Sunderland City Council

2022 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995

Local Air Quality Management

Date: June 2022

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Executive Summary: Air Quality in Our Area

We are pleased to be able to report that the Air Quality in Sunderland is good. Health based objectives known as the Air Quality Objectives are being met across the City and we have seen a general decline in the pollutants measured. We have not declared any Air Quality Management Areas in our City.

Sunderland City Council is committed to try to reduce levels further and to support initiatives that will improve air quality and well-being in Sunderland. We are continuing to monitor levels of air quality throughout the city; Appendix A of this report contains a summary of air quality data collected in 2021. Our real time monitoring data as well as data from other sites across the region can be accessed by going to www.wecare4air.co.uk.

We also look at new sources such as new roads or industrial sites to assess their potential impact on the City's air quality.

Together with our partners in Transport and Public Health we aim to work together to try to improve air quality and there are ways that Sunderland's residents and businesses can get involved too.

Sunderland residents and businesses can get more information by visiting http://gosmartergoactive.co.uk/.

Air Quality in Sunderland

Air pollution is associated with several adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. It affects the most vulnerable in society: children, the elderly, and those with existing heart and lung conditions. There is also a strong correlation with deprivation and poverty because areas with poor air quality tend to also be 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].

Pollutants come from a variety of man-made sources such as industry, combustion of fuels, traffic engines and building heating. Some can come from natural sources such as the North Sea which adds to particulate levels. Air Quality in Sunderland is most heavily influenced by traffic emissions. The pollutant of most concern to Sunderland is Nitrogen Dioxide (NO_2) caused by road traffic.

Levels of pollution across Sunderland, indicated by the latest monitoring data, are falling and Sunderland has not had to declare an AQMA within its boundary

Sunderland City Council's Environmental Health Team is responsible for overseeing the air quality monitoring network and reporting the data to DEFRA. We work together with other Local Authorities in our region as Air Pollution crosses administrative boundaries. Improvements to the road network or fitting buses with pollution reducing technology will have positive benefits in more than one local authority region in our area. The GoSmarter project mentioned earlier operates across all the Tyne & Wear Authorities and Northumberland.

We also work closely with our partners in Transport, Public Health and Planning as well as partners outside the Local Authority such as the Environment Agency to improve air quality standards.

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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.

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.

Sunderland City Council currently does not have any AQMAs. For reference, a map of Sunderland's monitoring locations is available in Appendix D.

Conclusions and Priorities

We are pleased to report that no exceedances of the Air Quality Objectives were identified during the year 2021. Sunderland City Council does not currently have any AQMA's and because of our good air quality we conclude that we do not need to declare an AQMA for any pollutants.

Looking back over the last 5 years of data there has been a general decrease in NO_2 levels. During 2017 a downward trend was observed across most of our monitoring sites. Interestingly, in 2018 we saw mixed results in change at our monitoring sites. Both automatic sites reported a small increase in annual mean NO_2, whilst at diffusion tube sites there were 22 sites reporting lower concentrations and the remaining 12 comparable

[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

sites showing an increase. The figures for 2019 demonstrate mixed results once more. One of our automatic sites reported an increase whilst the other a decrease though none of the increased values exceeded the air quality objective. Across the diffusion tube network, 23 sites reported an increase (although in many cases this was very small) and 15 sites have decreased concentrations. The NO_2 results gathered during 2020 have demonstrated a fall in concentrations at every monitoring site, both automatic and sites monitored by diffusion tube. This was not wholly unexpected and is likely to be attributed to reduced traffic on the region's roads caused by restrictions brought about by the COVID-19 Pandemic. There has also been a shift towards working from home and this may continue to reduce traffic levels and therefore pollution in the future. During 2021, as the restrictions were lifted there has been a corresponding small increase in NO_2 levels at our site in Trimdon Street and at the AURN site on Wessington Way. At our diffusion tube sites, all but one site showed an increase in concentrations in 2021 compared to 2020. However, concentrations of NO_2 are still lower overall than they were 5 years ago.

The annual average of Particulate Matter (PM_{10}) has remained fairly constant over the past 5 years. Levels at the Trimdon Street site have fluctuated whilst at our urban background site in Silksworth, the level of both PM_{10} and $PM_{2.5}$ has remained the same as in 2020.

Local Engagement and How to get Involved

Sunderland residents and businesses can get more information by visiting http://gosmartergoactive.co.uk/. Up to date Air Quality data can be accessed by visiting Sunderland Trimdon Street - We Care 4 Air.

In April 2022, a trial scheme will see a street temporarily closed around St Bede's Primary School, Washington, to address road safety concerns and improve air quality.

The School Streets pilot scheme will restrict motorised vehicles on Hampshire Place at school drop-off and pick-up times to reduce high traffic levels and inconsiderate or illegal parking around the school.

The scheme also aims to encourage active travel to and from school and improve air quality in the area.

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Tables

1 Local Air Quality Management

This report provides an overview of air quality in Sunderland during 2021. 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 Sunderland City Council 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.

Sunderland City Council currently does not have any declared AQMAs.

For reference, monitoring locations in Sunderland are shown in Appendix D.

Progress and Impact of Measures to address Air Quality in Sunderland.

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

- evidence of the workings of the annualisation of diffusion tubes was not shown. This has been included in this year's report within Table C.2.
- Locations for certain diffusion tubes were shown in appendix D without being listed in the previous tables. These have been amended for this year's report.

Sunderland has taken forward a number of direct measures during the current reporting year of 2021 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in Table 2.1. 23 measures are included within Table 2.1, with the type of measure and the progress Sunderland have made during the reporting year of 2021 presented. Where there have been, or continue to be, barriers restricting the implementation of the measure, these are also presented within Table 2.1.

Although Sunderland City Council does not currently have an AQMA and therefore has not produced an AQAP, the measures listed in table 2.2 demonstrate some of the key projects that are currently ongoing and that should have a positive impact on Air Quality and reduce pollutant concentrations.

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	Go Ultra Low Cities (Fastned) Charging Station	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2018	2019	North East Combined Authority (NECA)	Go Ultra Low Cities Grant and the European Regional Development Fund.	NO	Funded	£1 million - £10 million	Completed	Reduced vehicle emissions	Measured concentrations at AQ Sites	Completed	
2	EV Charging Infrastructure review	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2022	2022	Gateshead, North Tyneside, Newcastle, and Nexus	NECA Sustainable Transport Group	NO	Funded		Implementation	Reduced vehicle emissions	Measured concentrations at AQ Sites	Operator to be appointed and grow the public network	
3	Ultra-low emission taxi infrastructure scheme Round 2	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2018	2020	North East Combined Authority (NECA)	North East Combined Authority (NECA)	NO	Funded	£500k - £1 million	Implementation	Reduced vehicle emissions	Measured concentrations at AQ Sites	EV points for electric taxis to be provided across the North East. To be installed in Houghton-Le-Spring	
4	Connect 700 Bus Service	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	2012	2019	University of Sunderland & Nexus	University of Sunderland & Nexus	NO	Funded		Implementation	Reduced vehicle emissions	Measured concentrations at AQ Sites	The bus service continues to run.	
5	Ultra-low emissions bus fund	Vehicle Fleet Efficiency	Promoting Low Emission Public Transport	2022	2023	North East Combined Authority (NECA) & Nexus	Levelling Up Fund	NO	Not Funded			Reduced vehicle emissions	Measured concentrations at AQ Sites		
6	Walking & Cycling Strategy	Promoting Travel Alternatives	Promotion of cycling, Promotion of walking	2012	2025	Local Authority	Local Authority	NO	Funded	£50k - £100k	Planning	Reduced vehicle emissions	Measured concentrations at AQ Sites	Local cycling and Walking Infrastructure Plan to be adopted.	
7	Electric Bikes for staff business travel	Promoting Travel Alternatives	Promotion of cycling	2020	2023	Local Authority	Local Authority	NO	Funded	£50k - £100k	Implementation	Reduced vehicle emissions	Measured concentrations at AQ Sites	Procurement in progress	
8	Cycle to work salary cycle scheme	Promoting Travel Alternatives	Promotion of cycling	2017	2017	Local Authority	Local Authority	NO	Funded		Completed	Reduced vehicle emissions	Measured concentrations at AQ Sites	on going	
9	E-scooters Trail - 300 provided with plans to extend	Promoting Travel Alternatives	Promoting Low Emission Public Transport	2021	2022	Neuron	Local Authority/ Neuron	NO	Funded		Completed	Reduced vehicle emissions	Measured concentrations at AQ Sites	Operating zone tripled in size in April 2022.	
10	School Street Closure	Promoting Travel Alternatives	Promotion of walking	2021	2022	Primary Schools & Northumbria Police	Local Authority	NO	Funded		Implementation	Reduced vehicle emissions	Measured concentrations at AQ Sites	First primary school trial underway for 18-month period	

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
11	Rapid Cluster Site EV Charging	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2020	2030	North East Combined Authority (NECA)	North East Combined Authority (NECA)	NO	Funded		Completed	Reduced vehicle emissions	Measured concentrations at AQ Sites		
12	OLEV Workplace EV Chargers	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2020	2030	Local Authority	Local Authority	NO	Funded		Implementation	Reduced vehicle emissions	Measured concentrations at AQ Sites	Funding secured to install EV chargers at several Sunderland Council Sites	
13	On Street EV Charging Scheme	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2022	2030	Local Authority	Local Authority	NO	Funded		Planning	Reduced vehicle emissions	Measured concentrations at AQ Sites	Next phase in planning stage subject to grant funding	
14	ERDF Programme	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	2020	2023	South Tyneside, Gateshead, and Sunderland Local Authorities	ERDF	NO	Funded		Implementation	Reduced vehicle emissions	Measured concentrations at AQ Sites	Phase 1 ongoing	
15	Energy Generation & Storage Project	Promoting Low Emission Transport	Procuring alternative Refuelling infrastructure to promote Low Emission Vehicles, EV recharging, Gas fuel recharging	2022	2025	Local Authority	Local Authority	NO	Funded		Planning	Reduced vehicle emissions	Measured concentrations at AQ Sites	Contractor appointed, installation progressing	
16	Fleet Replacement Programme	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	2020	2021	Local Authority	Local Authority	NO	Funded		Completed	Reduced vehicle emissions	Measured concentrations at AQ Sites	Initial study on electrifying Sunderland Fleet vehicles.	
17	3 Electric Refuse Vehicles trial	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	2020	2020	Local Authority	ERDF	NO	Funded		Completed	Reduced vehicle emissions	Measured concentrations at AQ Sites	funding secured for one eRCV. Local match and vehicle procured and operational.	
18	City Centre Heat Network	Promoting Low Emission Plant	Low Emission Fuels for stationary and mobile sources in Public Procurement	2021	2023	HNDU, BEIS and LA.	HNDU	NO	Not Funded		Planning	Reduced Plant emissions	Measured concentrations at AQ Sites	Initial Study complete. Funding applications and project delivery stage.	
19	Mine Source Energy	Promoting Low Emission Plant	Low Emission Fuels for stationary and mobile sources in Public Procurement	2020	2023	Coal Authority, HNDU	Local Authority	NO	Not Funded		Planning	Reduced Plant emissions	Measured concentrations at AQ Sites	Initial study complete. Next stage under consideration.	

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
20	Zero Emission Vehicle Policy	Policy Guidance and Development Control	Regional Groups Co-ordinating programmes to develop Area wide Strategies to reduce emissions and improve air quality	2022	2024	North East Combined Authority (NECA)	North East Combined Authority (NECA)	NO	Funded		Planning	Reduced vehicle emissions	Measured concentrations at AQ Sites		
21	EV Infrastructure Strategy for Sunderland	Policy Guidance and Development Control	Low Emissions Strategy	2022	2024	University of Sunderland, Sunderland College, City Hospitals, Gentoo	Local Authority	NO	Funded		Planning	Reduced vehicle emissions	Measured concentrations at AQ Sites	Project partner appointed, stakeholder engagement stage.	
22	Mobility Hub with EV car club located in Riverside Sunderland	Promoting Low Emission Transport	Public Vehicle Procurement - Prioritising uptake of low emission vehicles	2020	2022	Local Authority, Riverside residents	Local Authority	NO	Funded		Implementation	Reduced vehicle emissions	Measured concentrations at AQ Sites	Workplace hub for staff travel by EV, e-bike, cycle, e-scooter, and public transport incentives	
23	Nissan36Zero creation of a microgrid including energy generation and EV battery production.	Promoting Low Emission Plant	Low Emission Fuels for stationary and mobile sources in Public Procurement	2020	2023	Nissan, Envision	Nissan, Envision	NO	Funded	> £10 million	Implementation	Reduced Plant emissions	Measured concentrations at AQ Sites	Construction commenced.	

$PM_{2.5}$ – 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.

Background on the impacts on health outcomes and rationale:

The people of Sunderland have lower life expectancy at birth than the England average, with a gap of 2.2 years for males and 2.4 years for females. Data published recently shows that:

- 17.1% of the gap for males and 24.1% of the gap for females is due to deaths from respiratory diseases.
- 13.4% of the gap for males and 16.2% of the gap for females is due to deaths from circulatory diseases.

28.1% of the gap for males and 34.3% of the gap for females is due to deaths from cancer. Evidence shows that long term exposure to poor air quality increases the risk of mortality from cardiovascular and respiratory diseases and also lung cancer. Sunderland has higher than England average rates of death for these causes as follows:

- Premature (under 75 years) mortality rates from cardiovascular disease of 93 per 100,000 compared to 76 per 100,000 for England; of this 62 per 100,000 were preventable.
- Premature (under 75 years) mortality rates from respiratory disease of 44 per 100,000 compared to 33 per 100,000 for England; of this 28 per 100,000 were preventable.
- Premature (under 75 years) mortality rates from lung cancer of 50 per 100,000 compared to 34 per 100,000 for England; around 89% of lung cancers are preventable.

Data from the Public Health Outcomes Framework suggests that man-made small particulate air pollution ($PM_{2.5}$) contributes to deaths in the City and the burden this create on our population is equivalent to 4.5% of all deaths at ages 30 years and over. This places Sunderland is the best performing quartile for this measure.

Levels of $PM_{2.5}$ in Sunderland (as measured by the Silksworth monitoring station) are generally relatively low and have not increased since 2020. Data for 2021, at 6µg/m^3 are well below the EU target of 25µg/m^3.
Actions already being taken by Sunderland City Council to reduce pollutants such as PM_{10} and NO_x as reported in Table 2.2 will also reduce levels of $PM_{2.5}$ emissions.

Examples of measures to tackle $PM_{2.5}$ can be categorised into Mobile Sources, Stationary Sources and Area Sources.

Mobile Sources

Sunderland Council has recently secured funding for the retrofitting of diesel buses which will help to reduce primary and secondary sources of $PM_{2.5}$.

Stationary Sources

Stationary sources of $PM_{2.5}$ can originate from industrial processes that use dusty raw materials and equipment such as electrostatic precipitators. The Environmental Health Team of Sunderland Council closely monitors dusty emissions from permitted processes and respond to any complaints regarding dust emissions from demolition and/or construction sites. We also control dust through the planning process by assessing proposed industrial and potentially dusty activities and advising on appropriate control measured, for example, ensuring construction sites have an adequate Construction Environmental Management Plan in place.

Area Source Measures

The whole of Sunderland City Council's boundary is a smoke control area and domestic coal is not permitted to be used as fuel. The
Environmental Health Team thoroughly investigates complaints of dark smoke or the use of unapproved appliances to minimise the emissions of $PM_{2.5}$ from these sources and promotes the Department for Environment Food & Rural Affairs practical guide for the use of open fires and wood burning stoves in the City
Sunderland City Council's Public Health Team are happy to support Environmental Health in promoting the importance of air quality in contributing to key priorities for the city and recommend that any actions that can reduce levels of $PM_{2.5}$ should be considered as part of the broad strategy to protect and promote the health of the Sunderland population.

Further discussions between our partners in Public Health and Transport are required to improve our understanding. Sunderland City Council will continue to work towards reducing emissions and concentrations of $PM_{2.5}$ in their area as practicable.

