Annual Progress Report (APR)

2023 Air Quality Annual Progress Report (APR) for Dundee City Council

In fulfilment of Part IV of the Environment Act 1995, as amended by the Environment Act 2021

Local Air Quality Management

November 2023

Information	Dundee City Council
Local Authority Officer	Jamie Landwehr
Department	Regulatory Services Community Safety & Protection Neighbourhood Services
Address	5 City Square, Dundee DD1 3BA
Telephone	01382 436280
E-mail	pollution.control@dundeecity.gov.uk jamie.landwehr@dundeecity.gov.uk
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Executive Summary: Air Quality in Our Area

Air Quality in Dundee

In 2006 Dundee City Council (DCC) declared the whole of DCC local authority area as an 'Air Quality Management Area' (AQMA) for the nitrogen dioxide (NO_2) annual mean Air Quality Objective (AQO). A single AQMA rather than several connecting AQMAs was declared to enable wider consideration of air quality improvements in Dundee. In 2010, DCC amended the initial AQMA to include the annual mean AQO for particulate matter (PM_{10}) and in 2013 DCC further amended the AQMA to include the 1-hour mean AQO for NO_2. In line with other cities, the predominant source contributing to these exceedances is road traffic.

DCC published its 'Air Quality Action Plan' in January 2011, introducing a set of 32 measures to work towards achievement of the AQOs in the AQMA. The implementation of these measures has helped to reduce pollutant levels across the local authority, with the number of exceedance locations greatly reducing over the 12 years that the AQAP has been in place.

Dundee City Council currently monitors for NO_2, PM_{10} and $PM_{2.5}$, the latest results and trends are discussed in Chapter 3. Additional analysis is also available on the Air Quality in Scotland website within the 2022 annual summary report prepared by Ricardo Energy & Environment - https://www.scottishairquality.scot/assets/reports/365/Dundee_City_annual_2022.html.

The 2022 monitoring results indicate compliance with the air quality objectives for the pollutants monitored using the reference equivalent analysers. One potential exceedance of the daily mean objective for PM_{10} was observed via an indicative OSIRIS unit, with the number of daily mean maximum levels exceeding the permitted number each year at one location. Nationally reported transboundary pollution events are linked to the daily mean exceedance.

No potential exceedance of the NO_2 annual mean objective was identified at any of the 88 passive diffusion tube (PDT) monitoring locations across the city for the 2022 calendar year.

Our 2021 and 2022 Annual Progress Reports advised that lockdown measures imposed in response to the COVID19 pandemic during 2020 resulted in a significant reduction in road traffic within Scotland's cities, including Dundee, which contributed to measured NO_2 concentrations decreasing significantly that year. In 2021, the recorded NO_2 annual mean concentrations increased slightly on the 2020 level, likely due to road traffic levels picking up. Monitoring data for 2022 reports that the NO_2 annual mean was lower than in 2020 in many locations. A main contribution to this improvement would be the introduction of fully electric buses to the Dundee bus network in January 2022, in particular by XPlore Dundee on routes covering Lochee Road. 80% of the bus movements on the Lochee Road corridor involve the Xplore Dundee electric buses, with the other main operator, Stagecoach, running the cleanest low emission zone (LEZ) compliant EURO VI vehicles on their routes.

Monitored annual mean levels of PM_{10} and $PM_{2.5}$ for 2022 were slightly increased on 2021 levels however remained compliant with the Scottish air quality objective levels. PM levels can be influenced by transboundary events with an example of such an episode being one that occurred in late March 2022. A 'Pollution episode report' [1] for this episode was produced with specific reference to monitoring stations in Dundee in the report. Emissions blown in from continental Europe added to locally emitted pollutants (industrial, transport and agricultural) which were not dispersed due to warm, calm weather conditions, resulting in higher concentrations of PM_{10} being recorded at monitoring stations in Dundee.

During 2022 Dundee City Council continued its ongoing work with Transport Scotland, Scottish Environment Protection Agency (SEPA) and the regional transport partnership (Tayside and Central Scotland Transport Partnership - TACTRAN) to introduce the Dundee Low Emission Zone Scheme on 30 May 2022.

SEPA also include the local authority for consultation on any new industrial process applications within the local authority boundary, and provide an annual update on existing processes in the city that they are the Regulators for.

Actions to Improve Air Quality

Dundee City Council has taken forward a number of measures linked to our AQAP during the current reporting year of 2022 in pursuit of improving local air quality.

Updates on AQAP related actions progressed during 2022 include:

- The Dundee Low Emission Zone Scheme application was submitted to Scottish Ministers in February 2022 with approval given in May 2022. The Dundee LEZ Scheme was then formally introduced on 30 May 2022. Enforcement of the scheme will not commence until the end of the two-year grace period in May 2024.
- There was an increase of 14 to the number of members to the Dundee ECO Stars larger commercial vehicles scheme, giving a total of 259 members at the end of 2022. This included the recruitment of the 250th member of the Dundee scheme, M&H Carriers. The number of vehicles included in the larger commercial vehicle scheme however rose by over 12% to 9476 vehicles. The number of members of the ECO Stars scheme for taxis/private hire vehicles was maintained at 18 operators (570 vehicles) during 2022.
- Dundee City Council has continued to use the platform of its Drive Dundee Electric campaign to successfully engage with current and potential electric vehicle (EV) owners

[1] https://www.scottishairquality.scot/news/latest-air-pollution-episode

(both in public and business) through the local media in the form of EV related articles encouraging people to make the switch to EV. These quarterly local media EV articles continue to encourage the taxi industry to switch to electric vehicles. In 2022, Dundee City Council deployed a series of fully accessibility EV charging infrastructure trials as part of an innovation pilot project. In October 2022, Dundee City Council hosted the HEVTCP bi-annual international conference in partnership with OZEV.

- The Dundee City Council Fleet section continued to replace older vehicles with newer, less polluting models. During 2022, 36 older diesel vehicles were replaced with electric vehicles. By the end of 2022, there was a total of 207 fully electric vehicles within the council fleet.
- At the end of 2022 there were 181 pure electric taxis in Dundee, up from 165 in 2021.
- To support the modelling of the air quality impacts of the preferred option for possible adjustments to the Lochee Road corridor, traffic counts were undertaken in March 2022. The report on the impacts on air quality of the preferred option was completed by SEPA in late 2022.
- Road infrastructure changes on Lochee Road at the Cleghorn Street / Rankine Street were implemented in 2022 to benefit road safety and to help ease congestion caused by vehicles turning right into these streets from Lochee Road.
- 'Clean Air Day 2022' was promoted via social media channels on June 17 to help raise awareness of air quality and how we can protect those most vulnerable to the impacts of exposure to poor air quality.
- A project to provide residential cycle storage solutions in areas of Dundee where a high level of flatted development and tenements exist was undertaken with a procurement contract awarded to Cyclehoop to deliver 40 cycle storage shelters. The first of the 'Cycle-hoop' cycle storage units are due to be installed in early 2023.
- Additional School Streets (vehicle exclusion zone) projects were introduced at five sites (seven schools) in Autumn 2022. Planning began for the next batch of schools to see the introduction of School Streets in 2023.
- A number of Places for Everyone projects were continued throughout Dundee with funding secured to move to their next stages of delivery in Broughty Ferry, Union Street, East End Campus and Ninewells.

