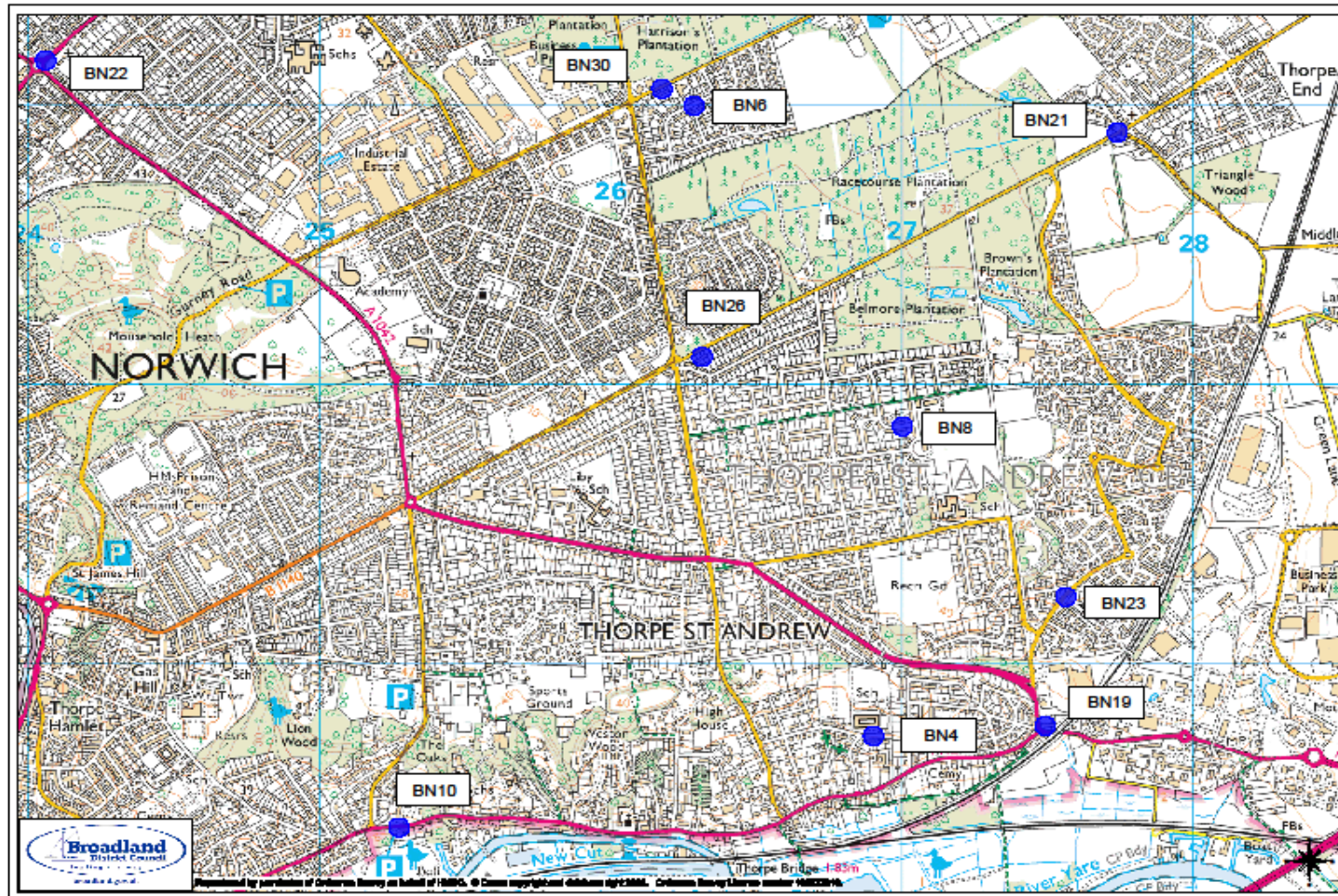
Distance correction has not been undertaken for any location as none of the annual average results were above or sufficiently close to the threshold standard to warrant this being undertaken. Should distance correction be required it would be carried out in line with paragraphs 7.77-7.79 of LAQM TG16.