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

This section sets out the monitoring undertaken within 2021 by Sunderland and how it compares with the relevant air quality objectives. In addition, monitoring results are presented for a five-year period between 2017 and 2021 to allow monitoring trends to be identified and discussed.

Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

Sunderland undertook automatic (continuous) monitoring at 3 sites during 2021. Table A.1 in Appendix A shows the details of the automatic monitoring sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. The www.wecare4air.co.uk page presents automatic monitoring results for Sunderland, with automatic monitoring results also available through the UK-Air website.

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Sunderland undertook non- automatic (i.e. passive) monitoring of NO_2 at 34 sites during 2021. 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.

3.1.3 Nitrogen Dioxide (NO_2)

Table A.3 and Table A.4 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 2021 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.

Table A.5 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 were no exceedances of the annual or 1-hour air quality objectives for NO_2 at all of the monitoring locations.

Unfortunatley CM2 (Silksworth) only had 15% data capture for NO_2 in 2021 and therefore the results were unable to be included in this report.

The annual mean at Both CM1 and CM3 slightly increased when compared to the data collected in 2020, however levels did not increase more than the 2019 mean. It is possible that COVID restictions that were still in place during the start of 2021 and the increased ability for home working has led to a reduction in traffic on the roads. Figure A.1 shows a comparison of the last 5 years data.

The diffusion tube results demonstrated a similar trend to the continuous analysers with all but one site having an increased concentration but the increase was typically small and not above the levels measured in 2019 and 2018. Figures A.2 and A.3 show the diffusion tube data for 2017 to 2021.

3.1.4 Particulate Matter (PM_{10})

Table A.6 in Appendix A: Monitoring Results compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past five years with the air quality objective of 40µg/m^3.

Table A.7 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past five years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

However, it must be noted that the data from CM1 was collected using a TEOM. In previous years the data has been corrected using the VCM model but the removal of a nearby FDMS analyser has meant that there is no longer an analyser in range and the correction model cannot be used. After seeking advice from the LAQM helpdesk, the data was corrected using a factor of 1.3 but it cannot be relied heavily upon to make conclusions. When compared with the last 5 years data the annual concentration is slightly higher than it has been previously but is not dramatically different, see Fig A.

Sunderland are currently gathering information to replace the TEOM with a MCERTS approved method and hopefully this should be in place by the beginning of 2023.

Relying on the data from CM2, there were no exceedances of the annual or daily air quality objective for PM_{10} in Sunderland for the year 2021. Annual concentrations of PM_{10} increased at CM1 and remained the same at CM2 when compared to the previous year's levels. The number of 24-hour means >50µg/m^3 decreased at CM1 and remained the same at 0 days for CM2.

3.1.5 Particulate Matter ($PM_{2.5}$)

Table A.8 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past five years.

Concentrations of PM2.5 were measured at CM2. This is an affiliate AURN site and as such the data has been correctly ratified and is available from the Data Archive - Defra, UK . There were no exceedances of the $PM_{2.5}$ objective at the monitoring location. Levels in 2021 remained the same at 6 µg/m^3 as measured in 2020.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Pollutants Monitored	In AQMA? Which AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
CM1	Trimdon Street	Kerbside	438928	557151	NO_2, PM_{10}	NO	Chemiluminescent; TEOM	3	0.5	2
CM2	Silksworth	Urban Background	438116	554462	NO2, PM10, PM2.5	NO	Chemiluminescent, FIDAS	230	0.5	2
CM3	Wessington Way	Roadside	438020	558348	NO2	NO	Chemiluminescent	15	1.5	1.8

Notes:

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

(2) N/A if not applicable

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

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)
38	17 Parkside South, East Herrington	Roadside	435714	552473	NO2	No	0.0	18.0	No	2.0
53	166 Chester Road, Millfield	Roadside	438568	556566	NO2	No	0.0	4.0	No	2.0
55	25 Eden Vale, Thornholme	Roadside	438690	556135	NO2	No	0.0	3.0	No	2.0
56	101 Southwick Road, Southwick	Roadside	439101	558292	NO2	No	0.0	2.0	No	2.0
57	5/6 Northbridge Street, Monkwearmouth	Kerbside	439664	557829	NO2	No	0.0	2.0	No	2.0
58	6 Beatrice Terrace, Shiney Row	Kerbside	432634	552616	NO2	No	0.0	3.0	No	2.0
86	2 Alice Street, Thornholme	Roadside	439466	556484	NO2	No	0.0	4.0	No	2.0
88	Hind's Street, Central	Kerbside	439160	556995	NO2	No	165.0	0.0	No	4.0
94	Chaplins PH, Mary St. City Centre	Kerbside	439374	556660	NO2	No	2.0	2.0	No	4.0
101, 105, 106	Puma Centre, Silksworth Lane	Urban Background	438116	554462	NO2	No	130.0	3.0	No	2.0
109	23 Newcastle Road, Bowling Alley	Roadside	439648	558120	NO2	No	0.0	3.0	No	2.0

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)
111	237 Queen Alexandra Rd	Roadside	438453	555507	NO2	No	0.0	9.0	No	2.0
113	Durham Road Prospect Junction	Urban Centre	437446	554989	NO2	No	20.0	4.0	No	2.0
117	3, Holmeside (Baker's Oven)	Roadside	439495	556795	NO2	No	97.0	4.0	No	2.0
118	27 Bridge Street	Roadside	439696	557205	NO2	No	0.0	2.0	No	2.0
119	4 Atheneum Street	Roadside	439792	556921	NO2	No	88.0	2.0	No	4.0
120	Gillespie’s	Roadside	439806	557063	NO2	No	100.0	5.0	No	4.0
121	16 Windsor Terrace, Grangetown	Roadside	440702	554722	NO2	No	0.0	2.0	No	4.0
123	263 Chester Road	Roadside	437943	556341	NO2	No	10.0	4.0	No	4.0
125	45 Station Road	Roadside	435417	547025	NO2	No	0.0	2.0	No	4.0
128	Echo Building (lamp post)	Roadside	439707	557312	NO2	No	20.0	2.0	No	4.0
129	West Sunniside (lamp post)	Roadside	439938	557089	NO2	No	2.0	1.0	No	2.0
130	St Mary's Car Park, Matlock Street	Roadside	439538	557292	NO2	No	177.0	3.0	No	2.0

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)
132	Dunn House North Bridge Street	Roadside	439661	557901	NO2	No	0.5	3.0	No	4.0
133	Northern Way	Roadside	438123	558344	NO2	No	0.0	3.0	No	4.0
134	Southwick Rd/ Thompson Rd	Roadside	438563	558517	NO2	No	0.0	2.0	No	4.0
135	Merle Terrace	Roadside	437561	557538	NO2	No	0.0	4.0	No	4.0
136	1, Morningside	Roadside	428269	553809	NO2	No	0.0	9.0	No	4.0
137	9 Esthwaite	Roadside	429935	556631	NO2	No	0.0	26.0	No	4.0
138	Galleries Service Yard	Roadside	429984	556576	NO2	No	56.0	1.0	No	4.0
139	Rear of 79 Spout Lane	Roadside	430899	556961	NO2	No	8.0	0.0	No	4.0
140	3 Musgrove Terrace	Roadside	430877	556851	NO2	No	3.0	0.0	No	4.0
141	Junction Dairy Lane & Front St	Roadside	432542	549640	NO2	No	9.0	3.0	No	4.0
142	3 Whitehall Terrace	Roadside	437224	556714	NO2		0.0	4.0		

Notes:

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

(2) N/A if not applicable.

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

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021(%) (2)	2016	2017	2018	2019	2020
CM1	438928	557151	Kerbside		86.9	30	32	28	25	26.1
CM3	438020	558348	Roadside		98	23	20	17	13	17

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

☒ **Reported concentrations are those at the location of the monitoring site (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**.

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%).

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

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 2021 (%) [2]	2017	2018	2019	2020	2021
38	435714	552473	Roadside	N/A	90.4	34.4	33.5	33.7	28.9	26.9
53	438568	556566	Roadside	N/A	90.4	25.9	25.3	25.6	15.1	21.1
55	438690	556135	Roadside	N/A	90.4	31.0	25.8	25.1	21.3	24.0
56	439101	558292	Roadside	N/A	90.4	24.1	22.2	26.0	18.5	22.2
57	439664	557829	Kerbside	N/A	80.8	26.9	27.1	32.2	22.2	31.6
58	432634	552616	Kerbside	N/A	90.4	32.1	32.2	33.0	19.8	25.4
86	439466	556484	Roadside	N/A	57.4	17.5	16.9	16.4	13.7	18.1
88	439160	556995	Kerbside	N/A	90.4		26.4	28.2	20.3	24.2
94	439374	556660	Kerbside	N/A	82.7	29.9	31.8	27.8	22.0	26.9
101, 105, 106	438116	554462	Urban Background	N/A	90.4	30.5	29.9	30.1	20.8	13.8
109	439648	558120	Roadside	N/A	82.4	18.0	18.3	17.5	13.2	20.4
111	438453	555507	Roadside	N/A	90.4	29.1	18.8	26.9	22.0	15.6
113	437446	554989	Urban Centre	N/A	80.8	29.2	29.1	29.0	20.0	25.5

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 2021 (%) [2]	2017	2018	2019	2020	2021
117	439495	556795	Roadside	N/A	90.4	28.6	28.3	28.6	24.5	22.8
118	439696	557205	Roadside	N/A	90.4	23.0	23.7	23.0	17.8	26.8
119	439792	556921	Roadside	N/A	82.7	27.0	23.0	23.6	17.4	19.6
120	439806	557063	Roadside	N/A	76.9	23.1	21.8	23.8	16.7	20.1
121	440702	554722	Roadside	N/A	65.4	31.3	30.5	32.5	21.2	16.7
123	437943	556341	Roadside	N/A	90.4	24.0	25.6	26.9	18.2	27.7
125	435417	547025	Roadside	N/A	65.1	29.9	22.3	26.1	22.8	20.3
128	439707	557312	Roadside	N/A	90.4	19.6	19.4	18.1	14.7	23.0
129	439938	557089	Roadside	N/A	84.6	23.3	25.0	22.1	17.6	14.9
130	439538	557292	Roadside	N/A	82.7	**40.0**	34.2	37.8	33.0	20.5
132	439661	557901	Roadside	N/A	72.8	27.1	28.2	25.1	18.7	34.7
133	438123	558344	Roadside	N/A	90.4	28.7	29.9	29.2	20.7	20.9
134	438563	558517	Roadside	N/A	90.4	19.1	19.6	21.4	15.6	23.9
135	437561	557538	Roadside	N/A	84.6	21.8	21.3	20.6	15.7	16.1

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 2021 (%) [2]	2017	2018	2019	2020	2021
136	428269	553809	Roadside	N/A	90.4		18.2	20.3	14.6	15.7
137	429935	556631	Roadside	N/A	90.4		37.9	36.9	25.4	15.6
138	429984	556576	Roadside	N/A	90.4		23.9	23.7	15.4	29.9
139	430899	556961	Roadside	N/A	90.4		21.7	22.3	15.0	18.2
140	430877	556851	Roadside	N/A	90.4				18.5	16.6
141	432542	549640	Roadside	N/A	75.0				20.4	18.6
142	437224	556714	Roadside		73.1					24.7

☒ **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 at Automatic Sites

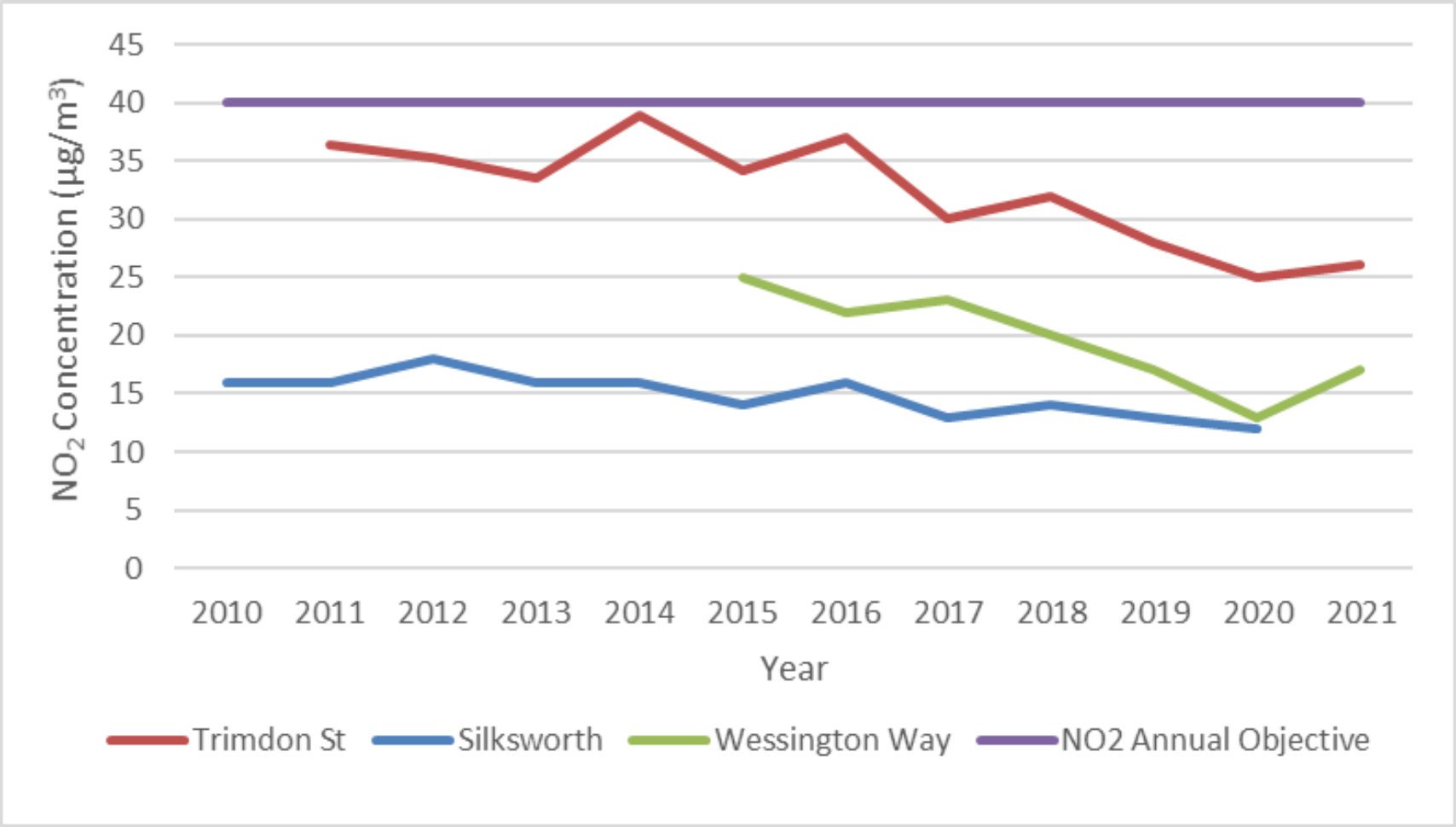


Figure A.2 – Trends in Annual Mean NO_2 Concentrations at Diffusion Tube Monitoring Sites 38 - 121