Local Priorities and Challenges

Air Quality Action Plan linked measures to be progressed over the course of the next reporting year include:

- A further 28 fully electric vehicles will be introduced to the DCC fleet by the end of July 2023, increasing the number of EV in the corporate fleet to 235, which represents 35% of the corporate fleet vehicles.
- The Staff Travel Plan is due to be launched in 2023 and will include dedicated pages set up on the Council's intranet providing information on staff travel measures.
- The 'Cycle-hoop' cycle storage units are due to be installed in early 2023, with all 40 sites to be installed during 2023.
- New electric vehicle charging infrastructure will continue to be deployed across Dundee, including Corporate Fleet department infrastructure at our Clepington Road depot being completed by May 2023.This deployment will facilitate an acceleration of DCC transition to e-mobility.
- Continuation of both ECOSTARS Schemes for Heavy Duty Vehicles and Taxis / Private Hire vehicles to encourage engagement with and participation of these transport providers in the achievement of air quality improvements in the city.
- Continued support for Active Travel related projects including the delivery of the School Active Travel Delivery programme and behaviour change campaigns to cycling, active and sustainable travel across the city via joint working with the Dundee Cycle Hub. The School Active Travel Team have been shortlisted for the 'Best Practice in Travel to School and Work Schemes' category of the 2023 Scottish Transport Awards.
- The promotion of Clean Air Day on 15 June 2023 to help raise awareness of air quality. This year's theme is *"Clean up our air to look after your mind this #CleanAirDay."*
- Progression will be made with the review and updating of the existing 2011 Dundee City Council Air Quality Action Plan. This will be in line the new Local Air Quality Management Policy Guidance PG(S)(23) published in March 2023, and the Scottish Government's 2021 'Cleaner Air for Scotland 2 – Towards a better Place for Everyone' air quality strategy.

How to Get Involved

Further information on air quality in Dundee can be found on the website at the following location: www.dundeecity.gov.uk/air-quality/ .

Further information on the Dundee LEZ can be found at www.dundeecity.gov.uk/LEZ .

	*The major scheduled bus operator in Dundee, Xplore Dundee, introduced a fleet of fully electric buses to the Dundee network, covering routes such as the number 28 which serves Lochee Road.*
	*The Dundee Low Emission Zone Scheme was introduced on 30 May 2022.* *Enforcement of the scheme will not commence until 30th May 2024 when the two-year grace period ends.*

Table of Contents

List of Tables

List of Figures

1 Local Air Quality Management

This report provides an overview of air quality in Dundee City Council during 2022. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995), as amended by the Environment Act (2021), 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 Progress Report (APR) summarises the work being undertaken by Dundee City Council to improve air quality and any progress that has been made.

Table 1.1 Summary of Air Quality Objectives in Scotland

Pollutant	Air Quality Objective Concentration	Air Quality Objective Measured as	Date to be Achieved by
Nitrogen dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
Nitrogen dioxide (NO_2)	40 µg/m^3	Annual mean	31.12.2005
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
Particulate Matter (PM_{10})	18 µg/m^3	Annual mean	31.12.2010
Particulate Matter ($PM_{2.5}$)	10 µg/m^3	Annual mean	31.12.2021
Sulphur dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
Sulphur dioxide (SO_2)	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
Sulphur dioxide (SO_2)	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005
Benzene	3.25 µg/m^3	Running annual mean	31.12.2010
1,3 Butadiene	2.25 µg/m^3	Running annual mean	31.12.2003
Carbon Monoxide	10.0 mg/m^3	Running 8-Hour mean	31.12.2003

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

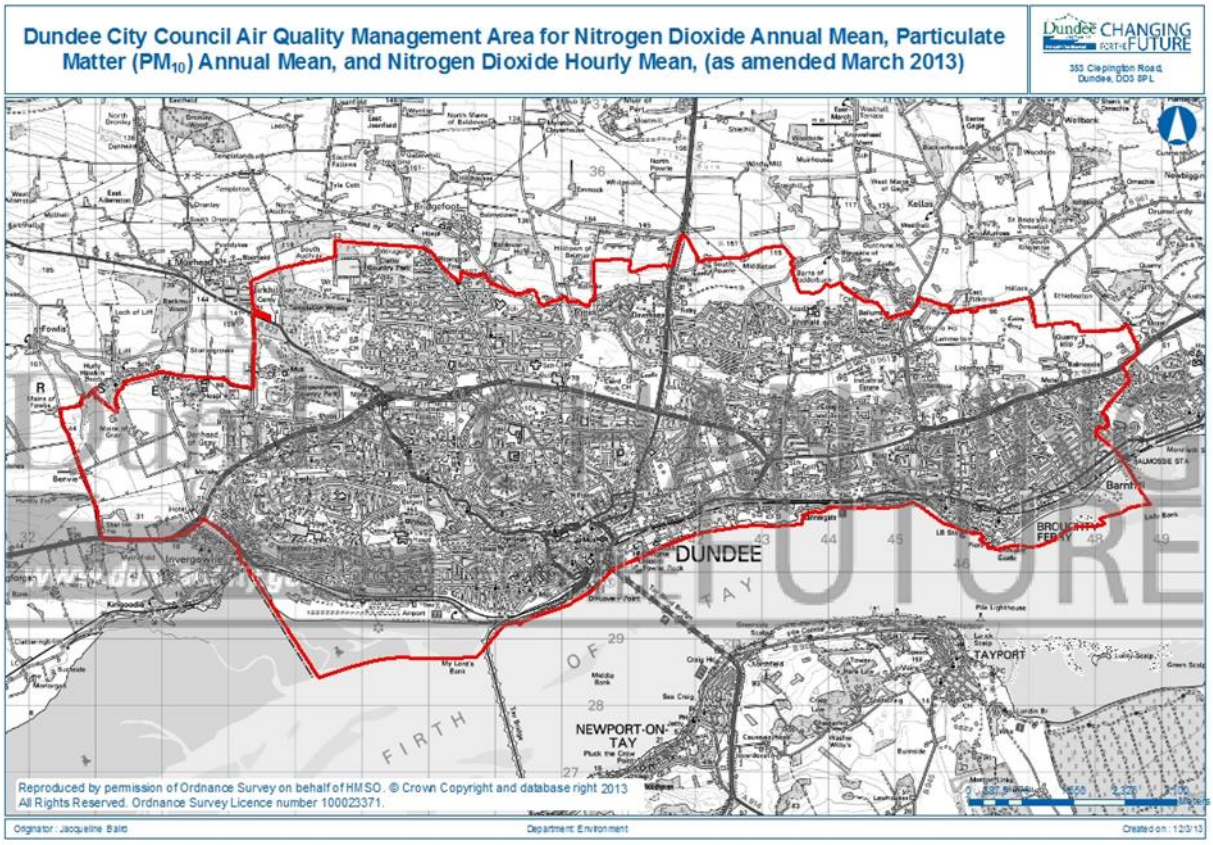
Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare, publish and implement an Air Quality Action Plan (AQAP) within the shortest possible time and no later than 12 months of the date of AQMA Designation Order. The AQAP must set out measures the local authority intends to put in place in pursuit of the objectives within the shortest possible time. Measures should be provided with milestones and a final date for completion. The action plan itself should have a timescale for completion and for revocation of the AQMA. Where measures to reduce air pollution may require a longer timescale an action plan shall be reviewed and republished within five years of initial publication and then five-yearly thereafter.