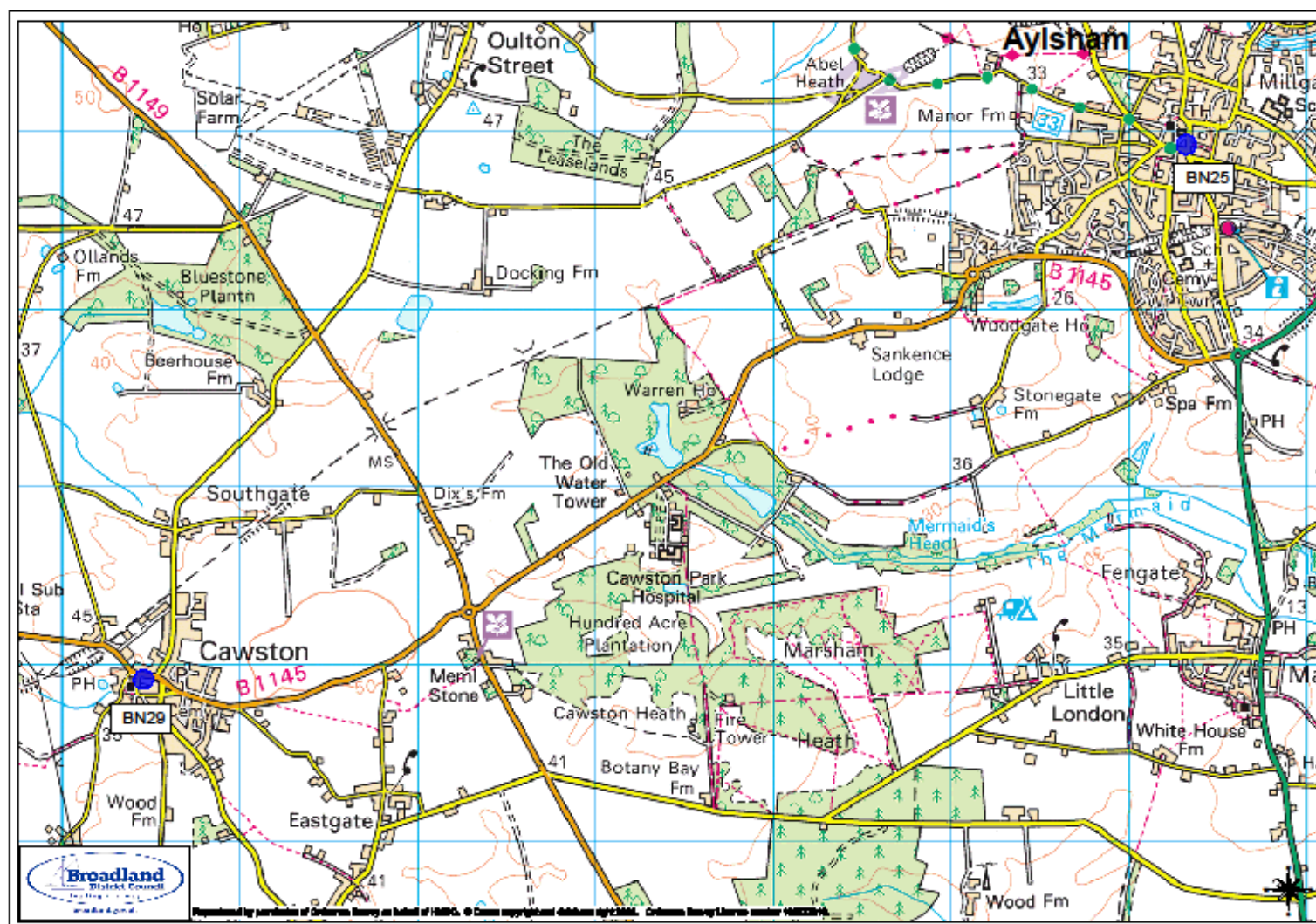
QA/QC of Diffusion Tubes Monitoring

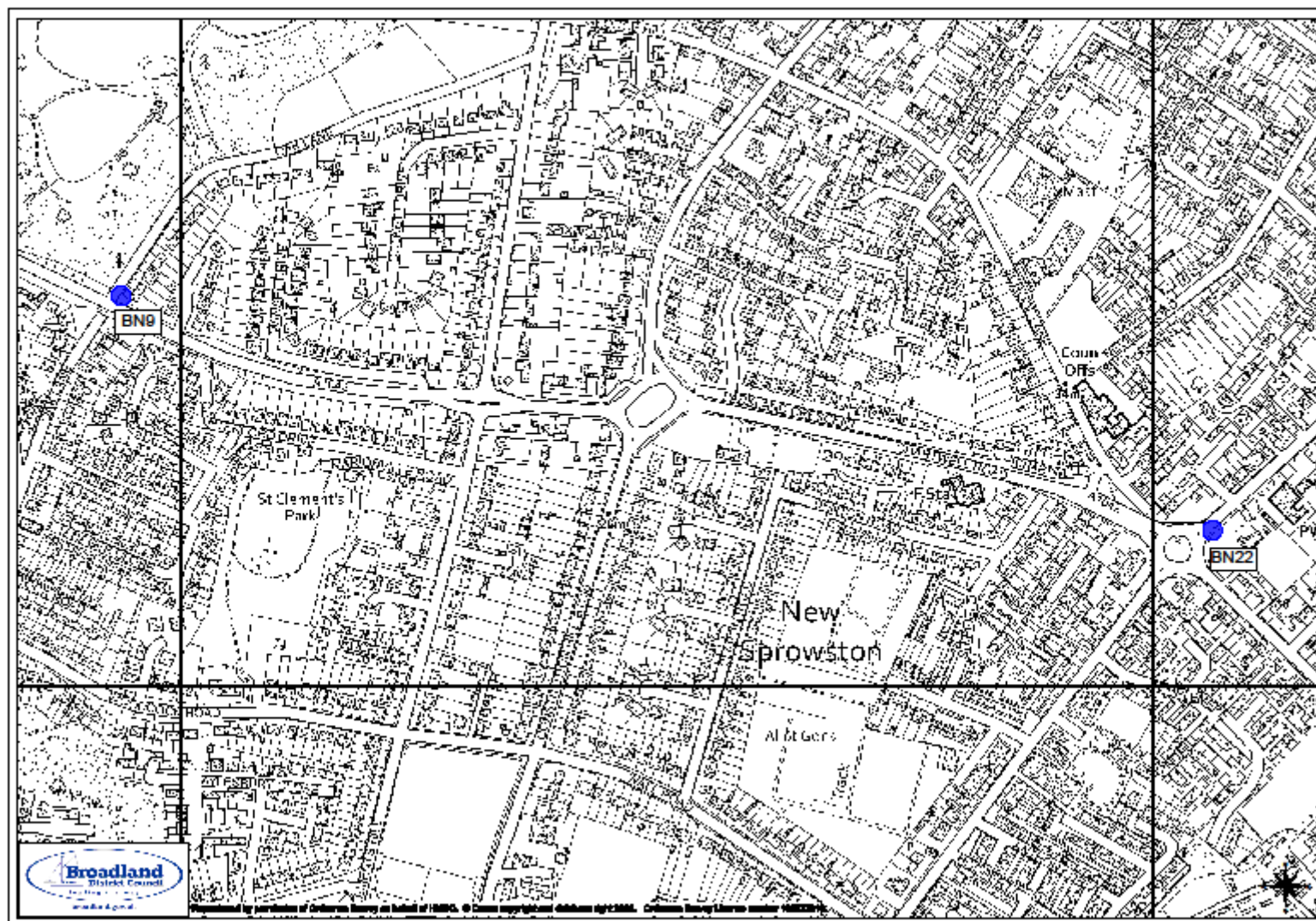
The diffusion tubes used by Broadland and South Norfolk District Councils are prepared and analysed by Gradko International using the 20%TEA in water method. The laboratory has demonstrated good data precision during 2019, and their analysis performance has been deemed 100% accurate by the AIR-PT assessment scheme (formerly the WASP assessment scheme).

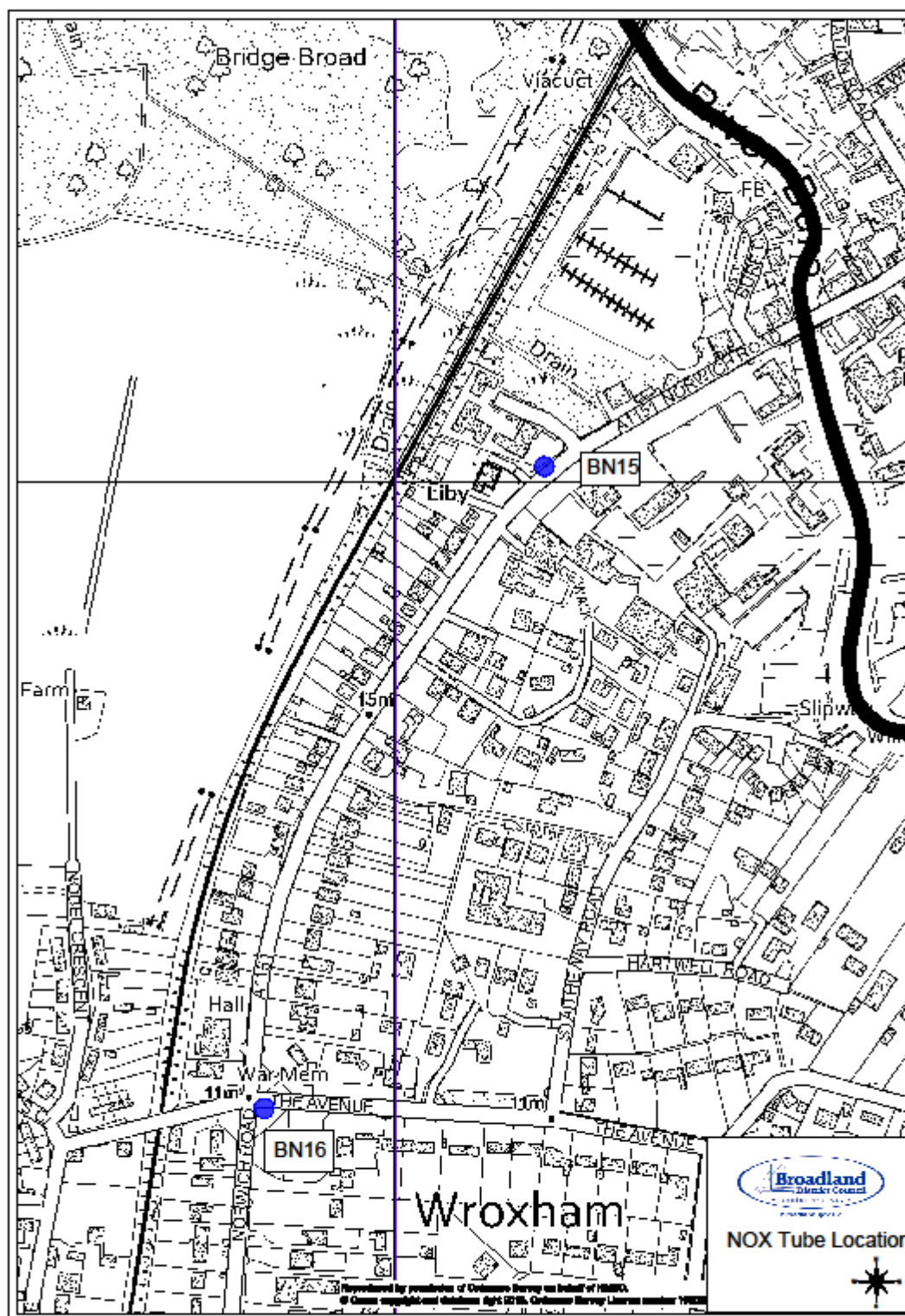
Appendix D: Map(s) of Monitoring Locations and AQMAs