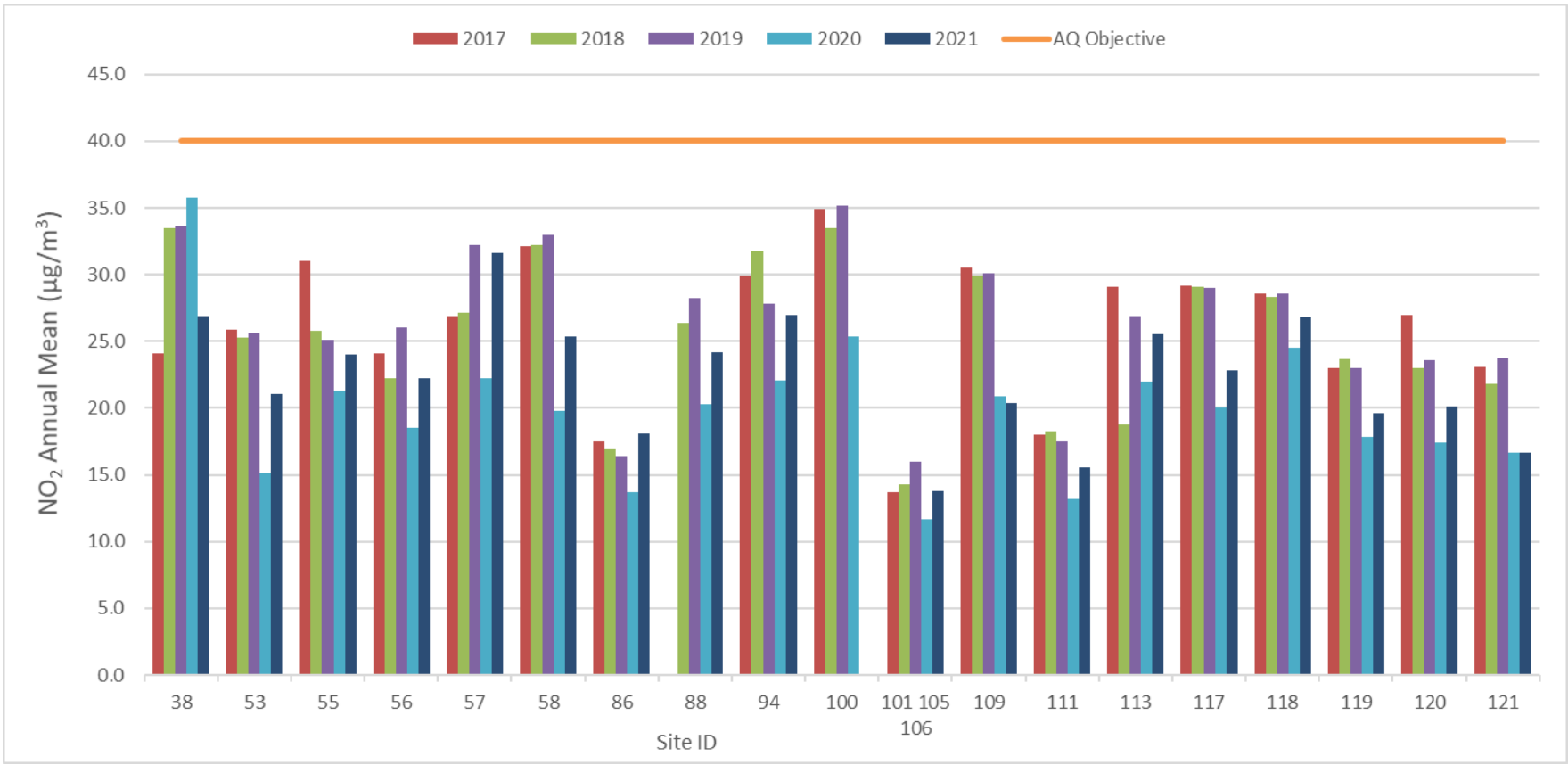


Figure A.3 – Trends in Annual Mean NO_2 Concentrations at Diffusion Tube Monitoring Sites 125-142

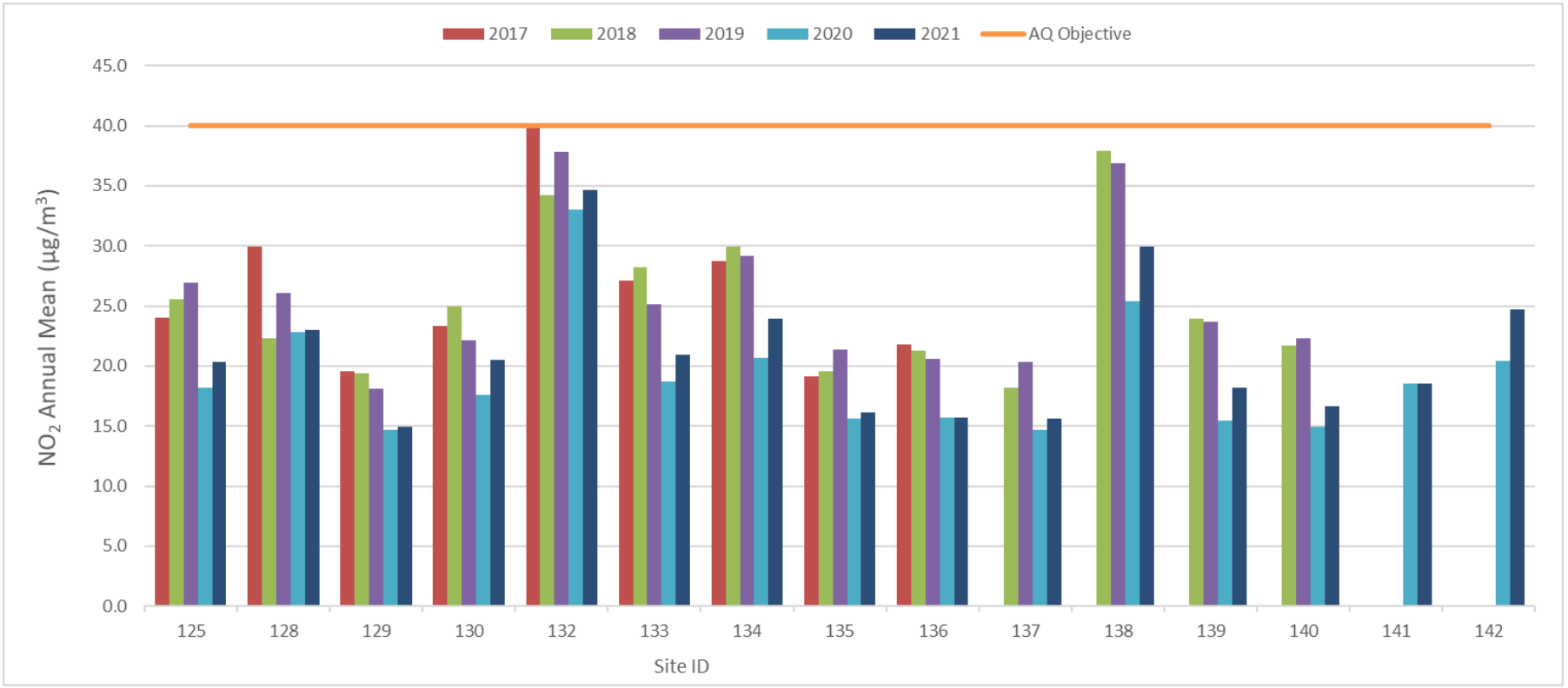


Table A.5 – 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM1	438928	557151	Kerbside		86.9	6	0	0	0	0
CM3	438020	558348	Roadside		98	0	0	0	0	0

Notes:

Results are presented as the number of 1-hour periods where concentrations greater than 200µg/m^3 have been recorded.

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold**.

If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

(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%).

Table A.6 – Annual Mean PM_{10} Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM1	438928	557151	Kerbside		85.4	16	19	19	18	20.1
CM2	438116	554462	Urban Background		99	12	15	15	11	11

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

The annual mean concentrations are presented as $\mu g/m^3$.

Exceedances of the PM_{10} annual mean objective of 40$\mu g/m^3$ are shown in **bold**.

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.

(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.4 – Trends in Annual Mean PM_{10} Concentrations

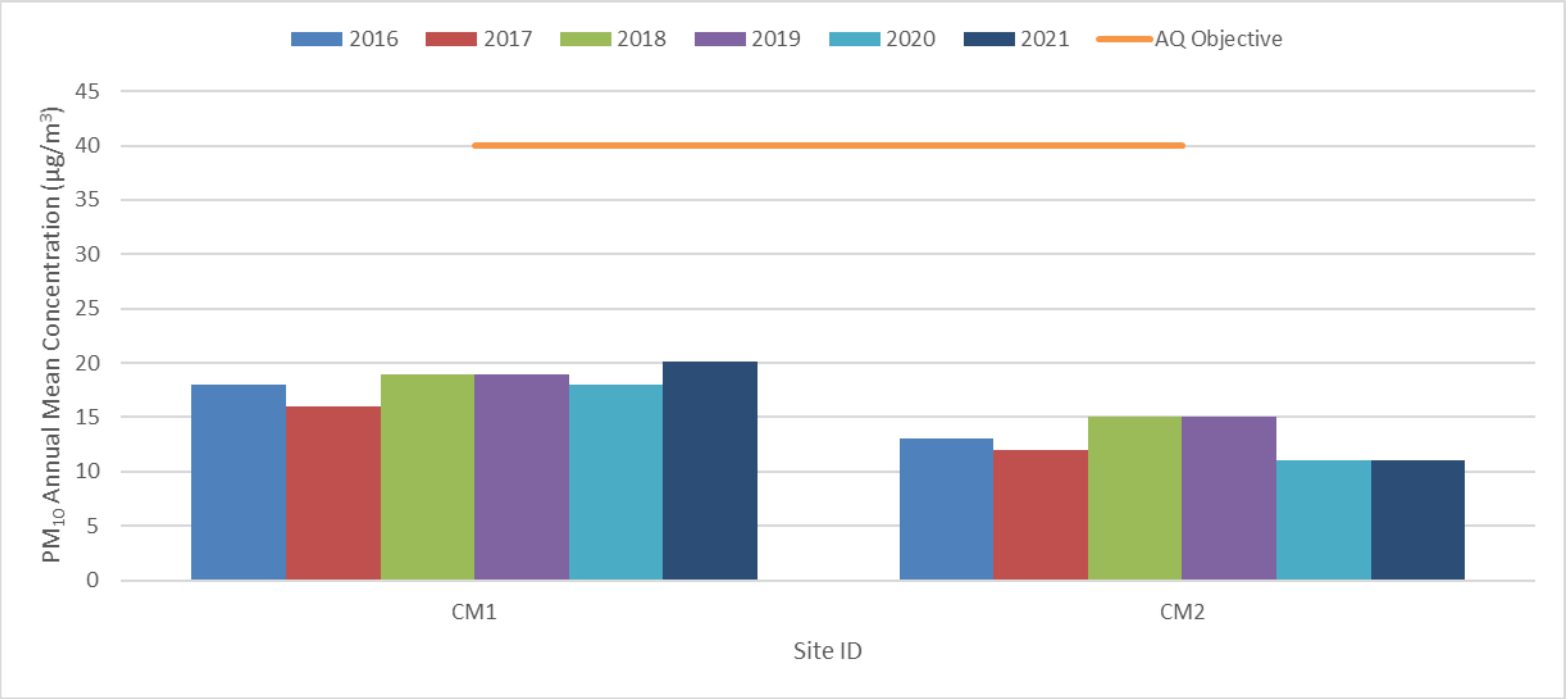


Table A.7 – 24-Hour Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hour Means > 50µg/m^3

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM1	438928	557151	Roadside		85.4	2	2	4	4	2
CM2	438116	554462	Urban Background		99	0	2	1	0	0

Notes:

Results are presented as the number of 24-hour periods where daily mean concentrations greater than 50µg/m^3 have been recorded.

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold**.

If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

(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%).

Table A.8 – Annual Mean $PM_{2.5}$ Monitoring Results ($\mu g/m^3$)

Site ID	X OS Grid Ref (Easting)	Y OS Grid Ref (Northing)	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2021 (%) (2)	2017	2018	2019	2020	2021
CM2	438116	554462	Urban Background		99	7	8	9	6	6

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

Notes:

The annual mean concentrations are presented as $\mu g/m^3$.

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.

(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.3 – Trends in Annual Mean $PM_{2.5}$ Concentrations

Appendix B: Full Monthly Diffusion Tube Results for 2021

Table B.1 – NO_2 2021 Diffusion Tube Results (µg/m^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 0.84	Annual Mean: Distance Corrected to Nearest Exposure	Comment
38	435714	552473		39.0	34.1	27.2	26.7	27.2	25.6	29.3	32.0	39.6	33.3	39.5	32.0	26.9	-	
53	438568	556566		27.7	28.5	28.9	23.6	22.4	8.4	23.4	29.8	23.7	31.9	31.4	25.1	21.1	-	
55	438690	556135		34.2	30.7	28.3	25.8	23.6	23.5	24.2	28.9	27.3	33.1	36.0	28.5	24.0	-	
56	439101	558292		34.3	27.0	28.6	31.4	18.6	22.3	20.7	28.0	26.8	28.0	27.5	26.4	22.2	-	
57	439664	557829		45.8	32.3	40.1	42.5	33.8	41.3	34.4	43.2		31.0	33.6	37.6	31.6	-	
58	432634	552616		38.0	29.8	27.6	24.5	23.5	21.9	28.2	29.0	31.8	27.8	50.4	30.2	25.4	-	
86	439466	556484		21.2	17.6	20.5	24.0					21.8	23.1	30.2	22.8	18.1	-	
88	439160	556995		33.1	25.9	29.9	33.0	24.0	27.7	26.1	33.0	26.3	29.5	30.1	28.8	24.2	-	
94	439374	556660		32.4	27.3	30.6	32.4	29.5	32.7	31.3	37.7	33.4		33.3	32.1	26.9	-	
101	438116	554462		17.8	13.3	16.6	13.6	11.4	13.5	14.0	18.8	19.6	20.1	20.8	-	-	-	Triplicate Site with 101, 105 and 106 - Annual data provided for 106 only
105	438116	554462		18.3	13.0	16.7	14.2	11.4	13.9	14.1	18.2	18.1	19.7	22.0	-	-	-	Triplicate Site with 101, 105 and 106 - Annual data provided for 106 only
106	438116	554462		17.0	12.8	19.7	14.3	10.7	14.3	14.0	16.9	18.9	20.6	21.8	16.4	13.8	-	Triplicate Site with 101, 105 and 106 - Annual data provided for 106 only
109	439648	558120		27.0		25.6	24.2	19.3	23.9	19.2	21.8	24.1	28.3	28.9	24.3	20.4	-	
111	438453	555507		19.2	18.7	21.3	18.5	15.2	17.6	15.8	18.3	17.3	20.3	21.3	18.5	15.6	-	
113	437446	554989		31.5	27.7	27.4	28.9	22.8	24.2	23.3	27.9		58.3	33.8	30.4	25.5	-	
117	439495	556795		24.5	22.8	24.0	22.5	21.0	22.7	28.1	34.3	32.9	29.5	34.9	27.1	22.8	-	
118	439696	557205		36.7	34.2	25.9	29.2	28.7	27.8	29.7	33.6	35.8	37.2	33.9	31.9	26.8	-	
119	439792	556921		29.4	23.9	20.8	18.9	18.3	20.2	20.7	25.8	24.7		31.6	23.3	19.6	-	

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 0.84	Annual Mean: Distance Corrected to Nearest Exposure	Comment
120	439806	557063			24.6	23.0	21.0	19.7	21.2	23.0	25.7	26.2		30.2	24.0	20.1	-	
121	440702	554722		28.6		19.6	19.7	14.0	18.3		20.6	19.6	20.1		19.7	16.7	-	
123	437943	556341		39.1	30.1	33.1	35.1	28.0	34.0	27.2	36.5	31.6	31.2	37.0	32.9	27.7	-	
125	435417	547025		29.0	23.6	28.0	26.0	21.2				25.3	19.4	24.9	24.6	20.3	-	
128	439707	557312		21.5	32.1	23.4	20.0	27.6	22.1	22.4	29.3	31.8	39.2	30.5	27.4	23.0	-	
129	439938	557089			18.1	15.3	13.9	12.2	15.5	14.9	19.5	19.3	22.9	25.3	17.8	14.9	-	
130	439538	557292		31.4	21.5	21.7	24.7	14.7	20.7	20.3	26.6	29.9		33.2	24.4	20.5	-	
132	439661	557901		38.0	47.2	34.0	41.9	30.0		39.0	48.3	46.2		45.1	41.3	34.7	-	
133	438123	558344		31.0	22.3	27.2	25.5	20.3	24.1	26.2	25.8	21.4	24.2	27.4	24.9	20.9	-	
134	438563	558517		35.6	23.2	21.8	24.0	24.0	30.7	23.9	35.9	29.3	31.6	34.8	28.5	23.9	-	
135	437561	557538			17.6	22.6	22.5	14.2	17.9	14.9	19.8	18.0	20.7	22.8	19.2	16.1	-	
136	428269	553809		22.9	20.9	19.1	14.8	15.3	14.2	19.1	17.4	21.8	20.2	21.4	18.7	15.7	-	
137	429935	556631		29.0	15.8	17.5	18.4	12.5	15.5	20.4	19.9	19.8	14.4	23.9	18.6	15.6	-	
138	429984	556576		42.5	34.3	37.4	37.7	32.0	37.0	40.2	37.9	32.4	27.9	34.5	35.6	29.9	-	
139	430899	556961		24.6	22.3	19.8	16.9	15.4	16.8	21.5	23.5	26.6	22.5	28.4	21.7	18.2	-	
140	430877	556851		32.9	20.6	22.9	17.9	15.7	18.8	14.2	17.5	19.2	17.7	22.5	19.8	16.6	-	
141	432542	549640		26.0	21.2	22.2	21.8	18.7	19.4	23.5		21.8		25.5	22.1	18.6	-	
142	437224	556714		37.6	24.7	27.0	31.6	24.9	27.4	22.5	34.9			35.9	29.4	24.7	-	

☒ **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.**

☒ **Sunderland 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 Sunderland During 2021.