A summary of AQMAs declared by Dundee City Council can be found in Table 2. Further information related to declared or revoked AQMAs, including maps of AQMA boundaries are available online at https://uk-air.defra.gov.uk/aqma/local-authorities?la_id=365

Table 2.1 Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City / Town	Description	Action Plan
Dundee City Council AQMA	NO_2 annual mean PM_{10} annual mean NO_2 hourly mean	Dundee	The whole of the local government area of the City of Dundee was declared an AQMA in respect of the annual mean objective for NO_2 in July 2006. In October 2010 the AQMA Order was amended to include the annual mean objective for PM_{10}. The AQMA was further amended in March 2013 to include the hourly mean objective for NO_2. See Figure 1 for a map of the Dundee AQMA.	Air Quality Action Plan for Nitrogen Dioxide (NO_2) and Fine Particulate Matter (PM_{10}) - January 2011 www.dundeecity.gov.uk/service-area/neighbourhood-services/community-safety-and-protection/air-quality-in-dundee/air-quality-action-plan

Figure 1 Dundee Air Quality Management Area map



2.2 Cleaner Air for Scotland 2

Cleaner Air for Scotland 2 – Towards a Better Place for Everyone (CAFS2) is Scotland's second air quality strategy. CAFS2 sets out how the Scottish Government and its partner organisations propose to further reduce air pollution to protect human health and fulfil Scotland's legal responsibilities over the period 2021 – 2026. CAFS2 was published in July 2021 and replaces Cleaner Air for Scotland – The Road to a Healthier Future (CAFS), which was published in 2015. CAFS2 aims to achieve the ambitious vision for Scotland "to have the best air quality in Europe". A series of actions across a range of policy areas are outlined, a summary of which is available on the Scottish Government's website.

Progress by Dundee City Council against relevant actions for which local authorities are the lead delivery bodies within this strategy is demonstrated below.

2.2.1 Placemaking – Plans and Policies

Local authorities with support from the Scottish Government will assess how effectively air quality is embedded in plans, policies, City Deals and other initiatives, and more generally in cross departmental working, identifying and addressing evidence, skills, awareness and operational gaps.

Dundee City Council acknowledges the inclusion of this action within the updated CAFS2 air quality strategy and will seek to progress on this action, with support from the Scottish Government, as outlined in the delivery plan that supports the CAFS2 strategy.

2.2.2 Transport – Low Emission Zones

Local authorities working with Transport Scotland and SEPA will look at opportunities to promote zero-carbon city centres within the existing LEZs structure.

Dundee City Council acknowledges the inclusion of this action within the updated CAFS2 air quality strategy and will seek to progress on this action, with support from Transport Scotland, as outlined in the delivery plan that supports the CAFS2 strategy.

The Dundee Low Emission Zone Scheme received Scottish Ministerial approval in May 2022 and was introduced on the 30th May 2022. This commenced a two-year grace period meaning that enforcement of the LEZ will not begin until the end of May 2024. During this grace period communications will be put out by the local authority, in addition to nationally run campaigns to raise people's awareness of the restrictions on certain vehicle types from being able to drive within the LEZ without penalty. Opportunities to link this with existing zero-carbon initiatives, such as the 'Drive Dundee Electric' campaign and 'Sustainable Dundee', will be undertaken. Further details of the proposed Dundee LEZ scheme development follow in section 2.2.3.

2.2.3 Dundee Low Emission Zone scheme

Committee approval was sought in February 2022 to apply to the Scottish Ministers for the approval of the proposed Dundee LEZ scheme as per the proposed scheme consulted upon in 2021.

Approval was given and the application was submitted in February 2022. The Scottish Ministers advised Dundee City Council in May 2022 that the application had been approved with no amendments required to the proposed scheme. Following this approval, the necessary legal processes of advertising the making of the scheme were completed and the Dundee LEZ scheme was introduced on 30 May 2022. The two-year grace period from enforcement then commenced to allow those who may be affected by the LEZ to prepare for it.

The approved Dundee LEZ scheme applies to all vehicle types, apart from motorcycles and mopeds, however some vehicles are provided with a national exemption. Minimum emission standards for driving on a road within the LEZ are set as those outlined in the Low Emission Zones (Emission Standards, Exemptions and Enforcement) (Scotland) Regulations 2021. Penalty rates are also set within these Regulations to ensure consistency across the four Scottish LEZs.

The emission standards for LEZs in Scotland set in these Regulations allows only vehicles with the following minimum emission standards to drive on a road within the LEZ area without penalty:

- **Euro 4** for petrol light passenger and light goods vehicles
- **Euro 6** for diesel light passenger and light goods vehicles
- **Euro IV** for heavy duty petrol vehicles such as buses/coaches and HGVs
- **Euro VI** for heavy duty diesel vehicles such as buses/coaches and HGVs

For practical purposes, it is generally the case that diesel engine vehicles registered after September 2015 and petrol vehicles registered from 2006 onwards will meet the required LEZ standards. Diesel buses and HGVs first registered from 2013 onwards also generally meet the Euro VI standard.

Full details of the approved Dundee LEZ scheme design are available on the LEZ pages of the DCC website – www.dundeecity.gov.uk/lez . This webpage also contains links to reports and other documents produced during the LEZ development process, such as the NLEF reports, the SEPA emissions analysis and Air Quality evidence reports, and the Integrated Impact Assessment. A map of the LEZ area within DCC is shown in Figure 2.

The two-year grace period will allow for the necessary enforcement infrastructure to be installed, which includes fibre optic cabling for the automatic number plate recognition (ANPR) cameras and connection of these to the back-office enforcement system. The fibre optic work was progressed during 2022, while the ANPR cameras are proposed to be installed from May 2023 onwards. Two ANPR cameras were installed in 2022.

Preparations for approved LEZ signage installation have been ongoing, including meetings with Transport Scotland for advance warning signage installation on the trunk road network, such as the Tay Road Bridge, the Kingsway and East Dock Street. LEZ signage erection is expected to commence late summer 2023.

A programme of communications to raise awareness of the Dundee LEZ scheme will be undertaken during 2023, which will increasingly focus on enforcement of the scheme in the lead up to the date enforcement commences in May 2024. This will include a local television advert campaign running through the months of April, May and June 2023. The Council's website will be kept up-to-date with information on support funding available to help motorists prepare for the LEZ, while also containing weblinks to new tools available on the Low Emission Zones Scotland website. This includes the vehicle registration checker and the on-line registration system for the Blue Badge holder exemption scheme.

Figure 2 Dundee Low Emission Zone scheme area map

2.3 Implementation of Air Quality Action Plan(s) and/or measures to address air quality

In order to ensure that local authorities implement the measures within an action plan by the timescales stated within that plan, the Scottish Government expects authorities to submit updates on progress through the APR process. Dundee City Council has taken forward a number of measures within the action plan during the current reporting year of 2022 in pursuit of improving local air quality and meeting the air quality objectives within the shortest possible time. Details of all measures completed, in progress or planned are set out in Table . More detail on these measures can be found in the air quality Action Plan relating to each AQMA.