Broadland District Monitoring Locations

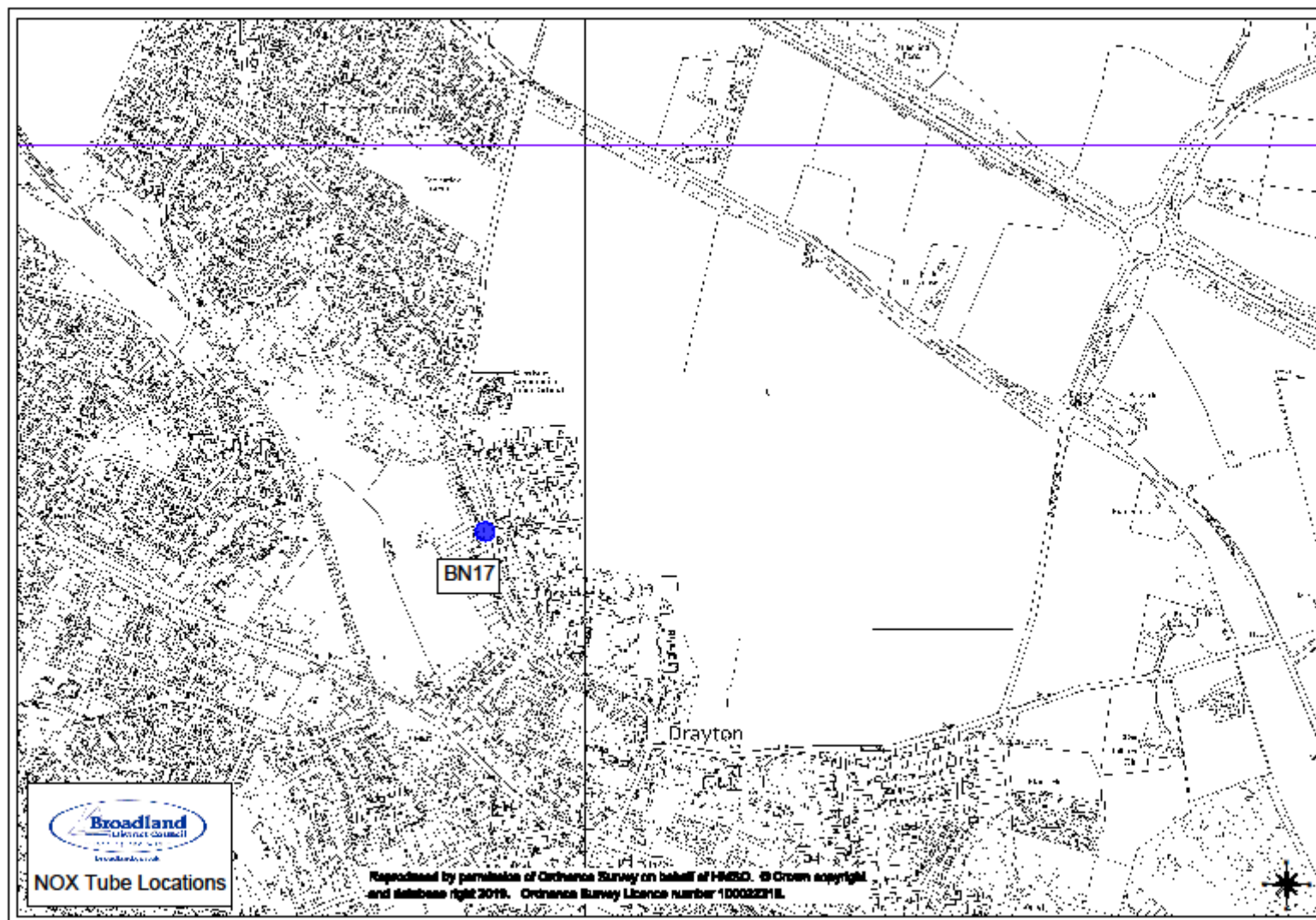