Sunderland City Council continues to assess new sources of pollution and during 2021 there were several new developments that were granted planning permission that had the potential to have an impact on air quality and have been subject to appropriate assessments.

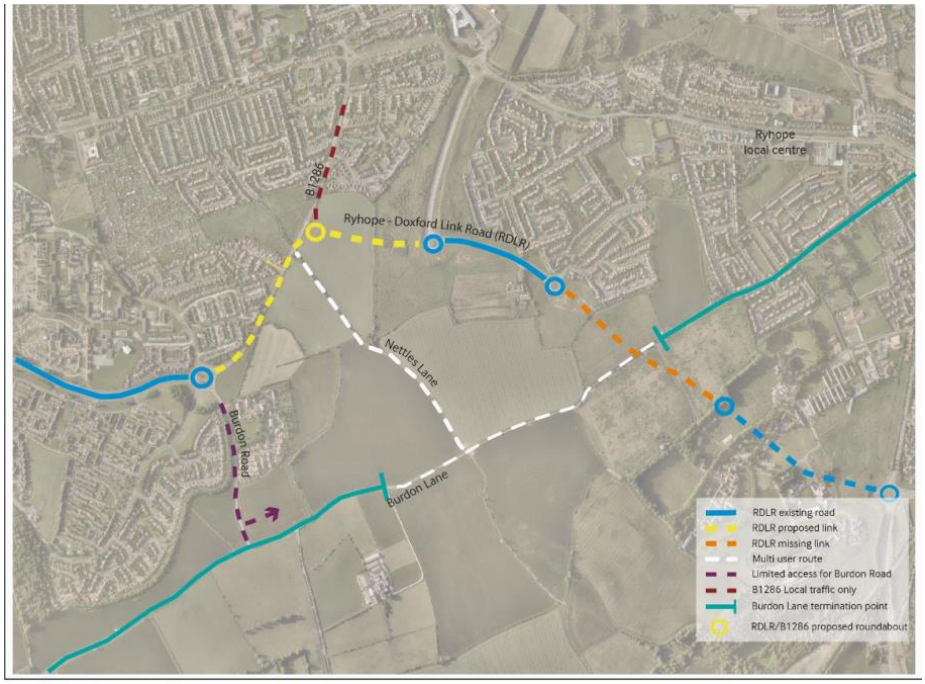
The South Sunderland Growth Area (SSGA) was identified as a major new growth area for housing development within the City and a Location for Major Development (LMD). The proposed SSGA has the potential to provide approximately 3000 new homes, meeting 20% of the City's future housing need. Applications for housing have been received in phases accompanied by suitable air quality assessments.

The development area has also been subject to an application for a new Link Road. The Ryhope to Doxford Link Road (RDLR) was granted permission in 2021 and is currently under construction. The air quality assessment of operational impacts predicted that the concentrations of NO_x, PM_{10} and $PM_{2.5}$ at existing sensitive receptors will not be significant and modelled concentrations will be well below the air quality threshold for all pollutants considered. However, the construction phase may have the potential to produce particulates and hence the construction company were required to submit a Construction Environmental Management Plan which incorporated Dust Mitigation.

There have been no new industrial processes that have required an Environmental Permit.

Sunderland has not completed any additional works within the reporting year of 2021.

RDLR: Proposed and existing local road network.



QA/QC of Diffusion Tube Monitoring

Sunderland City Council diffusion tubes are supplied and analysed by Gradko International Ltd, Winchester, Hampshire. The preparation method used is 20% TEA/ Water. Gradko are a UKAS accredited laboratory, and they also participate in several national quality schemes such as Air PT, LEAP and field intercomparison

Exposure of the diffusion tubes in line with the National Calendar was attempted wherever possible but unfortunately, in January 2021, staff shortages linked to COVID delayed deployment by 2 weeks. Therefore, the decision was made to remove this month's data from the set.

Diffusion Tube Annualisation

3 non-automatic sites required annualisation. Annualisation is required for any site with data capture less than 75% but greater than 25%. The Diffusion Tube Processing Tool was used to calculate the factor and the annualisation summary is provided as Table C.2.

Diffusion Tube Bias Adjustment Factors

The diffusion tube data presented within the 2022 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.

Sunderland have applied a national bias adjustment factor of 0.84 to the 2021 monitoring data. A summary of bias adjustment factors used by Sunderland over the past five years is presented in Table C.1.

The bias adjustment factor of 0.84 was obtained from the National Diffusion Tube Bias Adjustment Factor Spread sheet version v 03/22. This bias adjustment factor was chosen as being representative of a wide range of studies which had a full data set. Sunderland City Council have co located tubes in triplicate at CM2 which is an Urban Background site. However, in 2021 the data capture of the continuous analyser at this site was only 15% and was unable to be used to calculate the bias adjustment. In addition, advice from TG 16 states that triplicate tubes should represent the majority of tube locations in the study. Most of the tube sites in Sunderland are roadside so using a bias adjustment factor from an urban background site may not have been appropriate. In previous years tubes were also co located at CM1 which is a Kerbside site. The enclosure for the site has been replaced and the co locating of tubes near to the inlet was not possible. Therefore, the decision was made to use the National Diffusion Tube Bias Factor. An opportunity to co locate tubes at CM3 is being investigated.

Table C.1 – Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	Adjustment Factor
2021	National	03/21	0.84
2020	National	03/20	0.81
2019	National	03/19	0.93
2018	National	03/18	0.93
2017	National	03/17	0.89

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 Sunderland required distance correction during 2021.

QA/QC of Automatic Monitoring

The QA/QC procedures of Sunderland are based on the AURN Site Operator's manual along with training received from our original equipment suppliers, Casella Measurement. Refresher training is provided by the AURN when required for the sites that Sunderland act as LSO or at our affiliate site.

The fundamental aims of a quality assurance/ control programme are:

- The data obtained from measurement systems should be representative of ambient concentrations existing in each area.
- Measurements must be accurate, precise and traceable.
- Data must be comparable and reproducible.
- Results must be consistent over time.

An appropriate level of data capture is required throughout the year.

Equipment Maintenance

- Automatic analysers are serviced every 6 months by a qualified engineer under a contract with Matts Monitors
- Local Authority staff visits the air quality sites at least once every 2 or 4 weeks during which a check of the equipment is made to ensure it is all working within normal parameters. Filters are also changed during this visit.
- If a problem occurs, then a call-out is instigated to the service centre and an engineer will normally visit site within 48-hours to correct the fault.

Calibration

- At each site visit staff will perform a calibration response check using a certified gas cylinder. Results are passed to our data management partner to adjust data if necessary.
- At the 6-month service the instruments are re-calibrated to the site cylinder certificated value.
- Gas cylinder pressures are regularly checked at routine visits to ensure they are replaced before they run out completely.
- When a cylinder is replaced, the new certified values are recorded and forwarded to the data management team.

Data Validation

During 2021 the contract for data capture has been performed by WeCare4Air, who now host Sunderland's data at Air Quality Service and Data throughout the UK - We Care 4 Air. We Care 4 Air have continued the excellent work of AQDM and follow the same methods as outlined below.

Review data daily to ensure that

- Telecommunications to the station are operational
- The air quality station is operational
- Individual analysers are operational
- Air quality exceedances are identified
- Operational information such as TEOM filter loading, does not invalidate data
- Obvious data errors are identified

Data Ratification

In addition to the initial data screening process (validation), data are further scrutinised in monthly blocks in order to provide a final ratified data set.

The software that collects the data is used to rescale the data using the factor calculated from the monthly/ fortnightly calibration check. Data is then reviewed for erroneous data such as:

- Daily calibration spikes
- Routine or service visit errors
- Analyser faults
- Site faults, such as power outages

When data is satisfactory, it is compared to other local sites. This provides a check to ensure data is realistic.

PM_{10} and $PM_{2.5}$ Monitoring Adjustment

The data from CM1 (Trimdon Street) was collected using a TEOM and PM_{10} monitoring data collected was previously corrected using the Volatile Correction Model (VCM). This calculation is carried out by the data management company prior to it being completed into the final ratified data set. The removal of a nearby FDMS analyser has meant that there is no longer an analyser in range and the correction model cannot be used. After seeking advice from the LAQM helpdesk, the data was corrected using a factor of 1.3 but it cannot be relied heavily upon to make conclusions.

Sunderland are currently gathering information to replace the TEOM with a MCERTS approved method and hopefully this should be in place by the beginning of 2023.

The type of PM_{10}/$PM_{2.5}$ monitor(s) utilised within CM2 in Sunderland do not require the application of a correction factor.

Automatic Monitoring Annualisation

All automatic monitoring locations within Sunderland recorded data capture of greater than 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.

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 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 automatic NO_2 monitoring locations within Sunderland required distance correction during 2021.

Table C.2 – Annualisation Summary (concentrations presented in µg/m^3)

Site ID	Annualisation Factor Newcastle Cradlewell	Annualisation Factor Sunderland Wessington Way	Annualisation Factor Newcastle Centre	Annualisation Factor Site 4 Name	Average Annualisation Factor	Raw Data Annual Mean	Annualised Annual Mean	Comments
86	0.9476	0.9272	0.9604		0.9451	22.8	21.5	
121	0.9946	1.0125	1.0075		1.0048	19.7	19.8	
125	0.9796	0.9711	0.9926		0.9811	24.6	24.2	