Dundee City Council has taken forward a number of measures linked to our AQAP during the current reporting year of 2022 in pursuit of improving local air quality.

Updates on AQAP related actions progressed during 2022 include:

- The Dundee Low Emission Zone scheme application was submitted to Scottish Ministers in February 2022 with approval given in May 2022. The Dundee LEZ scheme was then formally introduced on 30 May 2022. Enforcement of the scheme will not commence until the end of the two-year grace period in May 2024.
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included the recruitment of our 250th member of the Dundee scheme, M&H Carriers. The number of vehicles included in the larger commercial vehicle scheme however rose by over 12% to 9476 vehicles. The number of members of the ECO Stars scheme for taxis/private hire vehicles was maintained at 18 operators (570 vehicles) during 2022.

- Dundee City Council has continued to use the platform of its Drive Dundee Electric campaign to successfully engage with current and potential electric vehicle (EV) owners (both in public and business) through the local media in the form of EV related articles encouraging people to make the switch to EV. These quarterly local media EV articles continues to encourage the taxi industry to switch to electric vehicles. In 2022 Dundee City Council deployed a series fully accessibility EV charging infrastructure trials as part of an innovation pilot project. In October 2022 Dundee City Council hosted the HEVTCP bi-annual international conference in partnership with OZEV.
- The Dundee City Council Fleet section continued to replace older vehicles with newer, less polluting models. During 2022, 36 older diesel vehicles were replaced with electric vehicles. By the end of 2022, there was a total of 207 fully electric vehicles within the council fleet.
- At the end of 2022 there were 181 electric taxis in Dundee, up from 165 in 2021.
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- ‘Clean Air Day 2022’ was promoted via social media channels on June 17 to help raise awareness of air quality and how we can protect those most vulnerable to the impacts of exposure to poor air quality.
- A project to provide residential cycle storage solutions in areas of Dundee where there is a high level of flatted development and tenements was approved and following a procurement exercise, a contract was awarded to Cyclehoop to deliver 40 cycle storage shelters. The first of the ‘Cyclehoop’ cycle storage units are due to be installed in early 2023.
- Additional School Streets (vehicle exclusion zone) projects were introduced at five sites (seven schools) in Autumn 2022. Planning began for the next batch of schools to see the introduction of School Streets in 2023.

- A number of Places for Everyone projects were continued throughout Dundee with funding secured to move to their next stages of delivery in Broughty Ferry, Union Street, East End Campus and Ninewells.

Progress on the following measures has been slower than expected:

- The launch of the Staff Travel Plan was been delayed due to the gradual return of staff to Council Offices. Once appropriate to do so the Plan will be launched in 2023 and will include dedicated pages set up on the Council's intranet providing information on staff travel measures.
- The commencement of the review and update of the current 2011 Air Quality Action Plan has been delayed however will progress during 2023.

Dundee City Council expects the following Air Quality Action Plan linked measures to be progressed over the course of the next reporting year:

- A further 28 fully electric vehicles will be introduced to the DCC fleet by the end of July 2023, increasing the number of EV in the corporate fleet to 235, which represents 35% of the corporate fleet vehicles.
- The 'Cycle-hoop' cycle storage units are due to be installed in early 2023, with all 40 sites to the installed during 2023.
- New electric vehicle charging infrastructure will continue to be deployed across Dundee, including Corporate Fleet department infrastructure at our Clepington Road depot being completed by May 2023.This deployment will facilitate an acceleration of DCC transition to e-mobility.
- Continuation of both ECOSTARS Schemes for Heavy Duty Vehicles and Taxis / Private Hire vehicles to encourage engagement with and participation of these transport providers in the achievement of air quality improvements in the city.
- Continued support for Active Travel related projects including the delivery of the School Active Travel Delivery programme and behaviour change campaigns to cycling, active and sustainable travel across the city via joint working with the Dundee Cycle Hub. The School Active Travel Team have been shortlisted for the 'Best Practice in Travel to School and Work Schemes' category of the 2023 Scottish Transport Awards.
- The promotion of Clean Air Day on 15 June 2023 to help raise awareness of air quality. This year's theme is *"Clean up our air to look after your mind this #CleanAirDay."*
- Progression will be made with the review and updating of the existing 2011 Dundee City Council Air Quality Action Plan in line with LAQM Policy Guidance PG(S)(23).

Table 2.2 Progress on Measures to Improve Air Quality

Measure No.	Measure	Category	Expected / Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
1	**Measure M1:** Existing Road Infrastructure Improvements City Centre Improvements - **Union Street.**	Transport, planning and infrastructure	2011	Completed		The continuous automatic air monitoring station was removed from Union Street in 2016.	Union Street Road Infrastructure improvements were completed December 2011. Two-way traffic was maintained. Pavement widths were altered and the bus stops were removed to reduce congestion and bus idling. Bus services redistributed to bus stops on Whitehall Street and Nethergate. Union Street, between the Nethergate and Whitehall Crescent, was then pedestrianised from August 2020 through Sustrans Spaces for People. This pedestrianisation has since been made permanent.	
	North West Arterial Route improvements – **Lochee Road**	Transport, planning and infrastructure	2012 / ongoing	Completed / in progress	Funding for modelling of the impact of infrastructure changes was obtained via the Scottish Air Quality Action Plan grant scheme in 2022/23.		Alterations carried out at Lochee Road/Rankine Street in February 2012 with the central reservation removed to free up road space and reduce congestion. Road infrastructure changes on Lochee Road at the Cleghorn Street / Rankine Street were implemented in early 2022 to benefit road safety and to help ease congestion caused by vehicles turning right into these streets from Lochee Road. This included the installation of a central island to prevent drivers from turning right from Cleghorn Street on to Lochee Road, from Lochee Road on to Cleghorn Street and from Rankine Street on to Lochee Road. Drivers will also not be able to cross Lochee Road from Rankine Street on to Cleghorn Street or vice-versa. Air quality modelling to identify impacts of the preferred infrastructure changes option was completed by SEPA in 2022.	
	Arterial Route Improvements - **Stannergate**	Transport planning and infrastructure	2016	Completed			Consultants engaged in 2013 to carry out traffic micro-simulation modelling and air dispersion modelling. Final draft of the AD Modelling was received in April 2016, with the summary of findings presented in the 2016 Annual Progress Report.	
	City Centre Improvements - **Meadowside**	Transport planning and infrastructure	2016 / 2021	Completed			Meadowside – in 2012 a trial lane closure at the north end of street to increase separation distance between traffic and receptors was put in place. A temporary paving surface was	