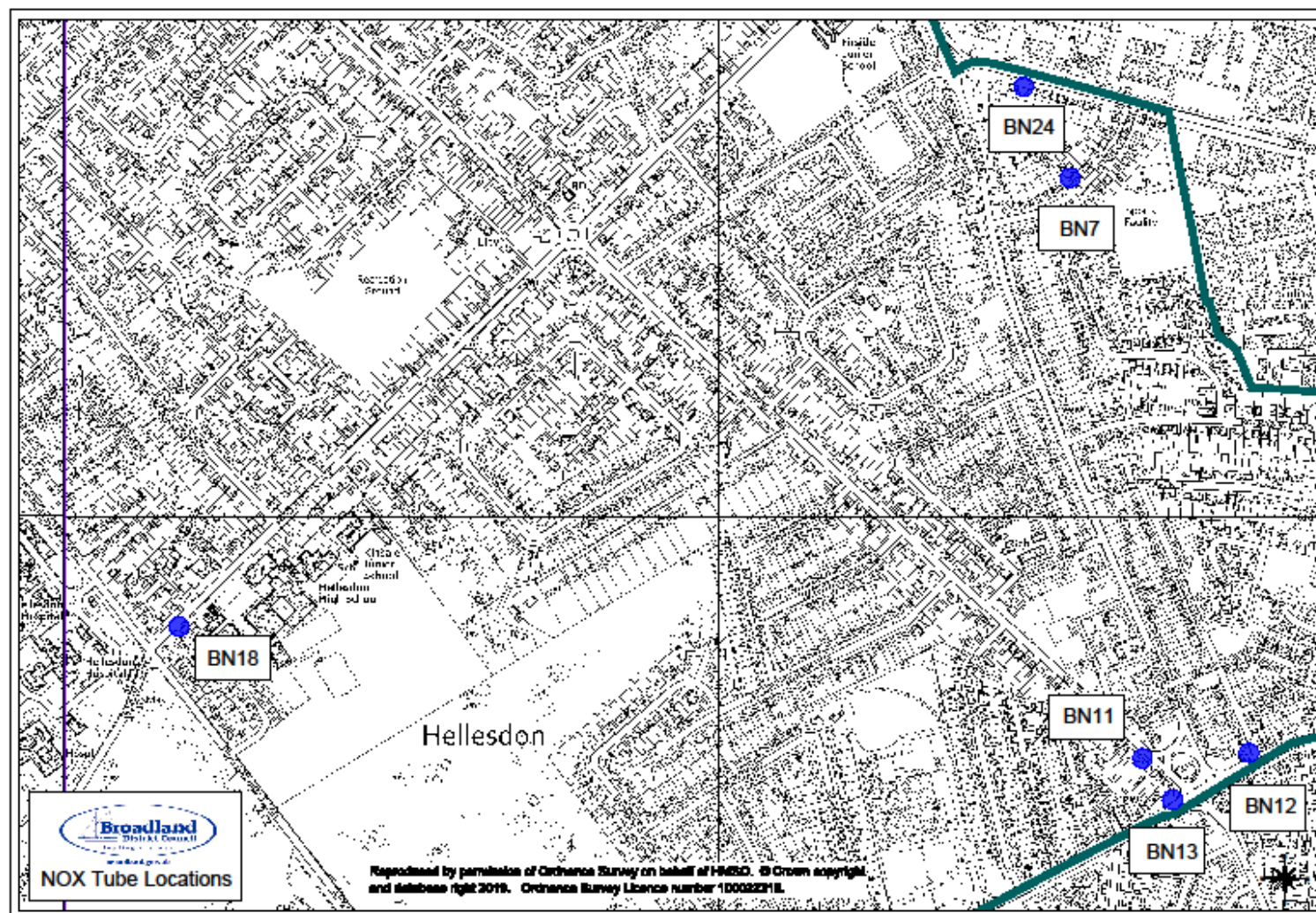




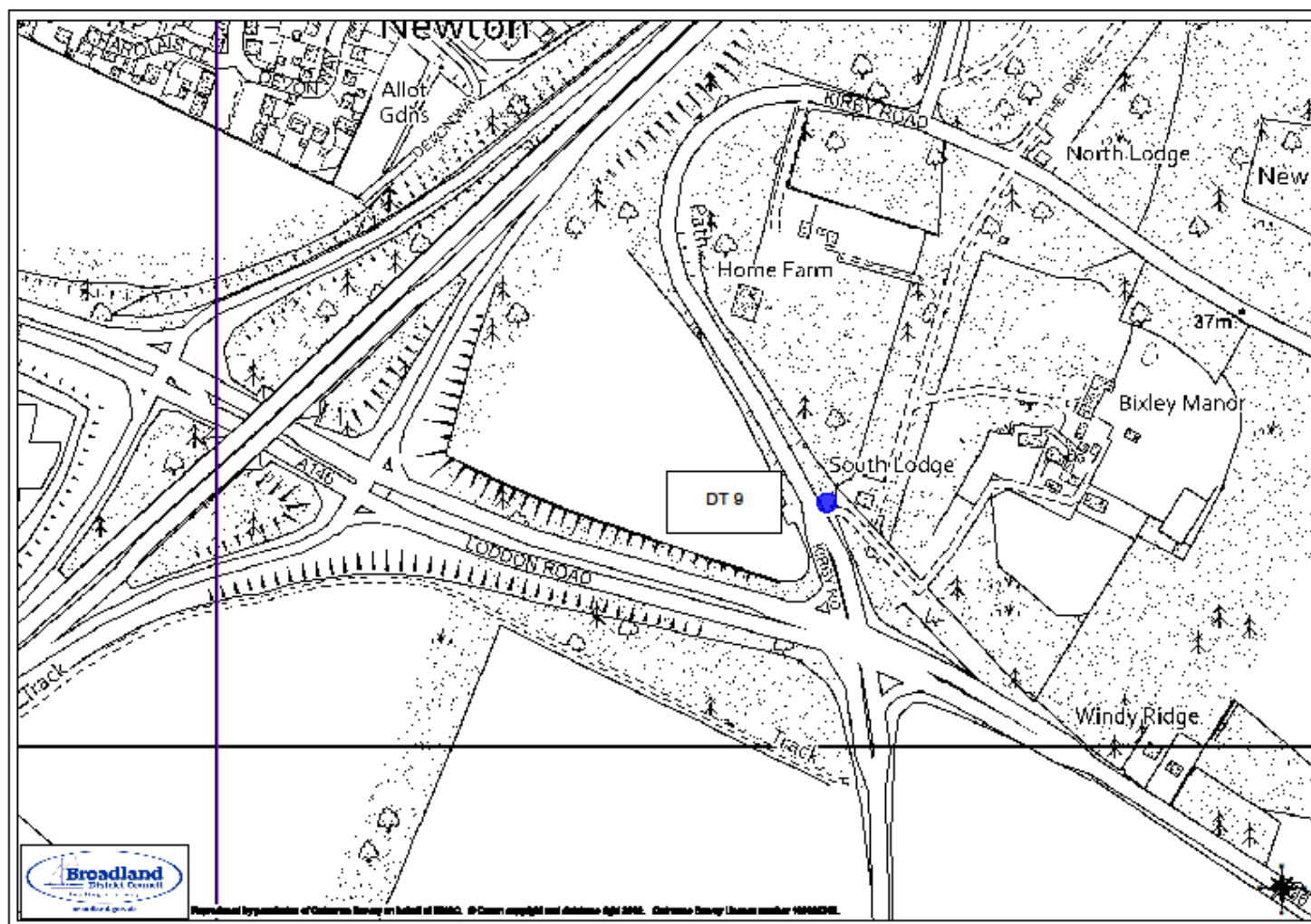


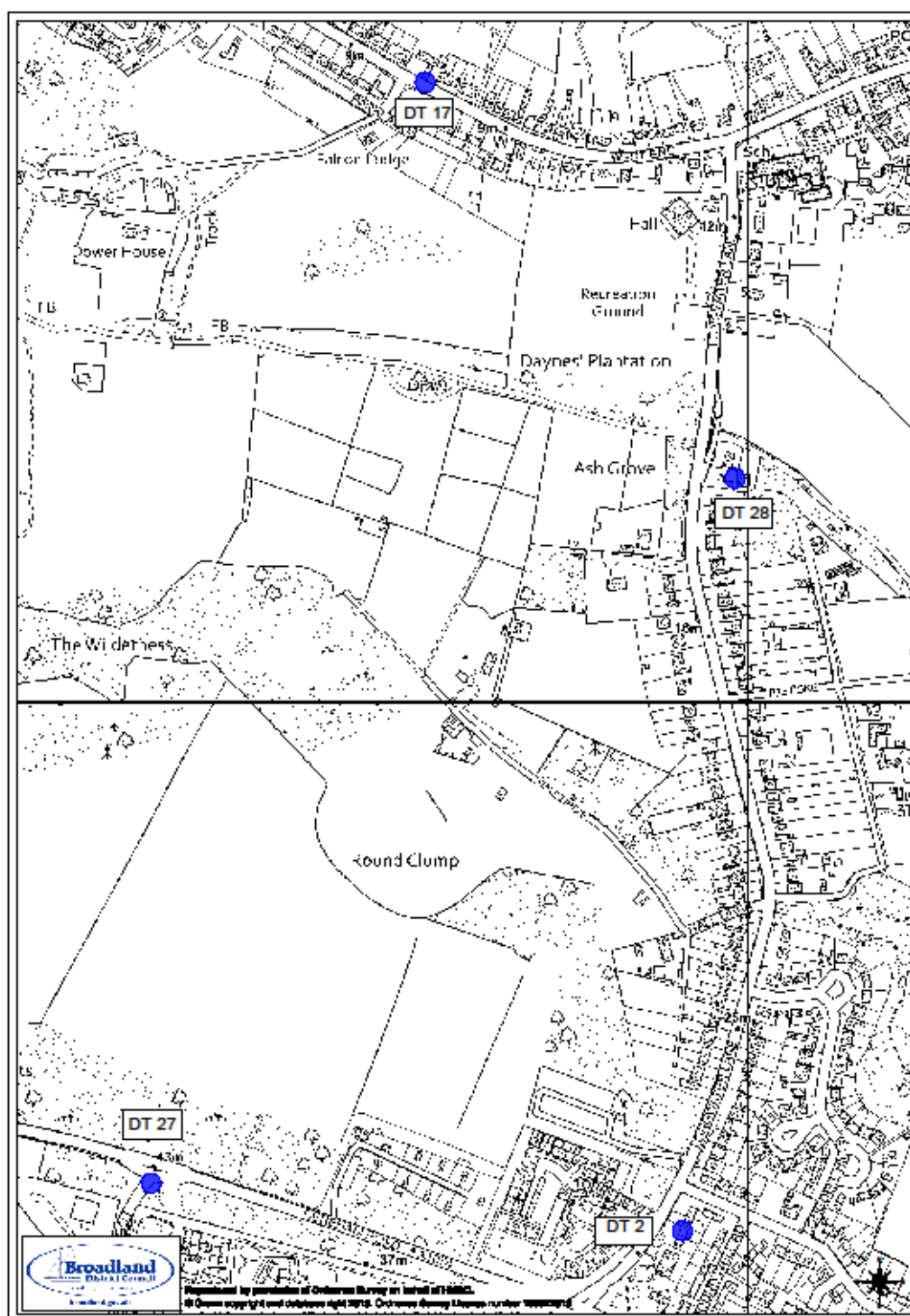