Appendix D: Map(s) of Monitoring Locations

Figure D.1 – Map of CM 1 and Diffusion Tube 88 Sites

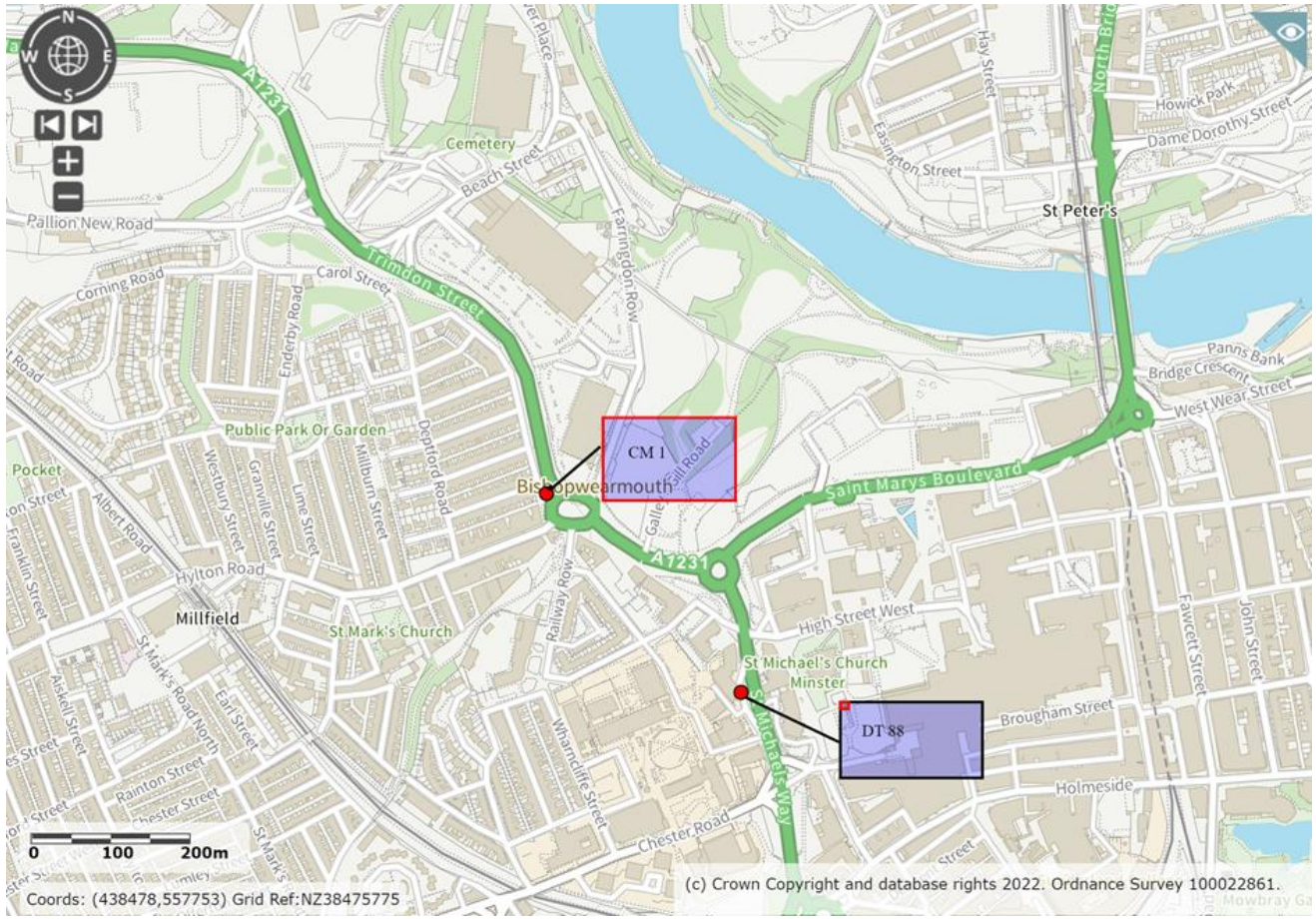


Figure D.2 – Map of CM 2 and Diffusion Tubes 101, 105 & 106

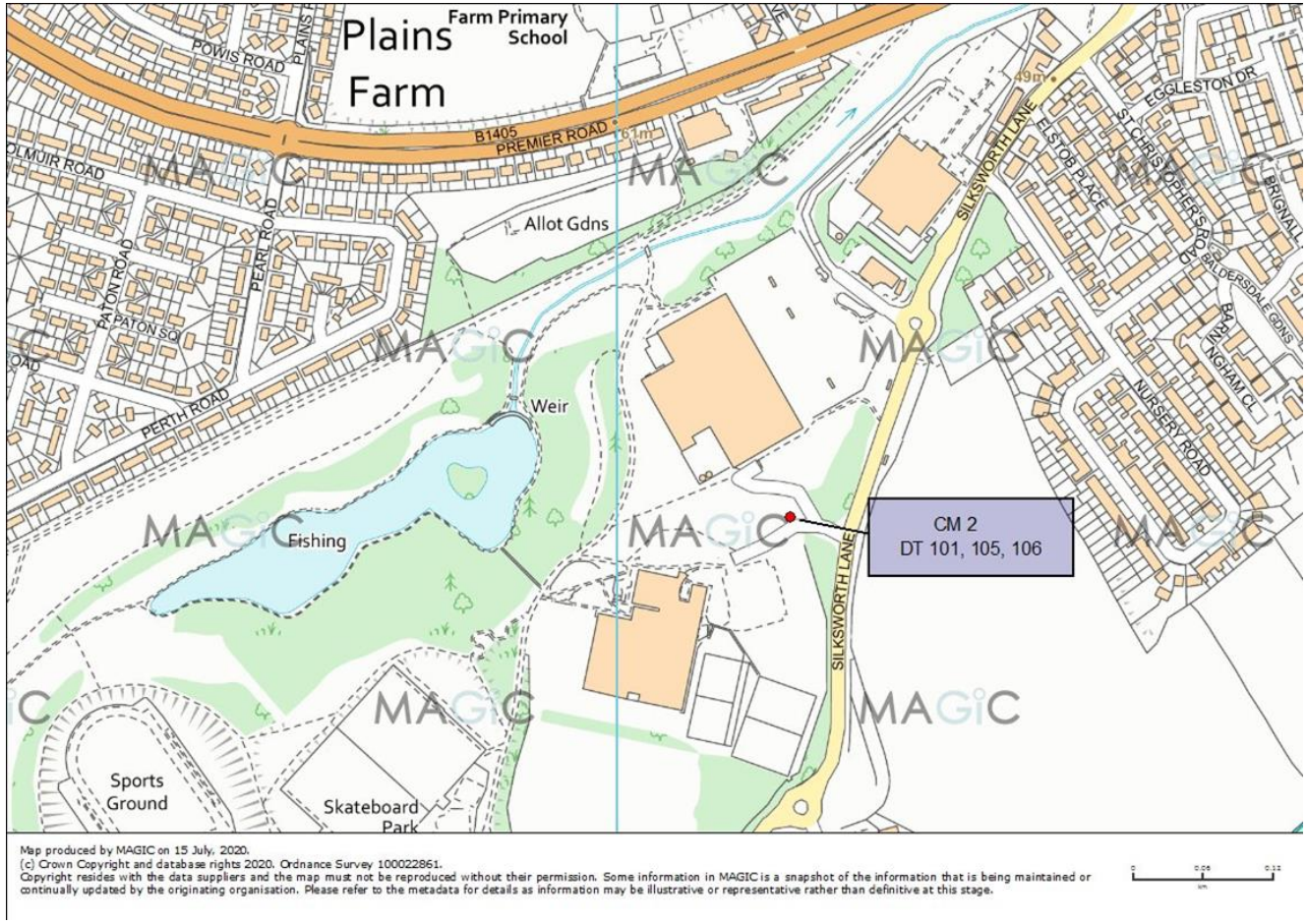


Figure D.3 – Map of CM 3 and Diffusion Tubes 133 & 134

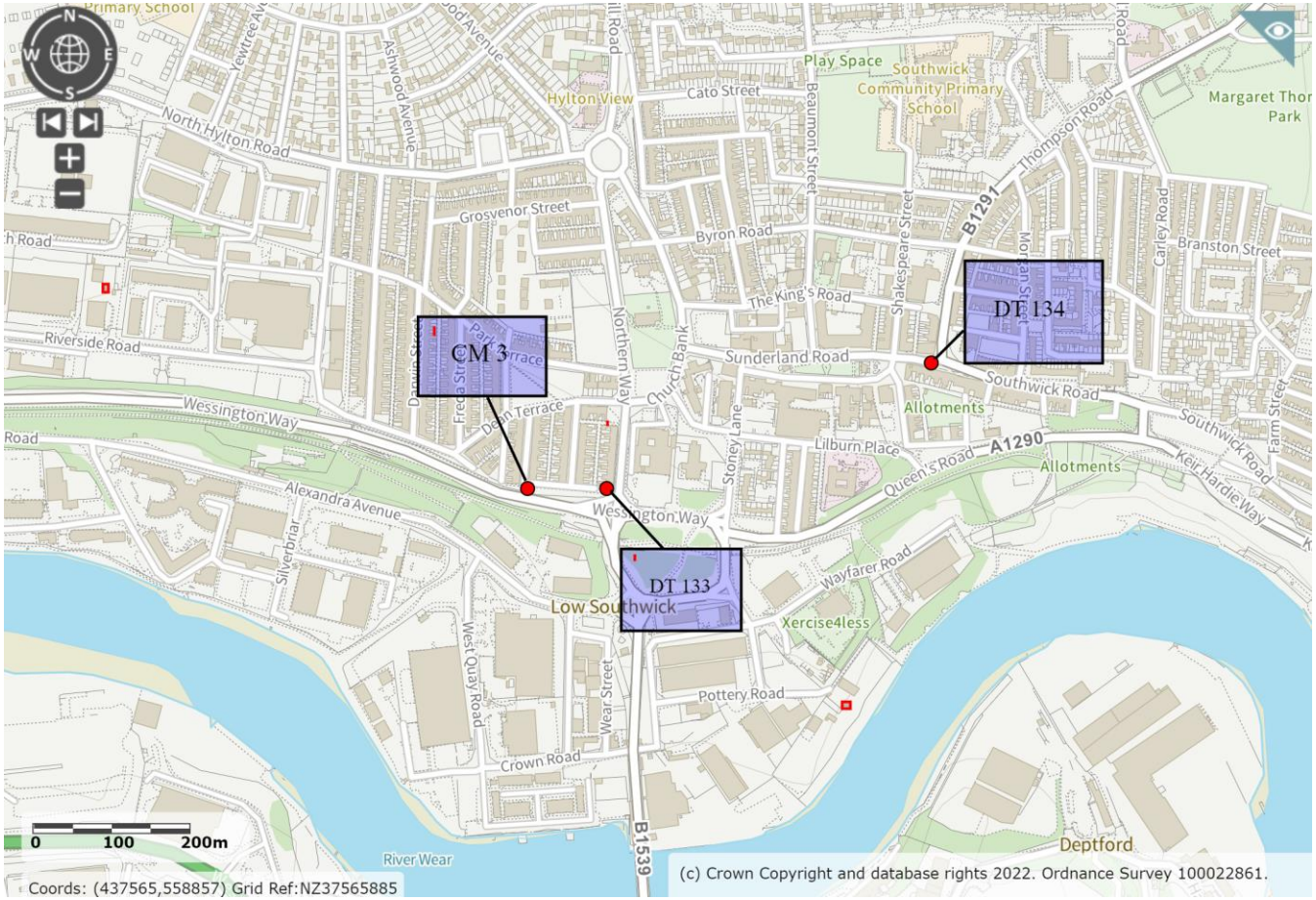


Figure D.4 – Map Diffusion Tube 135

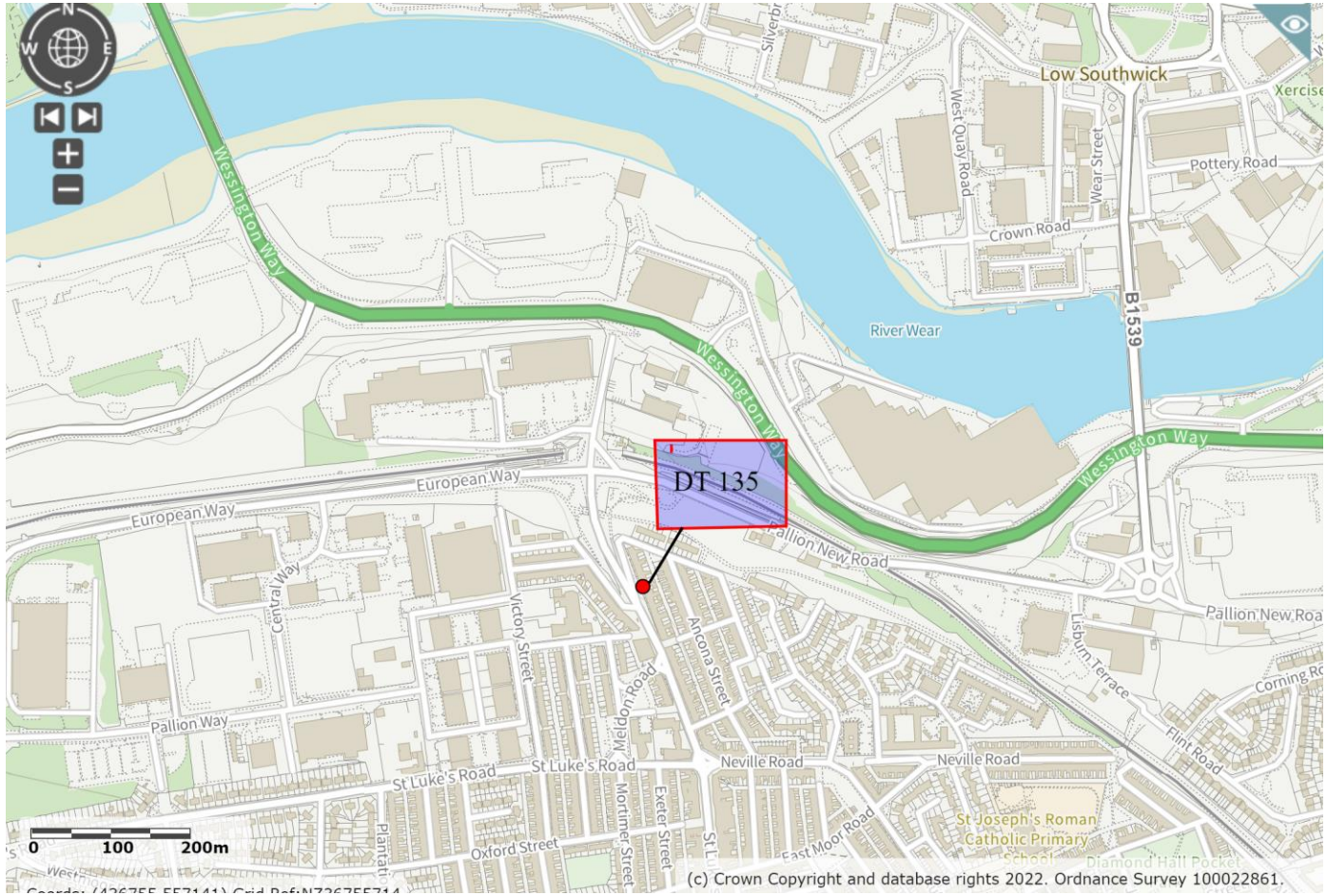


Figure D.5 – Map of Diffusion Tubes 53

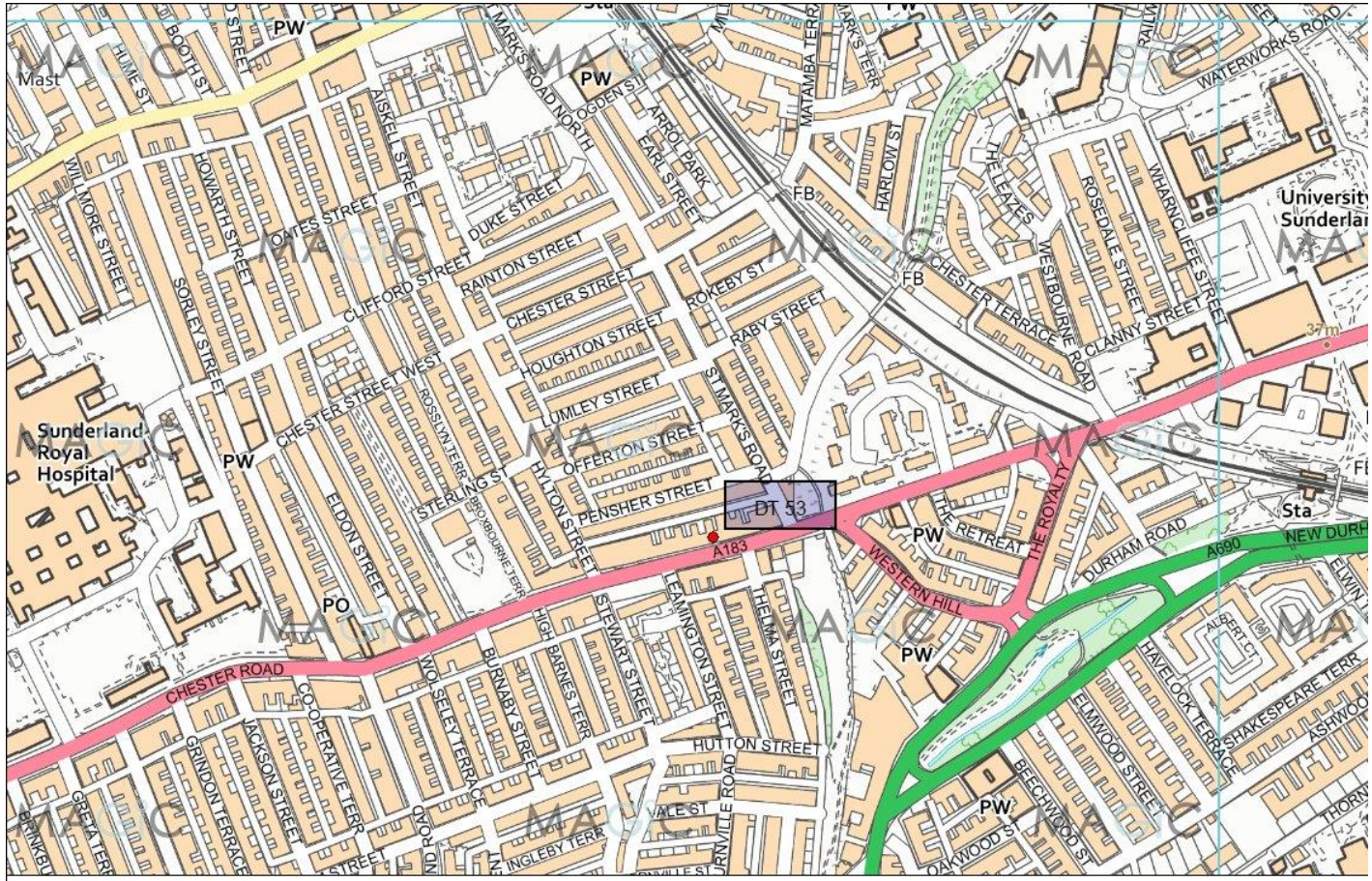


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Figure D.6 – Map of Diffusion Tube 55

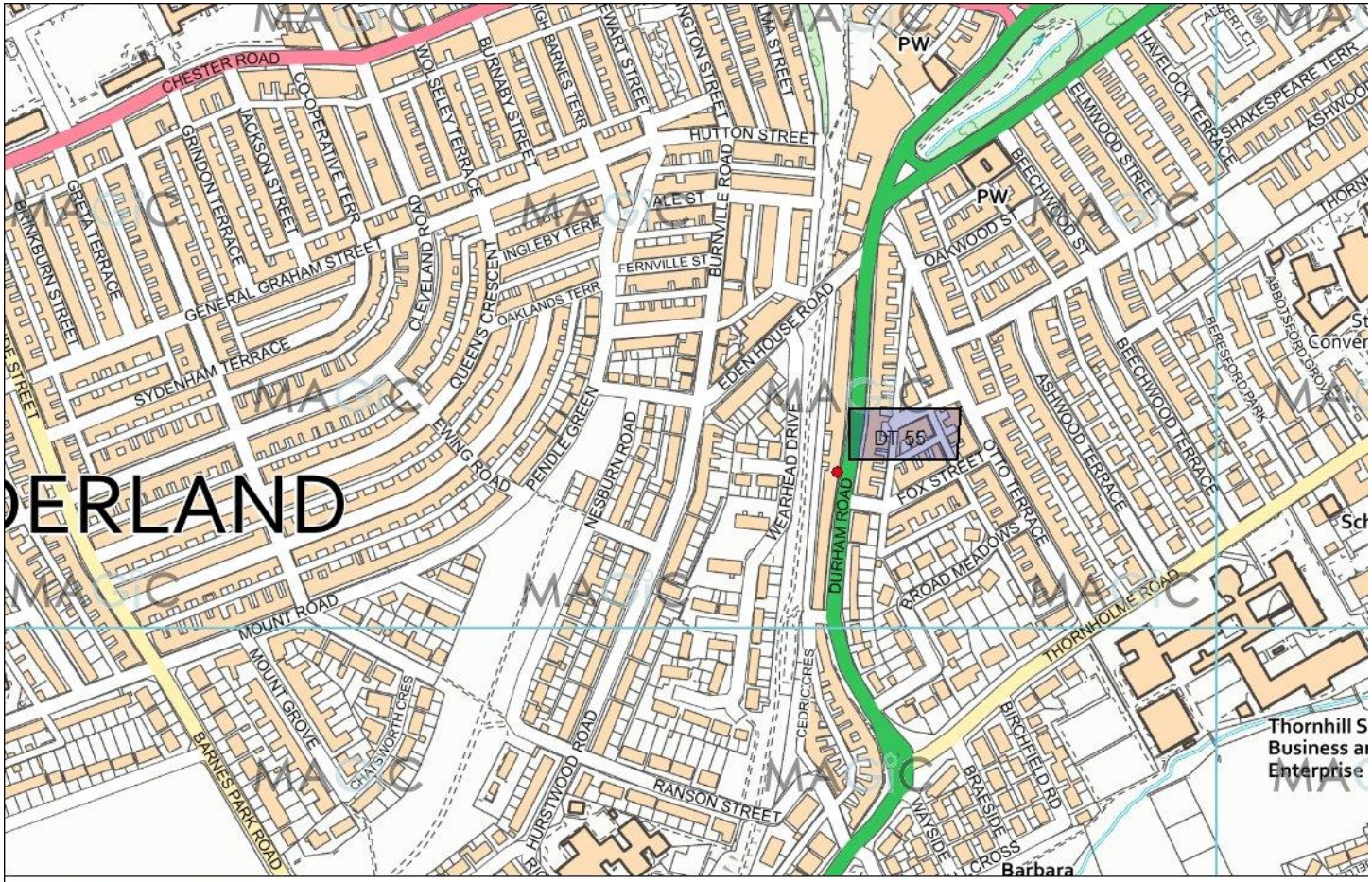

Figure D.7 – Map of Diffusion Tubes, 56, 57, 109 & 132.