Measure No.	Measure	Category	Expected / Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
							introduced in October 2013 to allow the impact on monitored concentrations to be studied for a 12 month period. Permanent street infrastructure changes were completed in Feb/March 2016. Bus priority measures were introduced on Meadowside in March 2021. The measures remove general traffic (cars etc) going north bound at the Meadowside signals near the Wellgate centre, with traffic diverted onto Bell Street from Meadowside to join at Victoria Street west of the Meadowside signals.	
	City Centre Improvements - **Upgrade 13 traffic signals with fibre optic connections**	Transport planning and infrastructure	2019	Completed			A Fibre network was implemented to improve Traffic Signals communication (and revenue saving) with the Control Room in Dundee House. This network will improve reliability and efficiency of Urban Traffic Management and Control (UTMC).	
	City Centre Improvements – **Seagate / St. Andrews Street**	Transport planning and infrastructure	2017	Completed			In 2014, consultants were commissioned to undertake a review of transport activity on the Seagate with a specific focus on identifying actions that would address its poor air quality. The report concluded that there were no affordable actions that could ensure AQ thresholds were met but a range of actions could help reduce emissions. Air Dispersion Modelling demonstrated that if all buses and HDVs were Euro VI then no exceedances of the NO_2 or PM_{10} objectives would persist in the city centre. Traffic modelling undertaken by SYSTRA with 2016/17 funding showed that the proposed transport management options would be unacceptable on traffic congestion, access and air quality grounds.	
	City Centre Improvements – **Crichton Street / Whitehall Street / Nethergate**	Transport planning and Infrastructure	2017	Completed			Consultants were commissioned in March 2017 to examine the current bus movements through the city centre. The executive summary of this report is in **Appendix C.5** of the 2018 DCC Annual Progress Report.	
2	**Measure M2:** DCC will enhance the Urban Traffic Management and Control (UTMC) system to reduce congestion Real-time traffic monitoring. Improved control regime to smooth out peak traffic.	Traffic management	2013 – UTMC 2016 – Bluetooth Traffic Speed Monitoring System	Completed Completed			UTMC scheme was implemented in March 2013 to expand UTMC to two congested junctions in Lochee Rd AQ hotspots. Seagate / Commercial Street traffic light refurbishment to improve bus and traffic flows completed Feb 2013. Coupled with	

Measure No.	Measure	Category	Expected / Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
							increased enforcement of waiting restrictions to reduce congestion. TACTRAN funding provided in 2014/15 to expand Bluetooth Traffic Speed Monitoring System to include the Lochee Road. The system was expanded along the eastern corridor on the A92 coming in from Arbroath and Broughty Ferry. Bluetooth journey time monitoring is now undertaken on all major arterial routes leading in to the city centre area.	
	Paramics / AIRE modelling of key junctions – Kingsway / Forfar Rd & Lochee Rd corridor to test improvement options	Traffic management	2016	Completed			Consultants were engaged in 2013 to carry out traffic micro-simulation modelling and air dispersion modelling. A detailed summary of the options is contained in **Appendix C** of the 2016 Annual Progress Report.	
3	**Measure M3:** DCC to identify partnership and funding to continue benefits of Smarter Choices / Smarter Places: Dundee Travel Active Programme	Promoting travel alternatives	ongoing	In progress	AQAP funding has been applied for on an annual basis to partially fund projects related to this action plan measure.		Embark Dundee –Electric bike hire Scheme continued during 2022, installing new docking stations and attracting new members throughout the year. The scheme entered a winter shutdown in November 2022. AQAP funding was received in 2020/21 to assist with the installation of docking stations in areas in and adjacent to air quality hot spot areas. Funding was also granted in 2021/22 to run a membership incentive campaign. The Dundee Cycle Hub (DCH) opened in September 2021. The team at the DCH have continued to strengthen their offerings during 2022 providing outreach services around the city and regular activity at the Waterfront hub location. AQAP funding was awarded in 2022/23 to help support initiatives undertaken by this active travel hub. AQAP funding was awarded in 2022/23 which will be used to assist with delivery of a project to provide residential cycle storage solutions in areas of Dundee where there is a high level of flatted development and tenements. A contract was awarded in late 2022 to deliver 40 cycle storage shelters, with the first of the 'Cycle-hoop' cycle storage units due to be installed in early 2023.	
	Behavioural Change Primary School programme to promote sustainable travel options in all primary schools	Promoting travel alternatives	Ongoing	In progress	Joint funded, contribution for post applied for annually through Air Quality Action Plan support funding.		The Active Travel Schools team based at the Ancrum Centre have expanded their delivery of Bikeability and cycling and walking initiatives working closely with schools around Dundee. AQAP funding has been awarded in 2021/22 and 2022/23 to help cover the cost of this	

Measure No.	Measure	Category	Expected / Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
							team enabling it to reach as many schools as possible in Dundee. A School Streets (vehicle exclusion zone) launched at Fintry Primary School in September 2021. Additional School Streets projects were introduced at five sites (seven schools) in Autumn 2022. Planning began for the next batch of schools to see the introduction of School Streets in 2023.	
4	**Measure M4:** DCC will introduce measures to improve bus services and reduce emissions Statutory Bus Quality Partnership. Voluntary Bus Quality Partnership	Transport planning and infrastructure	Ongoing	In progress			The Tayside Bus Alliance was established in 2020 to develop a joint submission to the Scottish Government's Bus Partnership Fund. Dundee City Council is a member of this. The alliance has helped lay some foundations for a future Bus Service Improvement Partnership in Dundee. The Tayside Bus Alliance continued its work to develop a network of routes where bus journeys were prioritised. SYSTRA were commissioned to prepare a submission for the Bus Partnership Fund with the hope of securing future funding for Dundee and neighbouring authorities.	
	Fleet Renewal – Emissions Improvements	Vehicle Fleet efficiency	Ongoing	In progress	Local bus operators have received funding through schemes such as the BEAR retrofit scheme to retrofit older models to bring them up to EUROVI equivalent emission standards.		Xplore Dundee launched 12 new Zero-Emission electric buses in December 2021 which began full service in January 2022 on the Service 28 route serving Lochee Road. Emissions from buses in Dundee saw incremental improvement during 2022, with older vehicles being removed from the Xplore Dundee and Stagecoach fleets. This was partly achieved through the reduction in service levels (reduced frequencies on key corridors).	
	ECO Stars Dundee Fleet Management Recognition Scheme introduced	Vehicle Fleet efficiency	Ongoing	In progress	Funding to continue the scheme will be applied for on an annual basis through the AQAP grant scheme.		See Measure 6	
5	**Measure M5**: DCC will explore provision of Park and Ride facilities that do not have adverse impact on air quality Provision of Park and Ride (P&R) facilities	Alternatives to private vehicle use	Ongoing	In progress			Dundee City Council supported a bid from Fife Council to secure Levelling Up funding for a new Park & Ride on the south side of the Tay Road Bridge. Other potential P&R sites were considered and included in the developing Bus Partnership Fund submission prepared by SYSTRA.	
6	**Measure M6:** DCC will introduce measures to reduce emissions from Heavy Goods Vehicles	Freight and delivery management	Ongoing	In progress	Funding to continue the scheme will be applied for on an annual basis through the AQAP grant scheme.	Member number 250 was achieved during 2022.	Dundee City Council received funding from the Scottish Government's Air Quality Support Funding to enable continuation of the ECO Stars scheme	