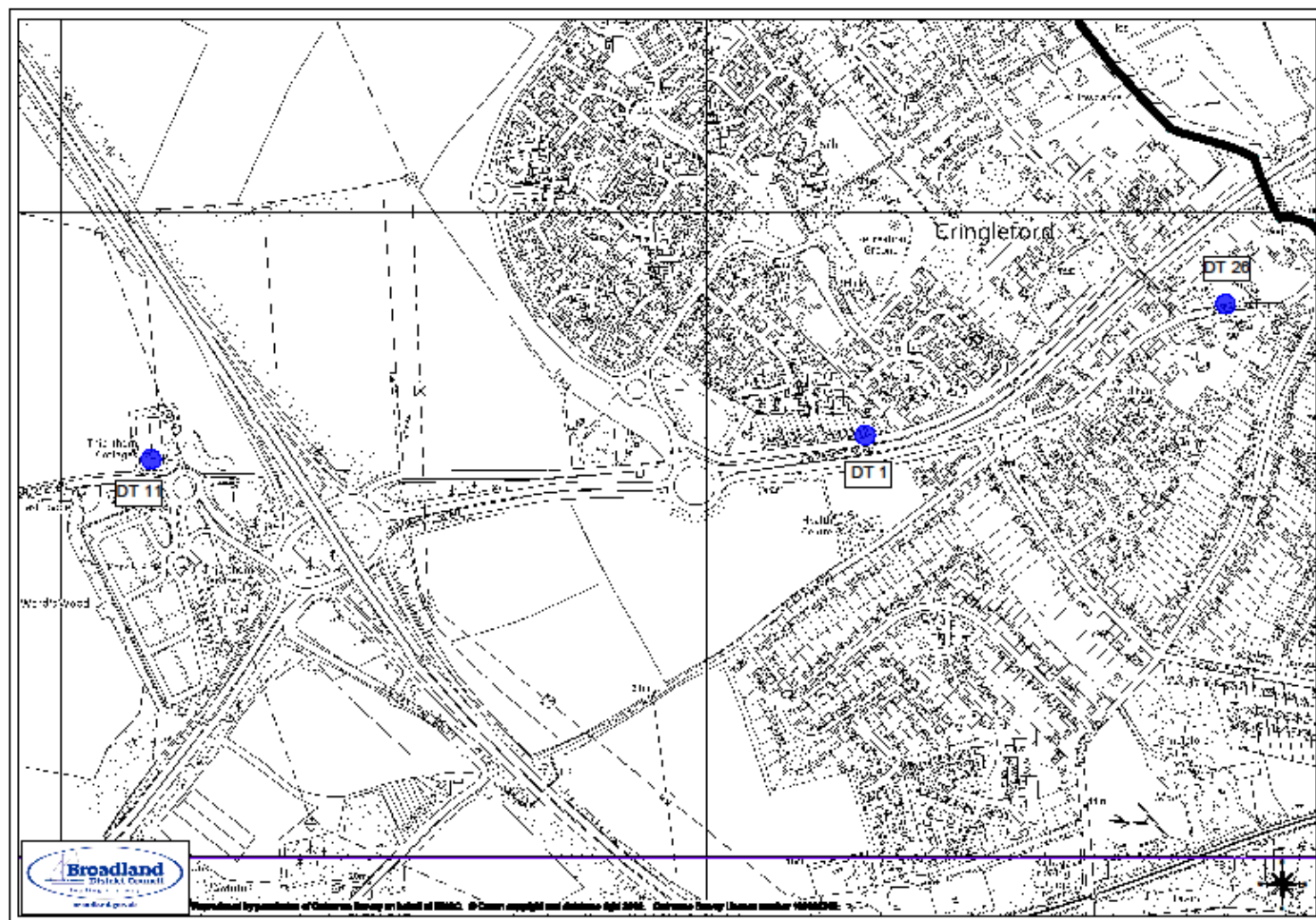


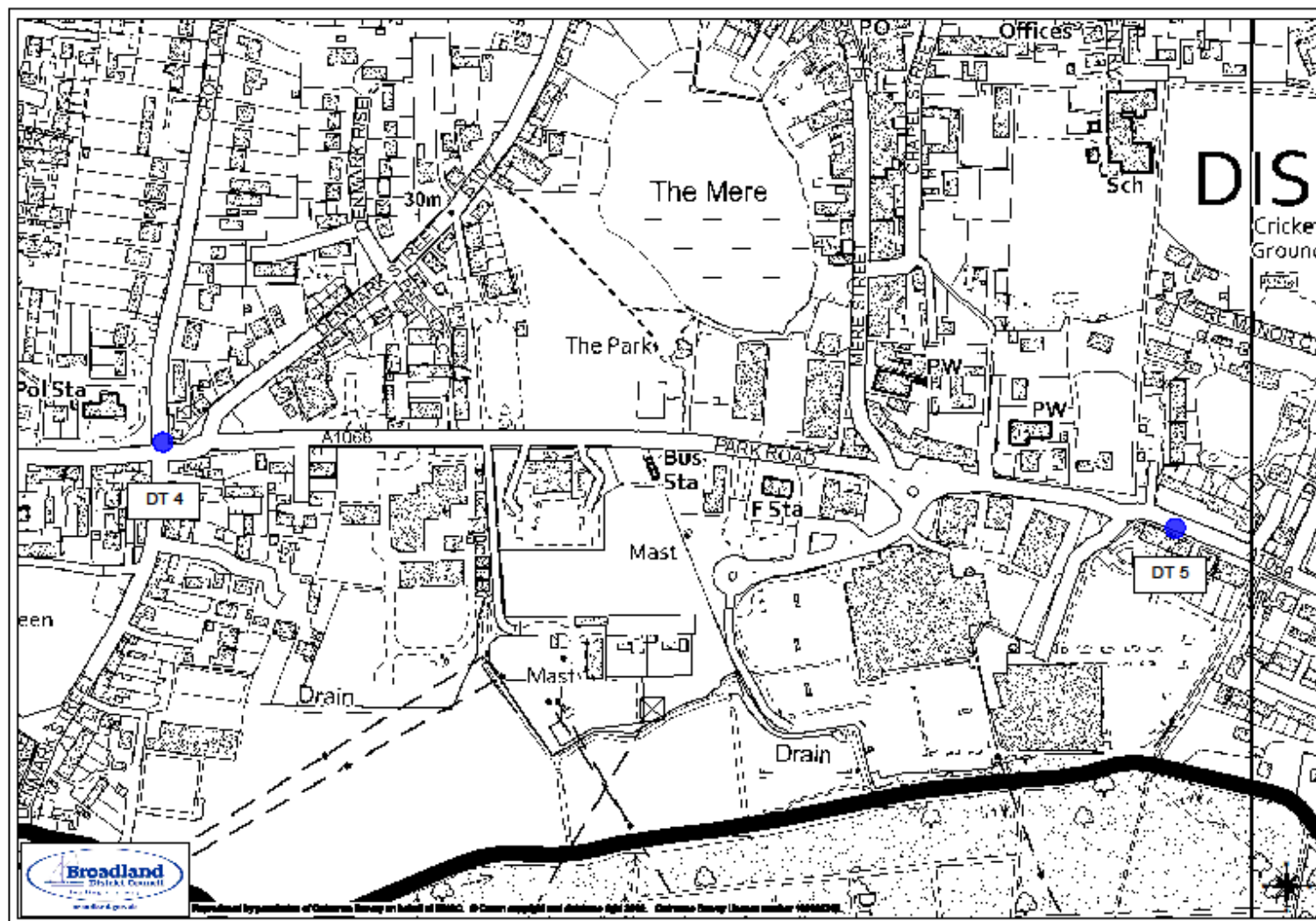