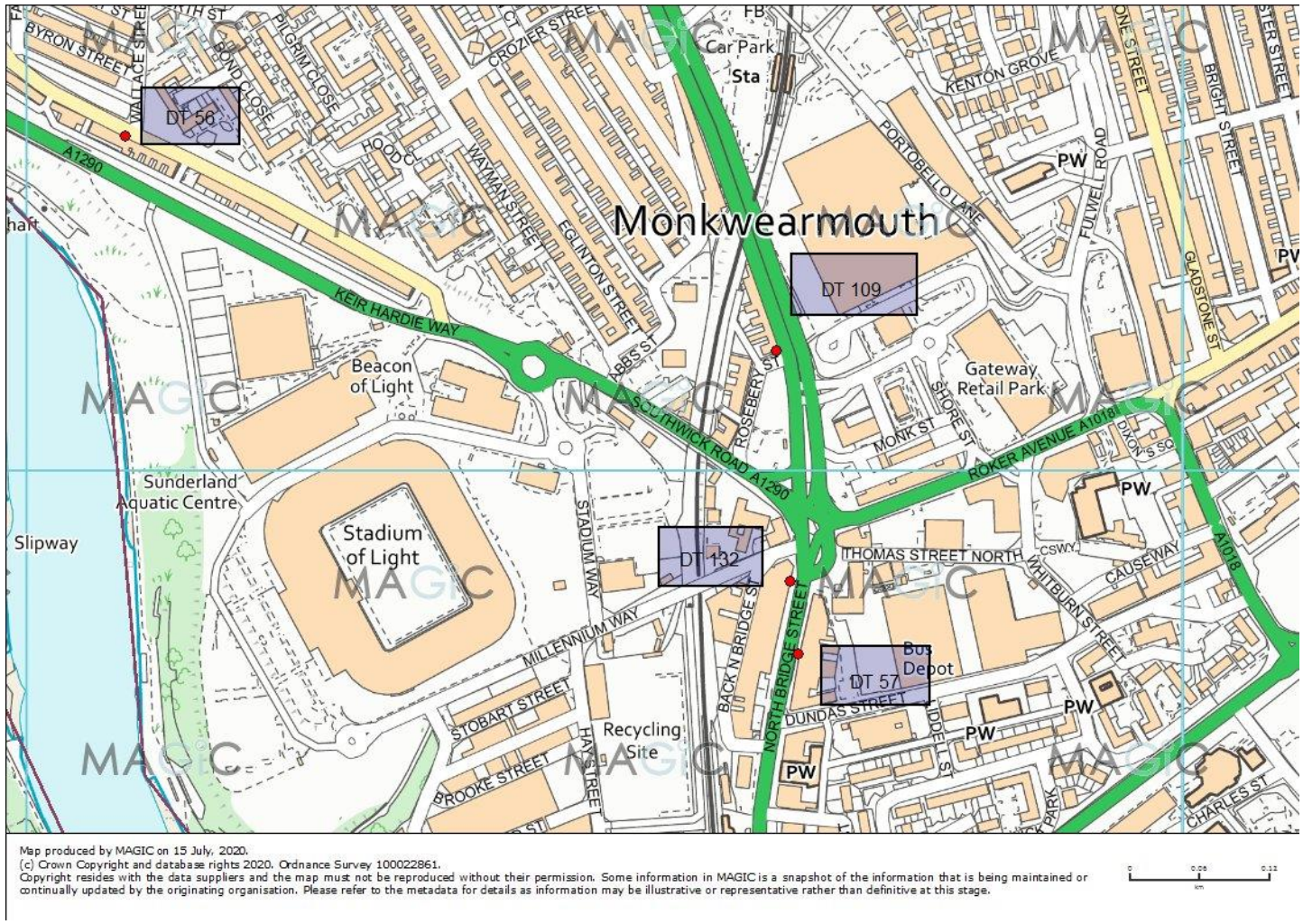

Figure D.8 – Map of Diffusion Tube 58

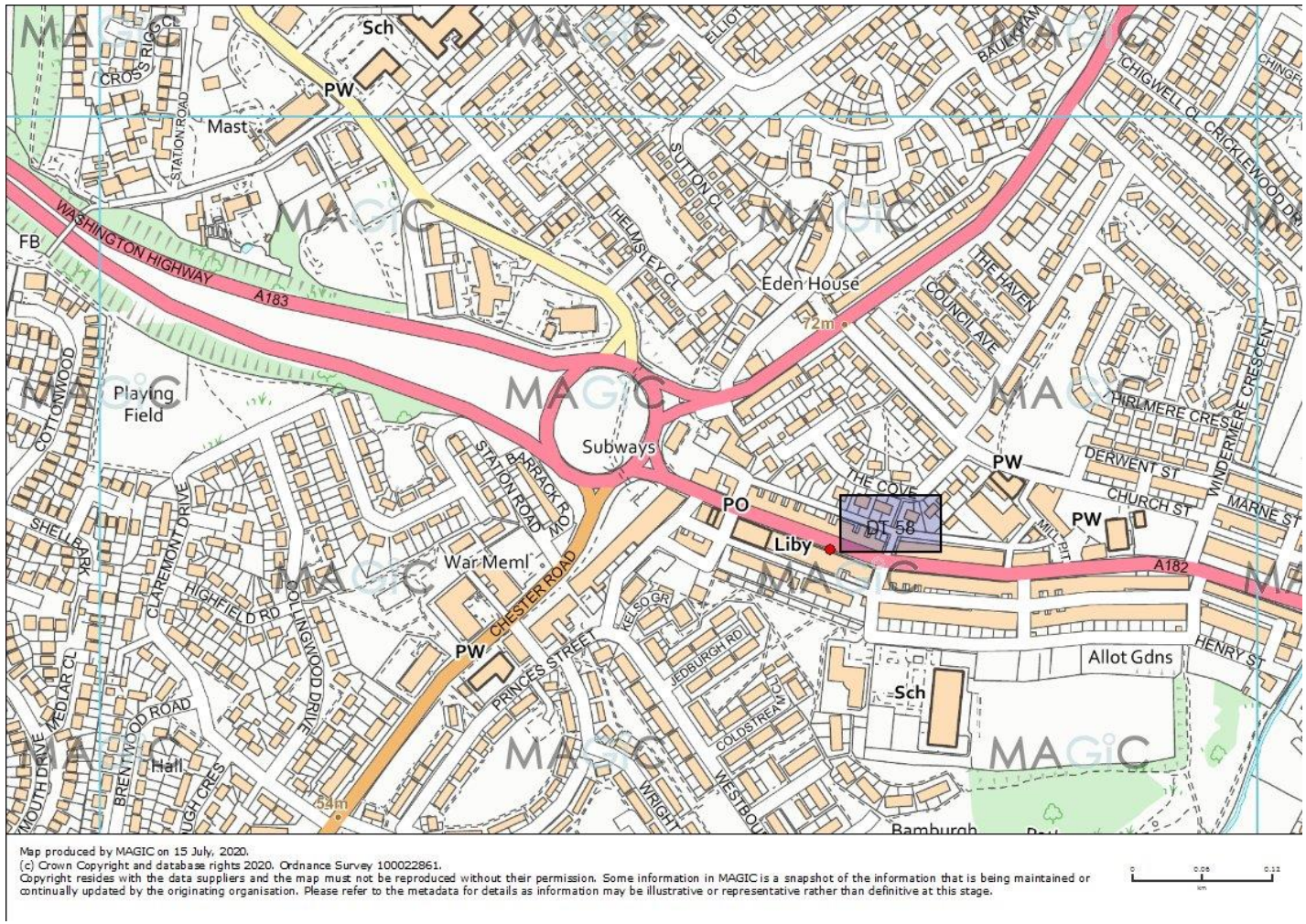

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Figure D.9 – Map of Diffusion Tubes 86, 88, 94 & 117

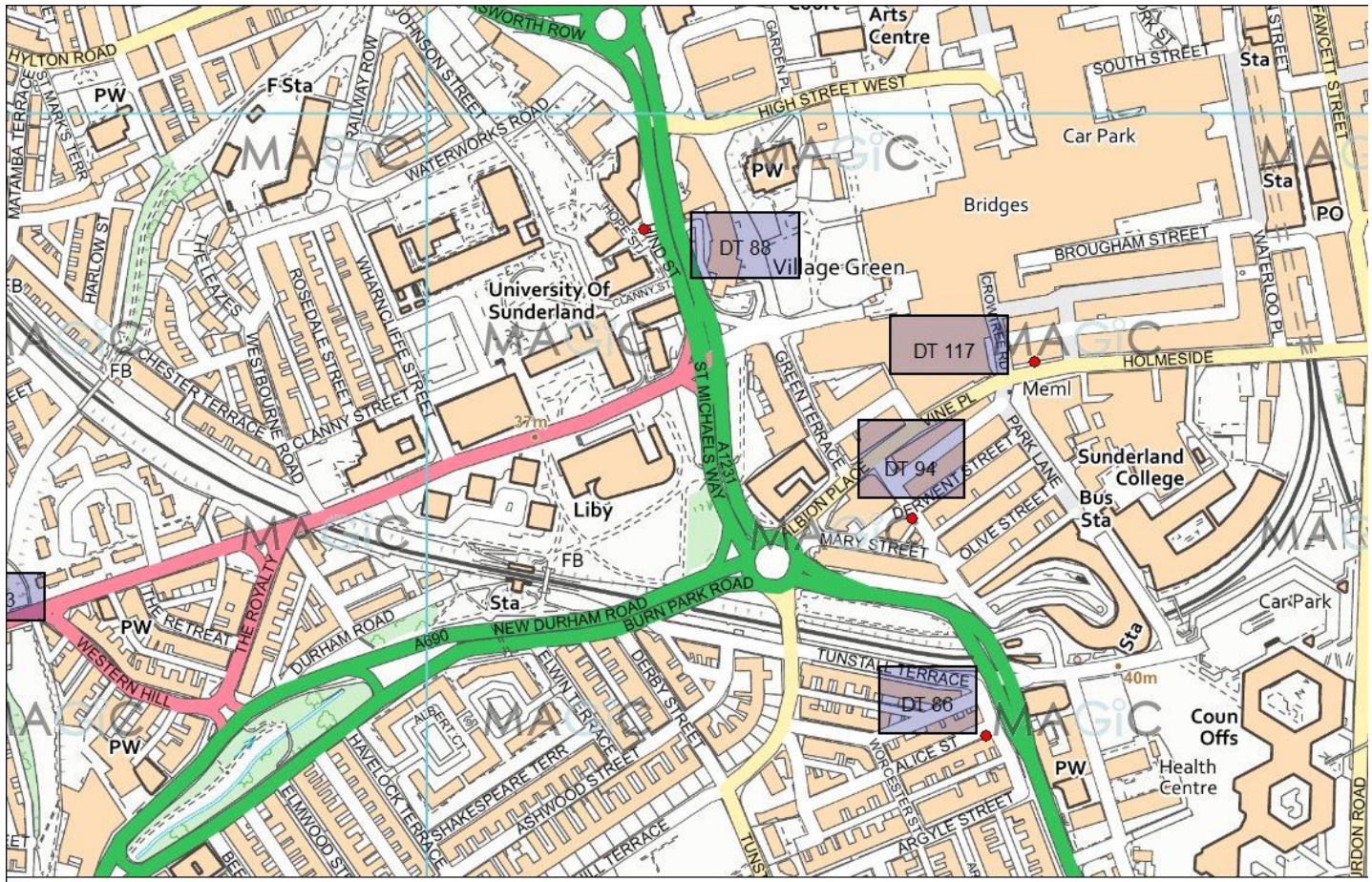

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Figure D.10 – Map of Diffusion Tube 111

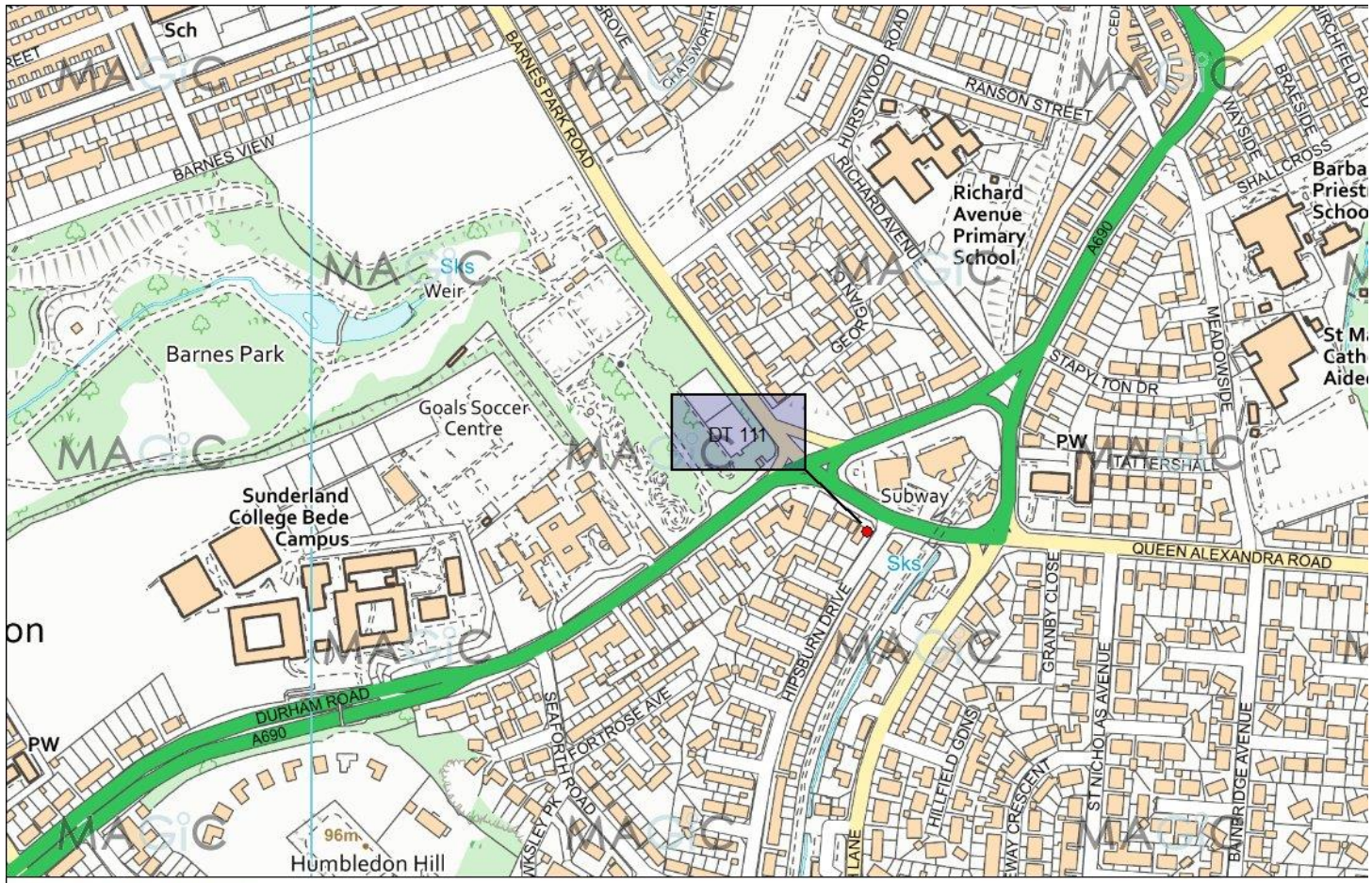

Figure D.11 – Map of Diffusion Tube 113.