Measure No.	Measure	Category	Expected / Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
	ECO Stars Dundee Fleet Management Recognition Scheme being introduced in 2013						for larger commercial vehicles and the separate scheme for Taxis and Private Hire Vehicles during 2022. 14 new members, bringing 1075 new vehicles, joined the Dundee commercial fleet scheme in 2022. This increased number of members to 259 (9476 vehicles) by the end of 2022.	
7	**Measure M7**: DCC will seek improvements in emissions standards, including NO_2 and PM_{10} for the council fleet and public service vehicles Development of Green Procurement Strategy to set target for Euro category/fuel type	Promoting Low Emission Transport	Ongoing	In progress	Various funding streams utilised by corporate fleet to facilitate switch to EV		See also measure 14. The Corporate Fleet department electric vehicle infrastructure installation at Clepington Road depot will be completed by May 2023.This deployment will facilitate an acceleration of DCC transition to e-mobility. AQAP funding was obtained in 2022/23 to assist with the development of this infrastructure. Presently the fleet has 207 fully electric vehicles in the fleet. The corporate fleet have ordered a further 28 fully electric vehicles and by the end of July 2023 will have 235 electric vehicles representing 35% of the corporate fleet vehicles.	
	Participation in ECO Stars Dundee-Fleet Management Recognition Scheme	Vehicle Fleet Efficiency	Ongoing	In progress			DCC Fleet continues to work closely with the ECO stars Recognition Scheme and remains at a 4-star rating.	
8	**Measure M8:** DCC in consultation with the Taxi Liaison Group will explore means of reducing emissions from taxis and private car hire vehicles in AQMA Enforce No idling for taxis. Increase cleaner taxis.	Promoting low emission transport		In progress			At the end of 2022 there were 181 electric taxis in Dundee. There has been a reduction in taxi numbers since COVID. Presently 27% of taxis in Dundee are fully electric.	
	Explore the potential of introducing Licensing Conditions for minimum taxi Euro category for certain classes of vehicles;	Vehicle Fleet Efficiency	Ongoing	In progress			DCC continues to implement a policy first introduced in 2016 that any applications for new Taxi Licences & Private Hire Car would only be granted on the condition that only an electric vehicle from the approved list can be placed on service. The introduction of Dundee's LEZ is also helping to accelerate the taxi trade electric vehicle adoption.	
	Expansion of ECOSTARS to include taxi / private hire operators	Vehicle Fleet Efficiency	2015	Completed	Funding for this measure is applied for annually through the Scottish Governments AQ Action Plan support funding, with running of the scheme dependent on this.		Funding to expand ECO Stars in Dundee to include taxi and private hire vehicle operators was obtained in 2014/15, with the scheme formally launched on the 11th March 2015.	Recruitment of new taxi / private hire vehicle operators remains a challenge.

Measure No.	Measure	Category	Expected / Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
							The number of members of the ECO Stars Dundee taxis / private hire vehicles scheme remained at 18 during 2022. There number of vehicles also remained at 570 at the end of 2022.	
9	**Measure M9:** DCC will investigate to initiate a Roadside Emission Testing (RET) scheme inside the AQMA and routes leading to AQMA To investigate into the establishment of a programme of RET in the AQMA.	Traffic Management	Not expected to be completed				Not progressed during 2022. This measure is unlikely to be progressed during the life of the Action Plan.	
10	**Measure M10:** DCC will ensure local air quality is fully integrated into the Local Development Plan (LDP) process and development scenarios are appropriately assessed with respect to the potential impacts on air quality Provide AQ policy within Local Development Plan with commitment to improve air quality. Produce air quality Supplementary Planning Guidance (SPG)	Policy Guidance And Development Control	2019	Completed		Supplementary Guidance and associated Technical Guidance documents for Air Quality and Planning were published in 2019.	The 2019 Local Development Plan was adopted in February 2019. Along with this Plan, the Supplementary Guidance Air Quality & Land Use Planning document was also adopted with technical guidance which can be updated as necessary.	
11	**Measure M11:** DCC will ensure effective co-ordination between climate change and air quality strategies and action plan measures Strategy to be developed to improve co-ordination between climate change and air quality strategies and action plan measures	Policy Guidance And Development Control	Ongoing	In progress	Funding for projects undertaken within this measure have been applied for through the Scottish Governments AQ Action Plan support funding scheme. Various other Climate Change focussed funding streams have been utilised.		The Sustainability & Climate Change Manager sits on the Corporate Air Quality Steering Group and also the Dundee Low Emission Zone Delivery Group to ensure synergy between AQ and CC policy. Dundee City Council declared a climate emergency in June 2019 and have worked through the Dundee Partnership to develop and deliver a citywide Climate Action Plan in support of the transition to a net-zero and climate resilient future. In line with Scottish Government and Council objectives for CAFS, tackling air quality and decarbonising transport are key objectives of this plan. Of the 62 actions in the plan, 18 are related to air quality. AQAP funding was obtained for 2021/22 to help run projects under the Sustainable Dundee banner. A Net Zero Transition Plan was also developed for the Council, addressing organisational emissions, Circular Economy, Climate Resilience and Just Transition. DCC were also successful in obtaining funding for a 4-year research project with Dundee University as part of a European Wide consortium. This citizen science project engages citizens in monitoring	

Measure No.	Measure	Category	Expected / Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
							local air quality, noise pollution and quality and accessibility of green space and active travel routes through the use of wearable apps and smart sensors. This research will help future Local Development Plans and Urban Green Planning.	
12	**Measure M12:** DCC will continue its active involvement and support of TACTRAN	Policy Guidance And Development Control	Ongoing	In progress			The Council will continue to support TACTRAN and focus on implementation of Regional Transport Strategy throughout the period of this plan. TACTRAN are included in the Dundee LEZ Delivery Group.	
13	**Measure M13:** DCC will promote the uptake and use of cleaner and/or alternative fuels where possible for transport DCC will explore the development of electric charging point infrastructure Determine strategy/advise note and annually review content Install Electric Charging Facilities in Car Parks	Promoting low emission transport	Ongoing	In progress	Various funding schemes including the Scottish Government AQAP grant scheme for which applications are made on an annual basis.		See also measures 7 and 14 Dundee City Council has continued to use the platform of its Drive Dundee Electric (DDE) campaign to successfully engage with current and potential electric vehicle owners (both in public and business) through the local media in the form of electric vehicle related articles encouraging people to make the switch to electric vehicles. These Quarterly local media electric vehicle articles continue to encourage the taxi industry to switch to electric vehicles. AQAP funding was obtained for 2021/22 to assist DDE campaigns and also to assist with the free parking in DCC multi-story carparks for electric vehicles. In 2022 Dundee City Council deployed a series of fully accessibility EV charging infrastructure trials as part of an innovation pilot project. In October 2022 Dundee City Council hosted the HEVTCP bi-annual international conference in partnership with OZEV.	
14	**Measure M14:** DCC will establish and implement a rolling programme for replacing older more polluting vehicles with newer cleaner vehicles, which comply with the prevailing EURO standard. Development of Green Procurement Strategy.	Vehicle Fleet Efficiency	Ongoing	In progress			See also Measure 7. In 2022 the corporate fleet section replaced 36 older diesel vehicles with fully electric vehicles throughout the year. There were 207 fully electric vehicles within the fleet at DCC by the end of 2022.	
15	**Measure M15:** DCC will improve the Council's vehicle fuel consumption efficiency by better management of fleet activities. Develop fleet management plan to improve fuel efficiency.	Vehicle Fleet Efficiency	Ongoing	In progress			See also Measures 7, 13 and 14. The council has increased the deployment of its GIS route optimisation system to a further 36 vehicles to further increase efficiency across the council corporate fleet.	