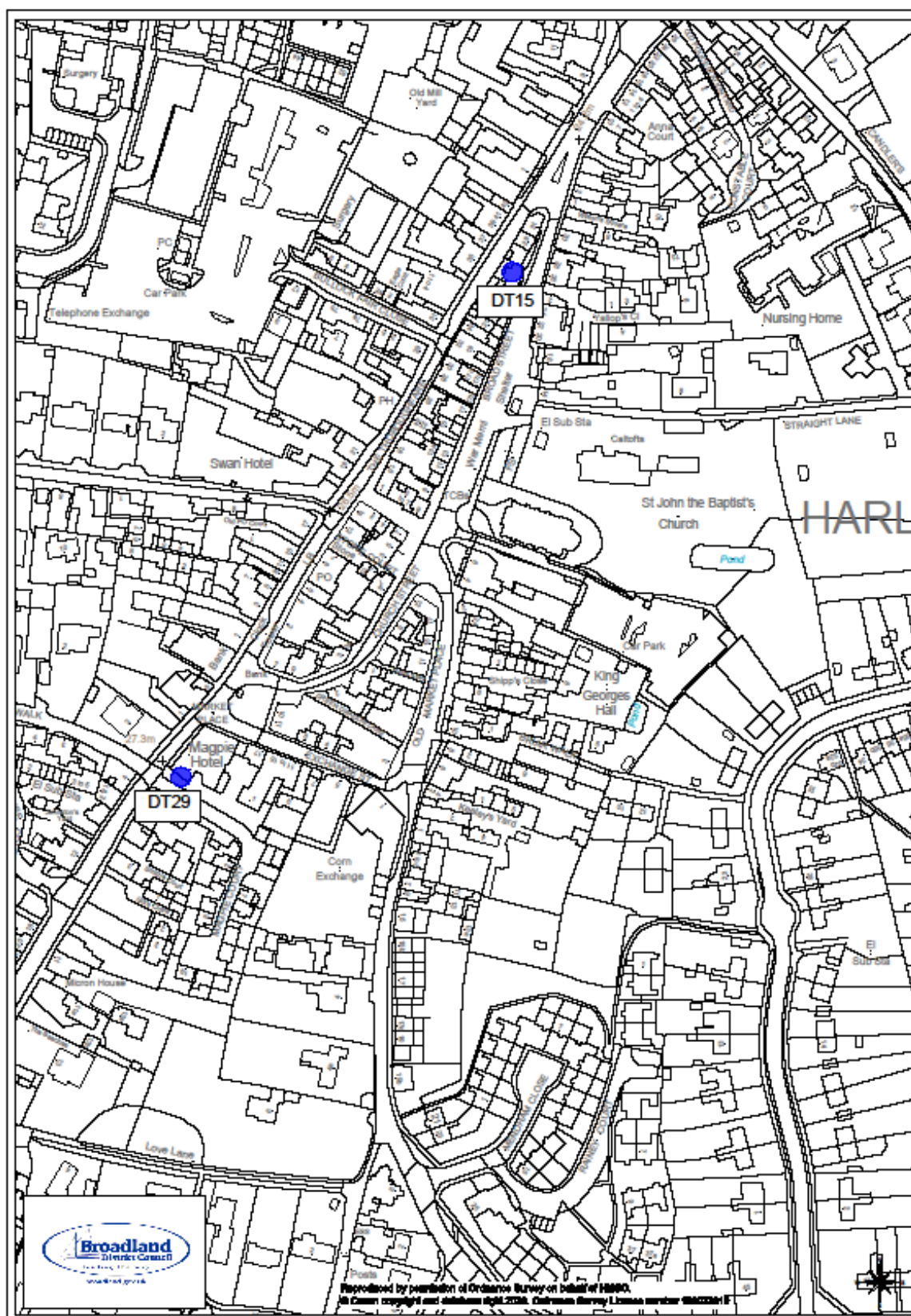
South Norfolk District Monitoring Locations