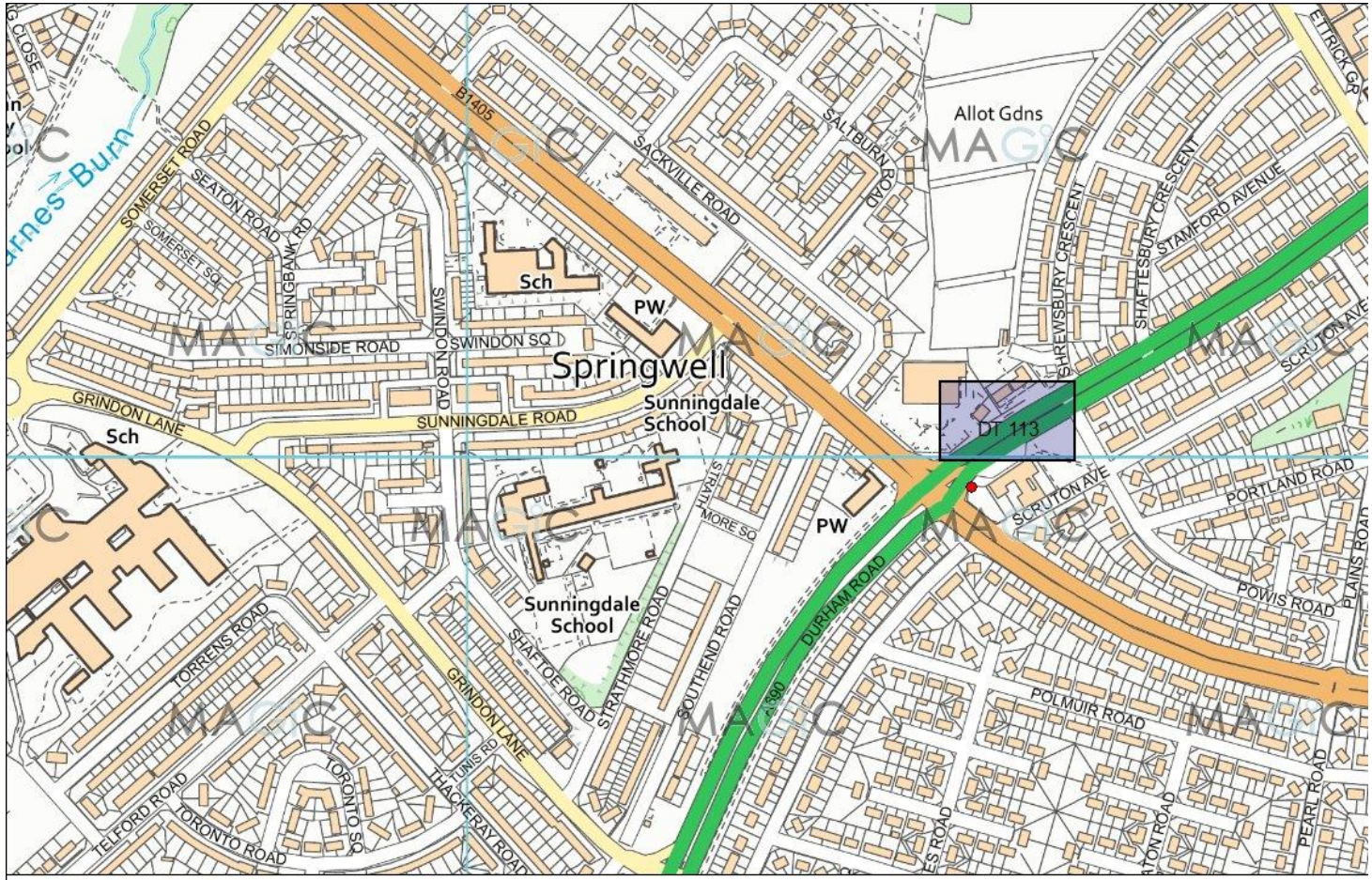

Figure D.12 – Map of Diffusion Tubes 118, 128 & 130

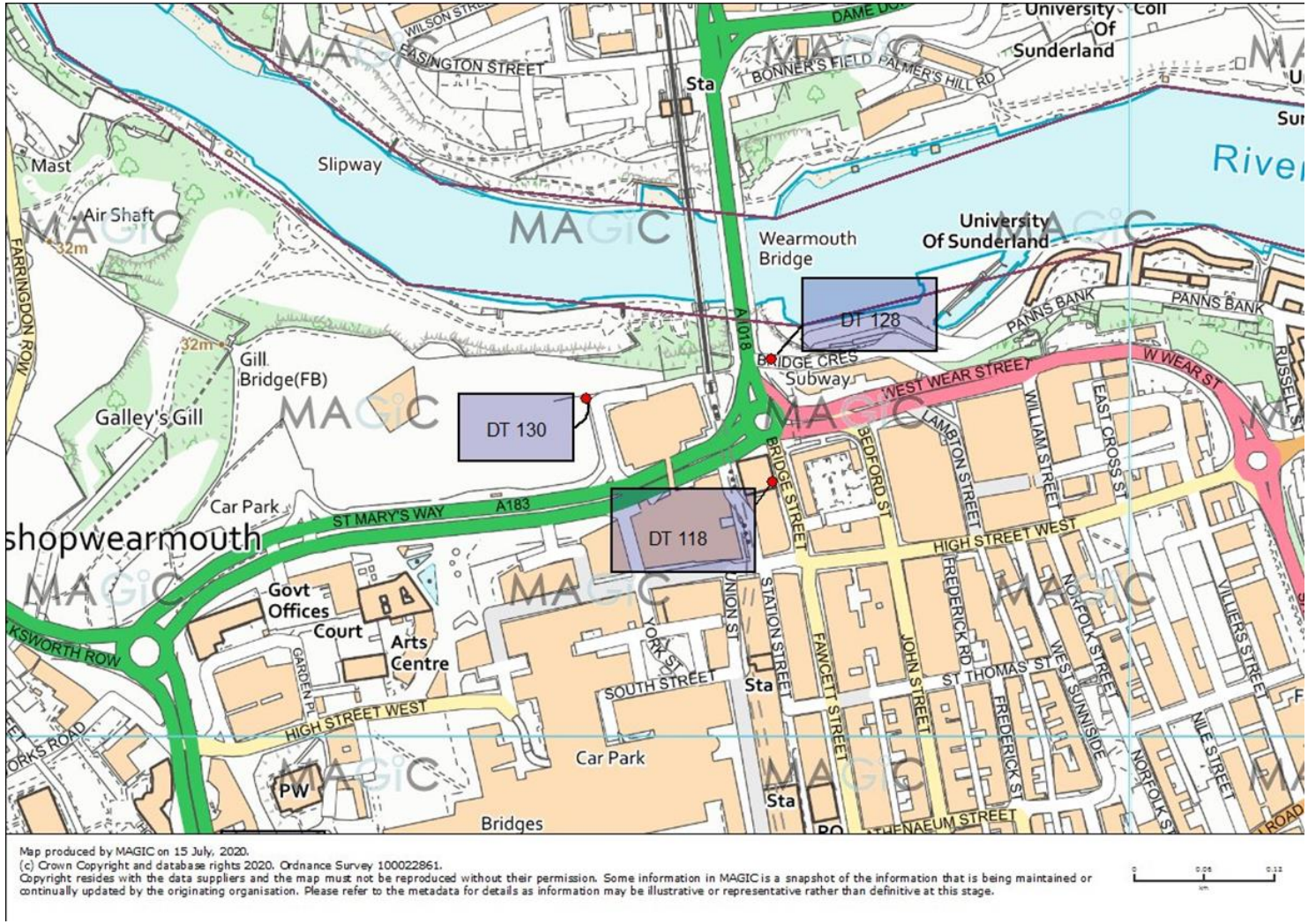

Figure D.13 – Map of Diffusion Tube 121

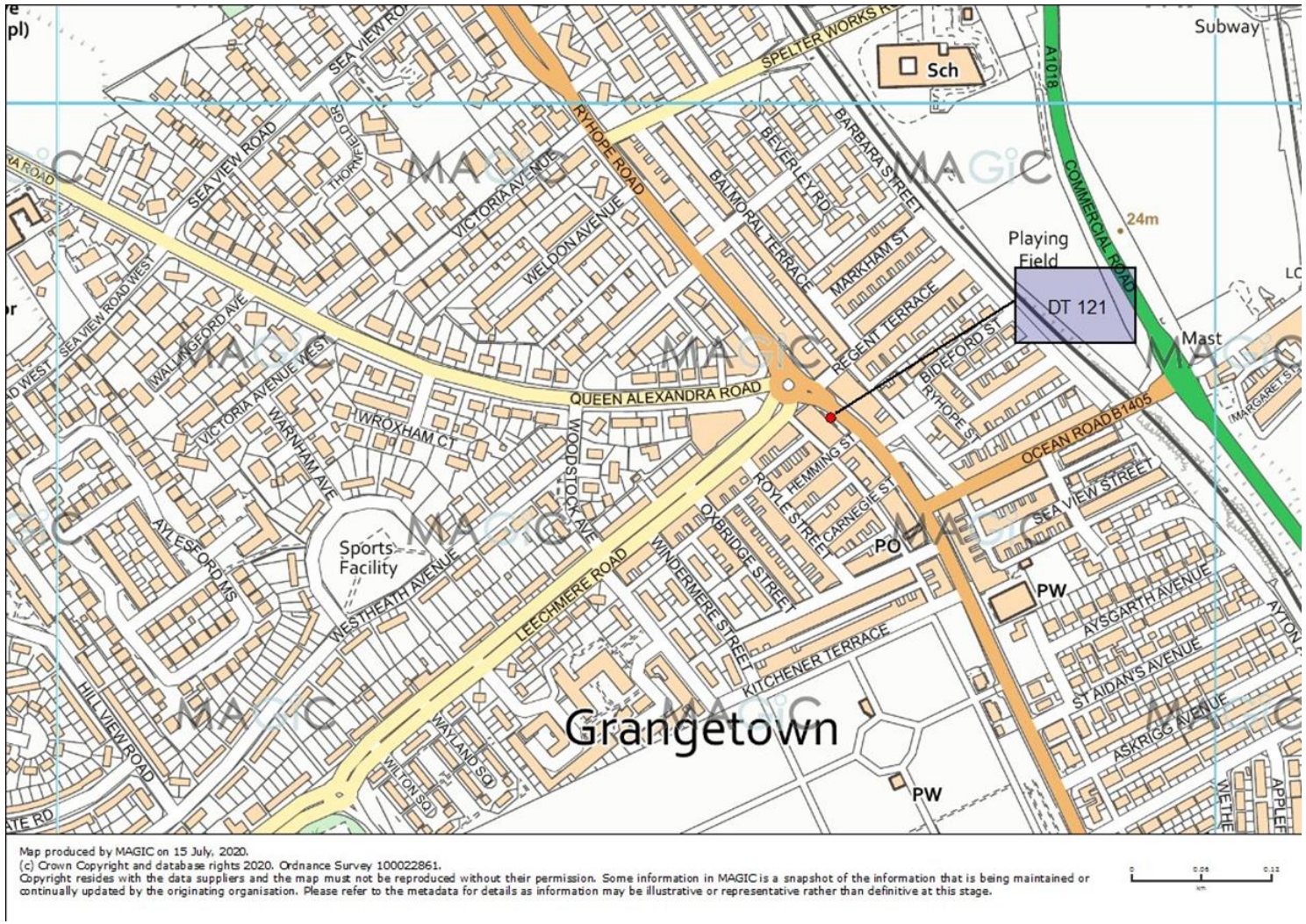

Figure D.14 – Map of Diffusion Tube 123 and 142.

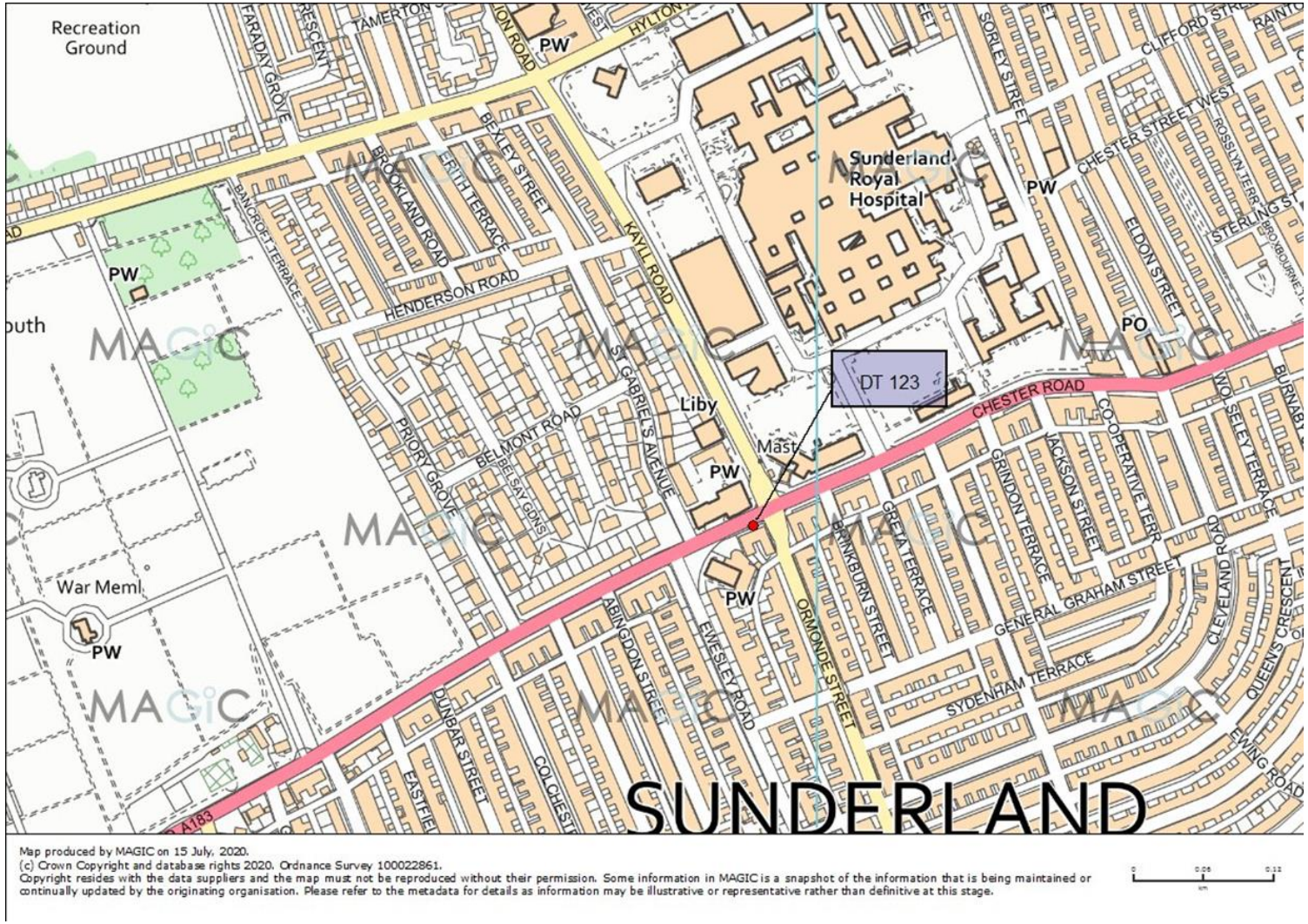

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Figure D.15 – Map of Diffusion Tube 125