Measure No.	Measure	Category	Expected / Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
16	**Measure M16:** DCC will promote options for better travel planning amongst Dundee City Council employees. Review DCC Travel Plan. DCC to investigate use of annual survey on how/what modes of transport employees use to travel to work	Promoting Travel Alternatives	2023	In progress	Funding for the initial development of the Staff Travel Plan was obtained via the Scottish Government AQAP grant scheme.		See also Measures 3, 17 & 22. A Staff travel survey was completed in October 2019, with over 700 responses received. A draft Staff Travel Plan was created, with the proposed 2020 launch postponed due to the impact of the pandemic. The draft of the Staff Travel Plan was revisited with a revised version set to be launched in March 2023, with proposals for specific intranet pages to be developed providing information on staff travel measures.	
17	**Measure M17:** DCC will continue to promote and encourage their employees to consider the use of bicycles in their daily duties by providing cycle usage mileage Continue to investigate and develop the use of various incentive schemes. Develop cycling strategies. DCC to investigate use of annual survey on how/what modes of transport employees use to travel to work.	Promoting Travel Alternatives	Ongoing		AQAP funding to help part-fund an embedded Sustrans Cycling Officer has been applied for on an annual basis since 2018.		See also Measures 3, 16 & 22. An updated Dundee Cycling Strategy was launched in September 2019. This refresh of the 2016 strategy sets out how Dundee City Council will deliver its duties, powers and policies to enable and encourage more people to cycle more often. AQAP funding was obtained in 2021/22 to enable the continued employment an embedded Sustrans officer. This 'Cycling Action Plan officer' takes a lead role in developing and delivering the policies of the Council in respect of Active Travel. Dundee City Council progressed actions contained within the 2019 Dundee Cycling Strategy to enable and encourage more people to cycle more often. The Embark e-bike scheme was launched for corporate membership in summer 2022, allowing DCC staff to use the e-bikes for work journeys.	
18	**Measure M18:** DCC will assess the Council's energy needs, make recommendations and implement reductions of carbon emissions which result in corresponding reductions of NO_2 and PM_{10}. DCC to implement annual energy reduction action plan.	Policy Guidance And Development Control	On going	In progress			The Council continues to invest in a range of energy management projects within its non-domestic building estate. Physical improvements to building fabric, installation of energy efficiency measures and behavioural change campaigns have led to year-on-year reductions in carbon emissions from the Council's buildings. The organisation's carbon footprint has reduced by 49% since 2007/08 and reduced by 11% in last reporting year to 2020/21. Dundee City Council continues to lead in the transition to e-mobility and its holistic approach to city-wide adoption of electric vehicle infrastructure continues to be a benchmark for other local authorities	

Measure No.	Measure	Category	Expected / Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
							looking to replicate the city's impressive electric vehicle progress. The council has also continued its adoption of renewable energy solutions to support its electric vehicle infrastructure generating over 575kwp of solar power daily. The council has converted another 36 vehicles in 2022 to fully electric reducing a further 43,000kg of carbon dioxide pollution across the city. The council presently has over 420 electric vehicle charging points in Dundee and this is set to treble over the next few years to provide over 1200 electric vehicle charging points by the end of 2025. DCC are currently carrying out a feasibility study for energy efficiency measures in all of its publicly owned buildings in order to develop a business case for Green Growth Accelerator Funding to finance the work. The Net Zero Transition Plan outlines a number of specific actions that each Service area within the Council can take to reduce emissions.	
19	**Measure M19**: DCC to promote and support localised energy generation that doesn't compromise Air Quality in private households. Determine strategy/advise note and annually review content	Promoting Low Emission Plant	Ongoing	In progress			Non-Domestic Energy Efficiency - Basket 2 project is complete with verified annual savings of £270,000 / 730 tCO_2. Non-Domestic Energy Efficiency - Basket 3 project (known as Climate Action Property Energy Conservation Programme) is due to start in the autumn 2021/22 with projected annual savings of £260,000 / 650tCO_2, Feasibility projects to determine the suitability of Photovoltaic installations to several properties are complete and currently being considered.	
20	**Measure M20:** DCC will provide the public with relevant air quality information. Investigating the potential for uptake of an air pollution information system, such as Air Alert. Improvements to AQ website information.	Public Information	Ongoing	In progress	Funding to improve the air quality pages on the DCC website was obtained via the Scottish Government AQAP scheme. Funding to assist with communications work for the introduction of the Dundee LEZ scheme has been obtained through the Transport Scotland LEZ Support fund for local authorities.		The 2022 Annual Progress Report was submitted to the statutory consultees and is able to be accessed via the Dundee City Council website. Historical air quality monitoring data for the 2006 – 2015 period is also directly available through the DCC website. The DCC website also contains links to recent real-time and historical air pollutant data from Dundee's continuous automated monitors and passive	

Measure No.	Measure	Category	Expected / Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
	Make up to date air quality information available to the public through Councils digital website.						diffusion tube network presented on the Scottish Air Quality (SAQ) website. The Dundee Low Emission Zone webpage (www.dundeecity.gov.uk/LEZ) contains detailed reports created during the process to identify the preferred scheme for Dundee's LEZ, including air quality evidence reports created by SEPA using outputs from the National Modelling Framework (NMF) AQ City Model and Paramics Traffic modelling.	
21	**Measure M21:** DCC will continue its work to increase uptake and implementation of School and Workplace Travel Plans, particularly where likely to impact on the AQMA. DCC to ensure all relevant commercial planning applications have travel plan conditions applied in accordance with current best practice.	Promoting Travel Alternatives	Ongoing	In progress			School Travel Plans are discussed at the School Travel and Pupil Safety Working Group with commitment from Executive Director of Children & Families Service to support schools in developing their own travel plans.	
22	**Measure M22:** DCC will continue working in partnerships with TACTRAN and local active travel networks to ensure that walking and cycling initiatives are promoted and supported in Dundee. Identify walking & cycling schemes (such as Park & Cycle). Identify walking & cycling promotional opportunities around Dundee City	Promoting Travel Alternatives	Ongoing	In progress			See also Measures 3, 16 & 17. DCC continues to participate in all TACTRAN meetings focused on active and sustainable travel developments and works in partnership. A number of Places for Everyone projects were continued throughout Dundee with funding secured to move to their next stages of delivery in Broughty Ferry, Union Street, East End Campus and Ninewells.	
23	**Measure M23:** DCC will continue to work with transport providers to support and promote increased uptake of public transport modes. Promote schemes such as the SQUID card including Dundee and surrounding towns. Introduce smart and integrated ticketing.	Transport planning and infrastructure	Ongoing	In progress			2022 proved to be another exceptionally difficult year for bus passengers with industry wide driver shortages meaning many registered journeys were cancelled. With such widespread uncertainty, it was difficult to promote bus travel to a wider audience and new users. Towards the end of 2022, the recruitment of new drivers began to ease the issues that many bus passengers had been experiencing.	
24	**Measure M24:** DCC will continue to work in partnership with other organisations to promote and implement energy efficiency measures in Dundee. To implement an Annual Action Plan of energy efficiency measures.	Policy Guidance and Development Control	Ongoing	In progress			The Council has invested approximately £47m in its External Wall Insulation programme with almost 5,000 residents in Dundee seeing their properties thermally upgraded. These improvements played a significant part in creating warmer homes with reduced fuel bills for residents as well as tackling fuel poverty across the city which, up until the current energy and cost of living	