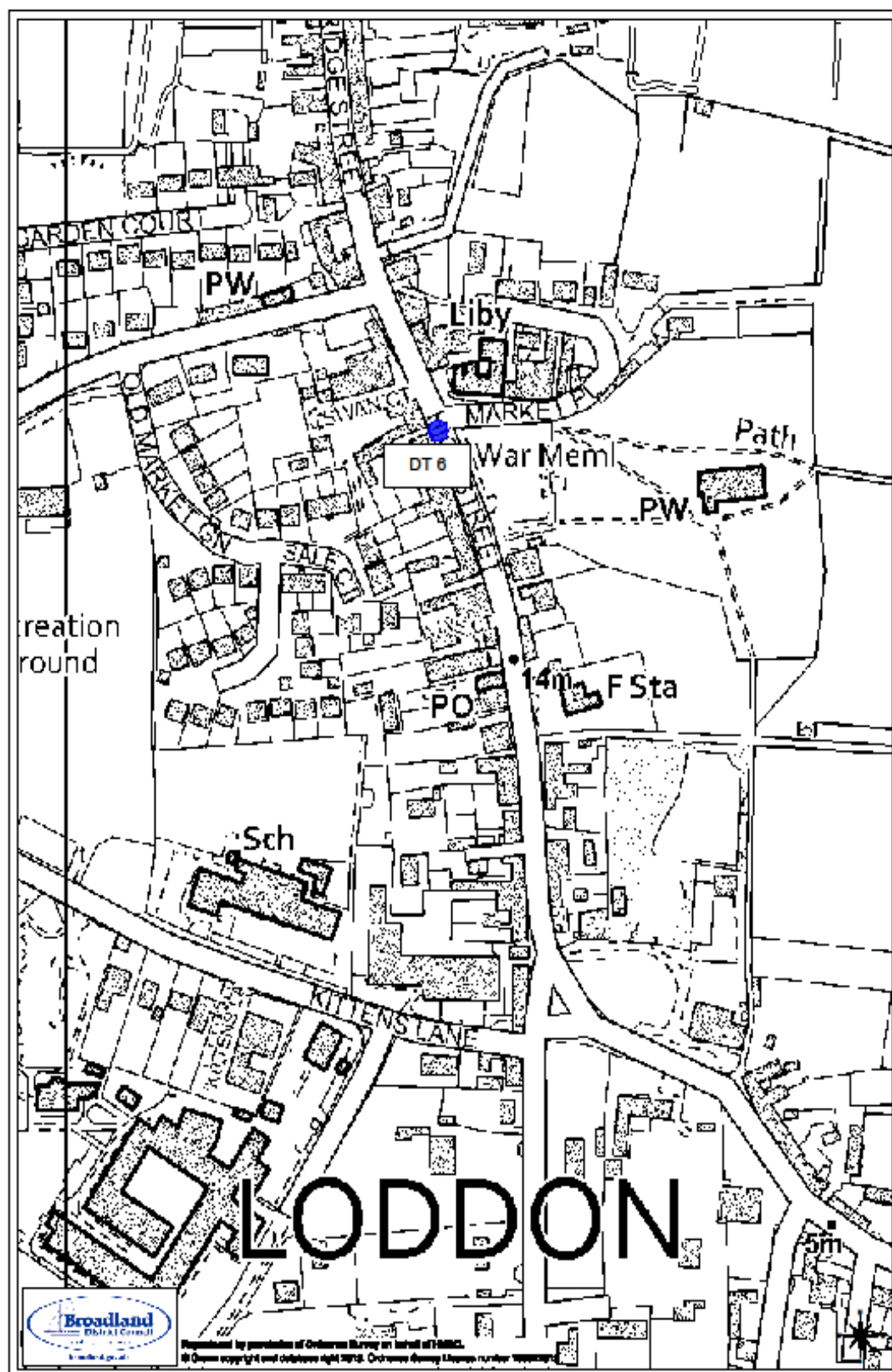


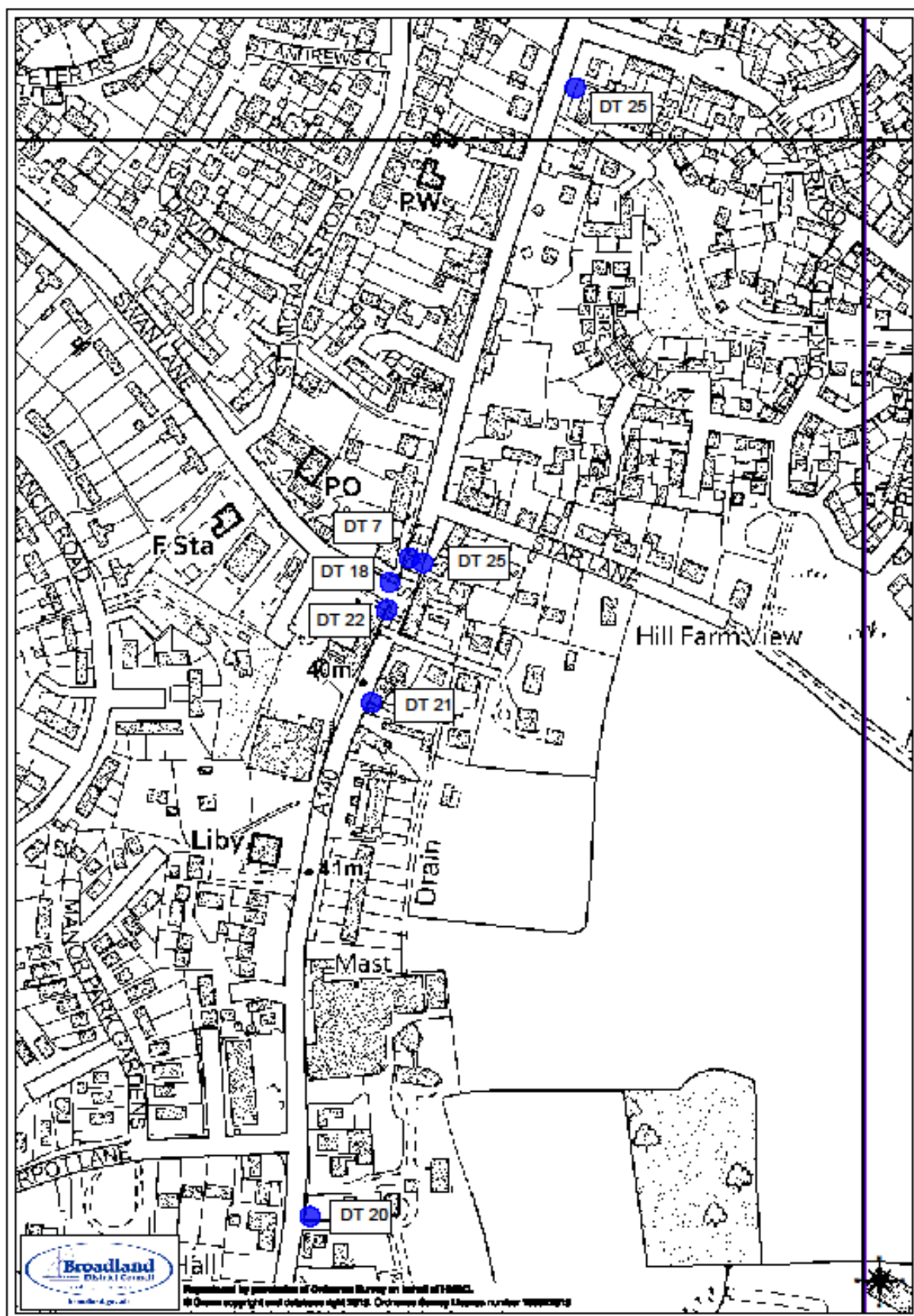


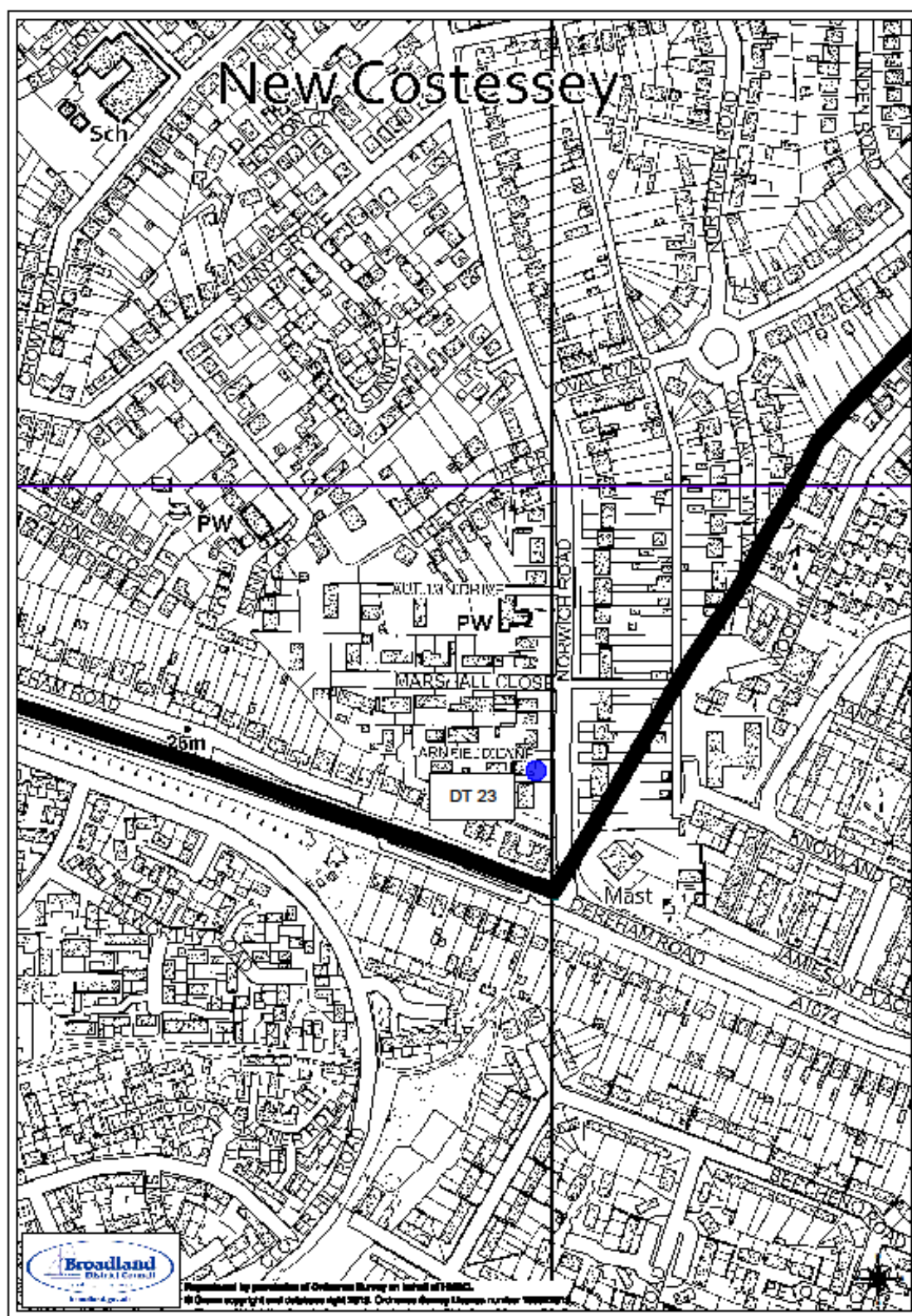


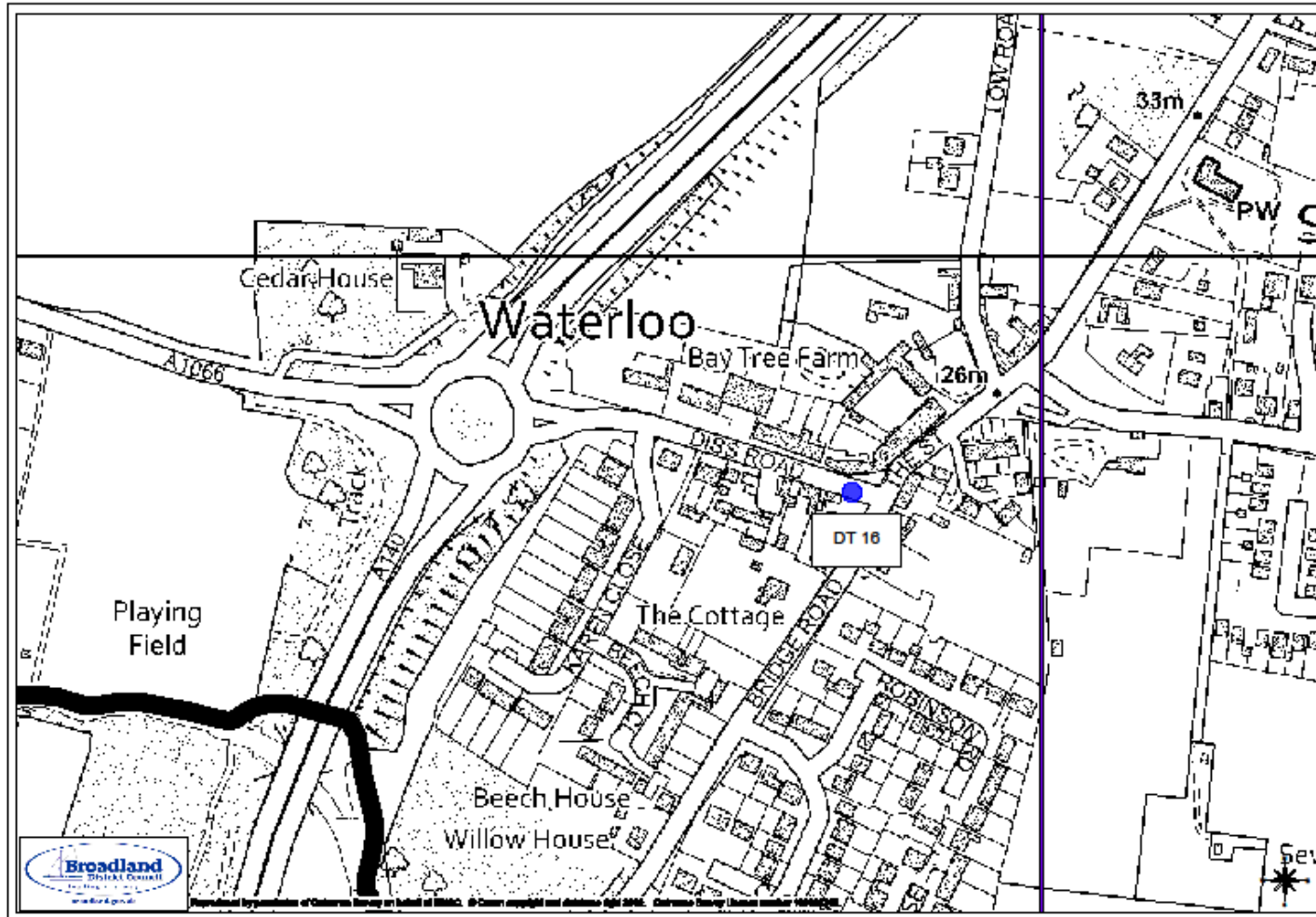














Appendix E: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective ⁴	
	Concentration	Measured as
Nitrogen Dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m ³	Annual mean
Particulate Matter (PM ₁₀)	50 µg/m ³ , not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m ³	Annual mean
Sulphur Dioxide (SO ₂)	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean

⁴ The units are in microgrammes of pollutant per cubic metre of air (µg/m³).

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	Air quality 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 (micrometres or microns) 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 Policy Guidance (PG16)

Local Air Quality Management Technical Guidance (TG16)

Air Pollution Background Concentration Maps (2010, 2011, 2013, 2015)

Greater Norwich Growth Area Air Quality Pledge (2017)

Draft Norfolk Bus Charter (2019)

Broadland District Council Environment Strategy (2020)

South Norfolk Council Environment Strategy (2020)