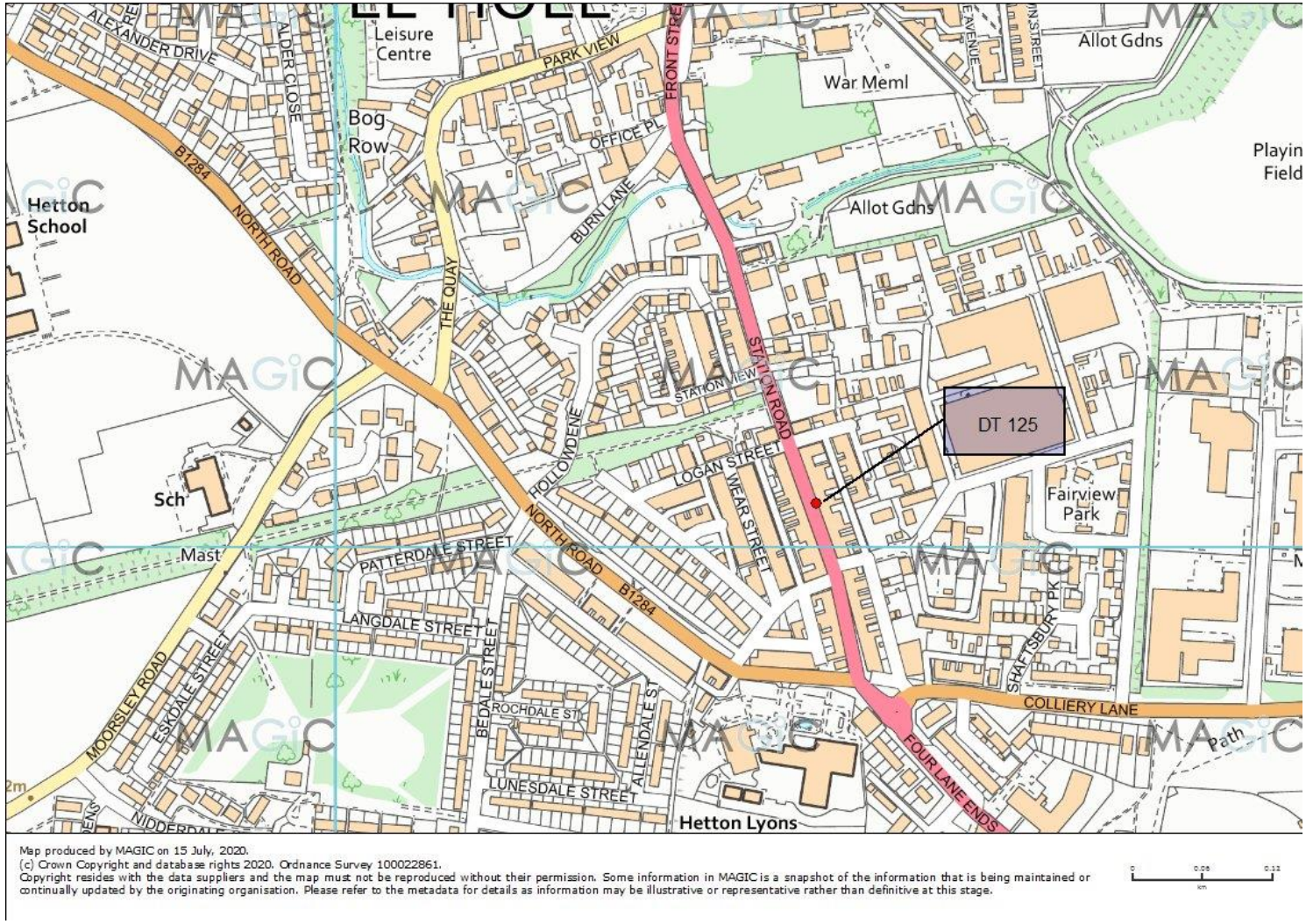

Figure D.16 – Map of Diffusion Tubes 136

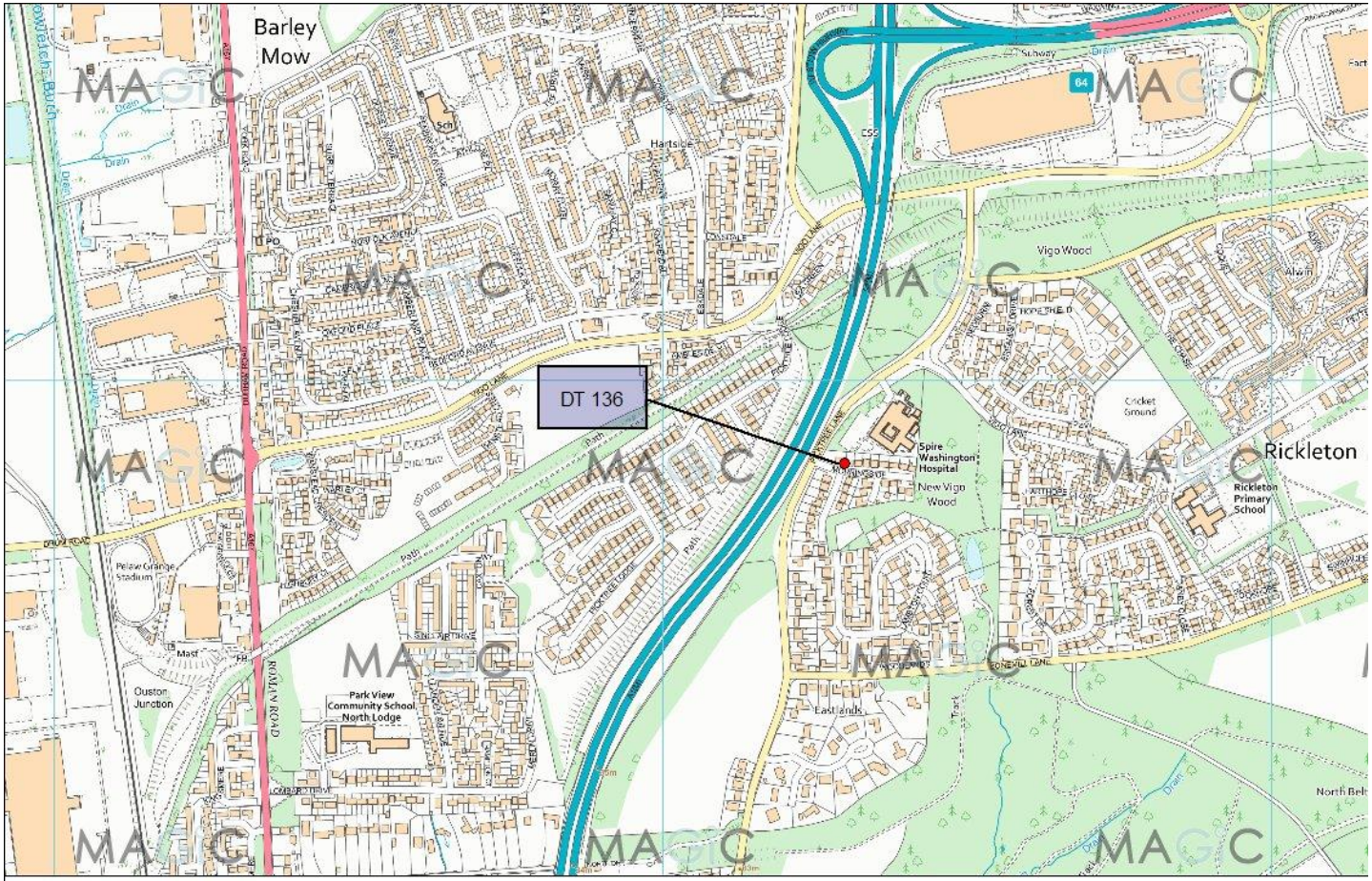

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Figure D.17 – Map of Diffusion Tubes 137, 138, 139 & 140.

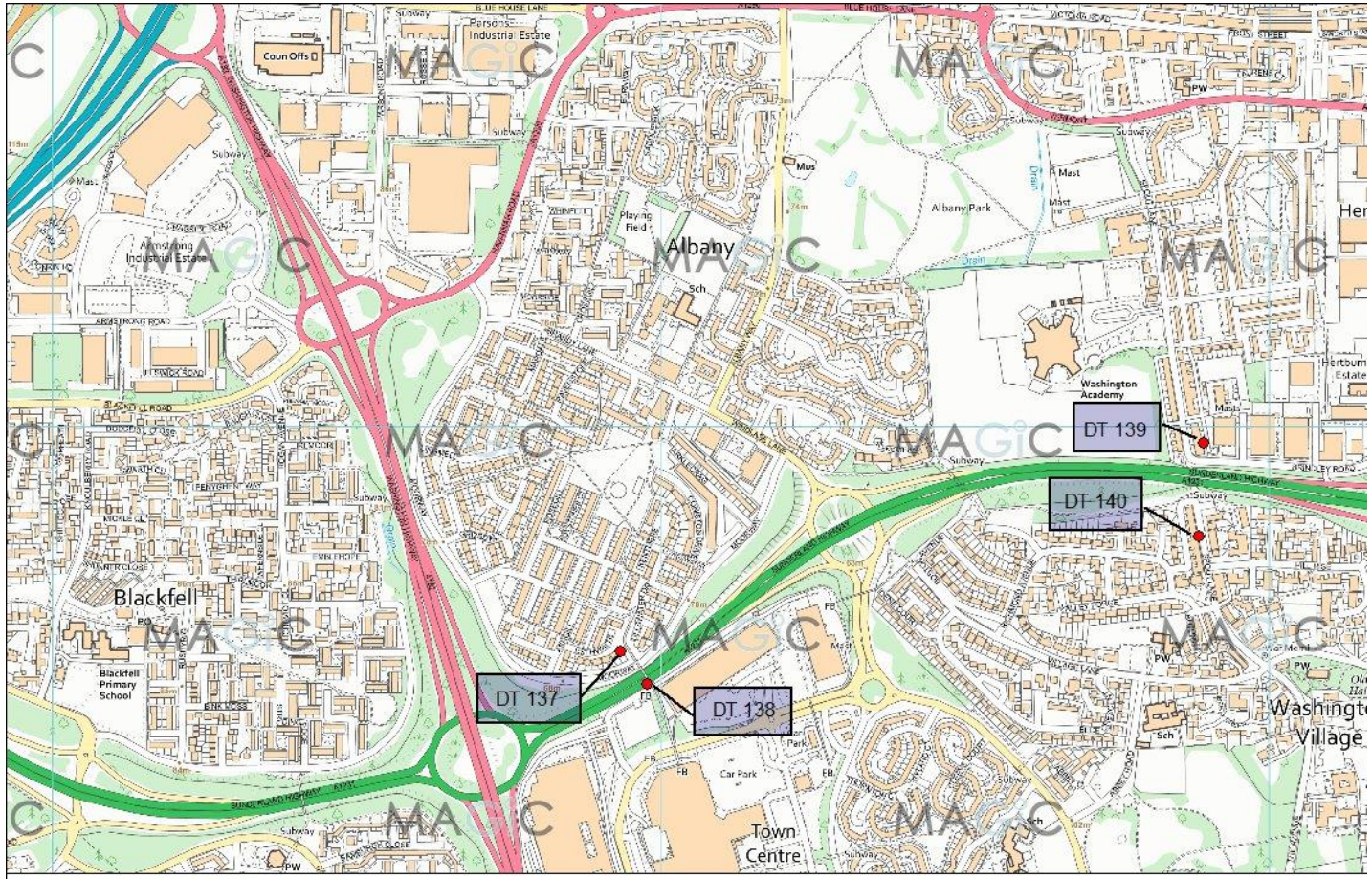
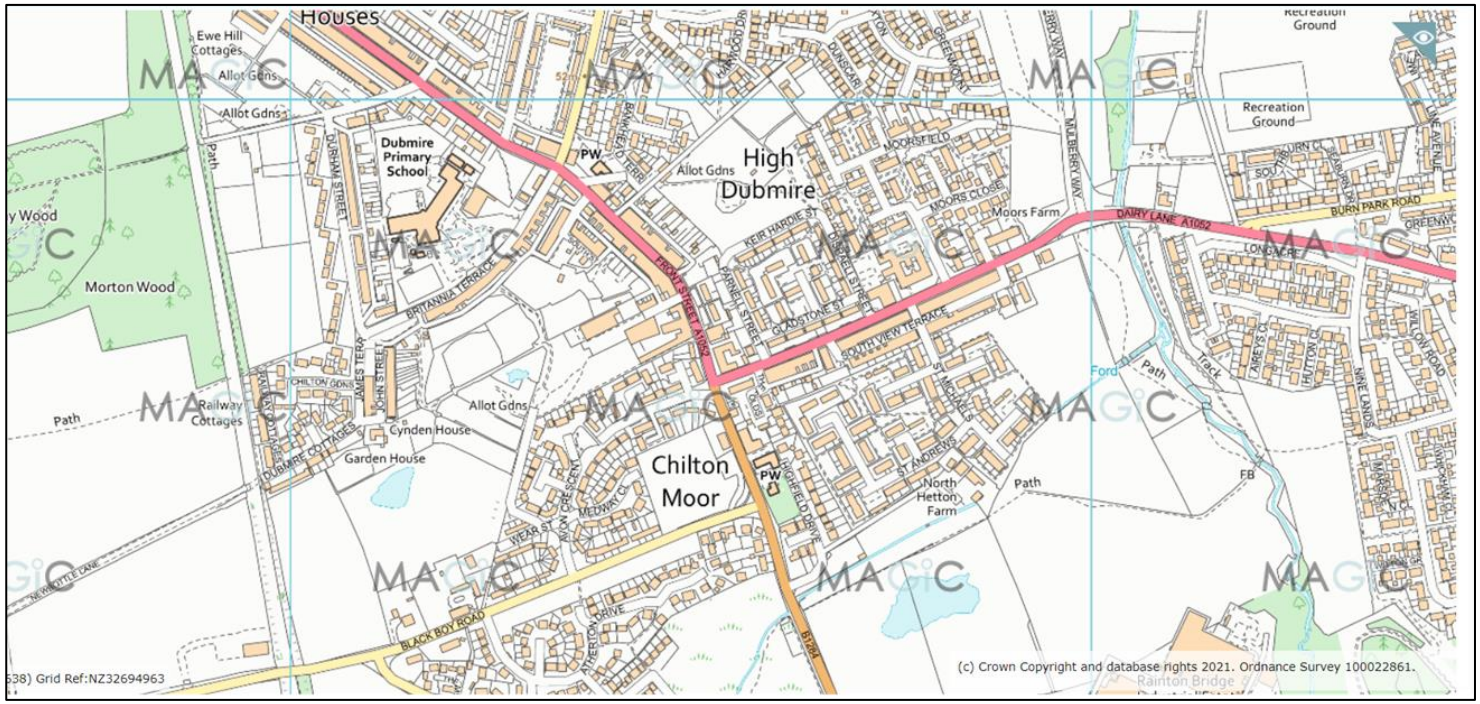


Figure D.18 – Map of Diffusion Tube 141.



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).

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.