Measure No.	Measure	Category	Expected / Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
							crisis, continued to experience a downward trend. The Council has completed its second phase of installation of energy conservation measures within its own estate using an Energy Performance Contracting model. In total £4.4 million has been spent on 26 sites with guaranteed energy savings of around £500,000 per annum. This has resulted in annual savings of 1,800 tonnes of CO_2. Measures have included LED Lighting, more efficient hardware/software (motors, boiler burners, control of pumps), Combined Heat and Power, insulation, solar PV etc.	
25	**Measure M25:** DCC Environment Department will comment upon planning applications to ensure that all relevant air quality issues are highlighted and mitigation measures are considered wherever possible	Policy Guidance and Development Control	Ongoing	In progress			Officers from the pollution team within Community Safety and Protection respond to consultations and check weekly planning lists and respond to the Planning Officers on all applications which may adversely impact on local air quality. 27 responses were made in the 2022 calendar year.	
26	**Measure M26:** DCC will enforce statutory legislation to control smoke, dust, fumes or gas emissions from commercial and domestic premises which are causing a nuisance or are prejudicial to health. DCC will continue to monitor and enforce statutory legislation in this area.		Ongoing	In progress			For the period 1st January to 31st December 2022, officers investigated a total of 25 relevant complaints of which 17 (68%) had been resolved with 8 still being investigated.	
27	**Measure M27:** DCC will enforce relevant legislation to reduce the burning of commercial and domestic waste. DCC will continue to monitor and enforce legislation in this area.		Ongoing	In progress			During 2022, officers investigated 9 complaints of smoke from commercial waste burning, which were all resolved, and 31 complaints from domestic waste burning (bonfires), with 2 still being investigated.	
28	**Measure M28:** DCC will promote composting in a bid to reduce pollution from domestic bonfires. Reintroduce discount / promotion campaign for compost bins	Policy Guidance and Development Control	Ongoing	In progress			In March 2020 a charge was introduced for the collection of garden waste. Householders who decided not to sign up were provided with different options for disposal of garden waste and discouraged from using the general waste bin or burning waste. DCC continued to offer a home composting bin as an alternative to the annual garden waste collection permit.	

Measure No.	Measure	Category	Expected / Actual Completion year	Measure Status	Funding Status	Key Milestones	Progress	Barriers to implementation
29	**Measure M29:** DCC will continue to monitor a range of air pollutants throughout Dundee and make the monitoring information freely available to the public in an easily understandable form. Continued support for Dundee Air Quality Monitoring Network	Public Information	Ongoing	In progress			See **Chapter 3** of this report for details of the automatic and non-automatic monitoring locations in Dundee. See **Measure 20** re availability of air quality monitoring data on both the Dundee City Council and Scottish Air Quality websites and the 2022 Annual Progress Report being available for viewing and download via the DCC website.	
30	**Measure M30:** DCC will ensure that all air quality monitoring data reported to the public is both accurate and precise by implementing quality control measures Regular calibrations and filter changing of continuous monitoring equipment in DCC's air quality stations. At least annual audit of air quality stations' equipment. Appropriate use and care of NO_2 diffusion tubes regularly deployed around the City Council area.	Public Information	Ongoing	In progress			See **Appendix C: Supporting Technical Information / Air Quality Monitoring Data QA/QC** of main report for details of processes. All diffusion tube changeovers were in accordance with the 2022 diffusion tube calendar.	
31	**Measure M31:** DCC will establish additional monitoring sites across the City in locations where poor air quality is suspected. DCC will continue to carry out and report on their statutory duties under the Review & Assessment process for LAQM.	N/A	Ongoing	In progress			See Measure 29 regarding pollutant monitoring locations. Two new passive diffusion tube (PDT) monitoring locations were introduced at the start of 2022. One was in response to a planning application, the other in response to the introduction of the Dundee LEZ. During 2022 there were amendments to three PDT monitoring locations due to infrastructure to which PDTs were attached being removed or becoming inaccessible. See **Chapter 3** of this report for further details.	
32	**Measure M32:** DCC will implement road traffic counts to inform the review and assessment process. Undertake classified traffic counts.	Traffic Management	Ongoing	In progress			Traffic counts of the Lochee Road corridor were undertaken in March 2022 to support the SEPA air quality model that was used to model air quality impacts of possible road infrastructure changes along this corridor. Annual road count data (as AADT) from the council's long-term Road Traffic Reduction Act (RTRA) Sites from 2005-2022 is presented in **Appendix E** of the main report.	

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how local concentrations of the main air pollutants compare with the objectives.

Dundee City Council undertook automatic (continuous) monitoring at 10 sites during 2022. Table A.1 in Appendix A shows the details of the sites. Three different PM_{10} monitors (CM3, CM13, CM16) are co-located at the Broughty Ferry Road site to help improve data accuracy and validity. There were no changes to the continuous monitoring sites in 2022. The NOx analyser at the Mains Loan site experienced several problems during 2022 resulting in a lower than anticipated data collection percentage for this calendar year.

In recent years, the NO_x analyser at the Meadowside monitoring station was replaced in March 2021, while Defra upgraded the NOx analyser at the AURN affiliated site at Mains Loan in September 2021.

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

National air quality monitoring results are made available at www.scottishairquality.co.uk . Further analysis of the 2022 monitoring is also available on the Air Quality in Scotland website within an annual summary report prepared by Ricardo Energy & Environment. This can be accessed via: www.scottishairquality.scot/assets/reports/365/Dundee_City_annual_2022.html

3.1.2 Non-Automatic Monitoring Sites

Dundee City Council undertook non- automatic (passive diffusion tube (PDT)) monitoring of NO_2 at 88 sites during 2022. Table A.2 in Appendix A shows the details of the sites.

Maps showing the location of the monitoring sites are provided in Appendix A. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C.

Two new PDT locations were added in 2022 (DT40 Marketgait (Palais Crt) and DT244 (Harefield Rd). These replaced sites DT242 (Clepington Rd (Mains Loan), and DT243 Victoria St (Eagle Mill)) as it was decided that further monitoring was not required owing to recent levels complying with the Scottish AQO, and nothing identified to suggest that levels would increase.

DT244 was added in response to a planning application that would introduce a new receptor closer to a road where traffic flow levels have increased in recent years. DT40 was added following a review of the traffic modelling outputs of the preferred LEZ scheme area which indicated a slight increase in the level of LEZ non-compliant vehicles using a section of the West Marketgait, south of the Hawkhill roundabout. A PDT had previously been installed at the DT40 location, however monitoring there ended in 2012 due to continued compliance with the Scottish AQO at that time.

Three other PDT locations were amended during 2022 due to infrastructure holding the PDTs either being removed or becoming inaccessible due to construction works. DT83 (Forfar Rd (104)) was replaced by DT245 (Forfar Rd (104)_2), DT13 (Clepington Rd / Forfar Rd) was replaced by DT246 (Clepington Rd / Forfar Rd_2) and DT235 (South Marketgait/Nethergate) was replaced by DT247 (South Marketgait (street sign)).

3.1.3 Other Monitoring Activities

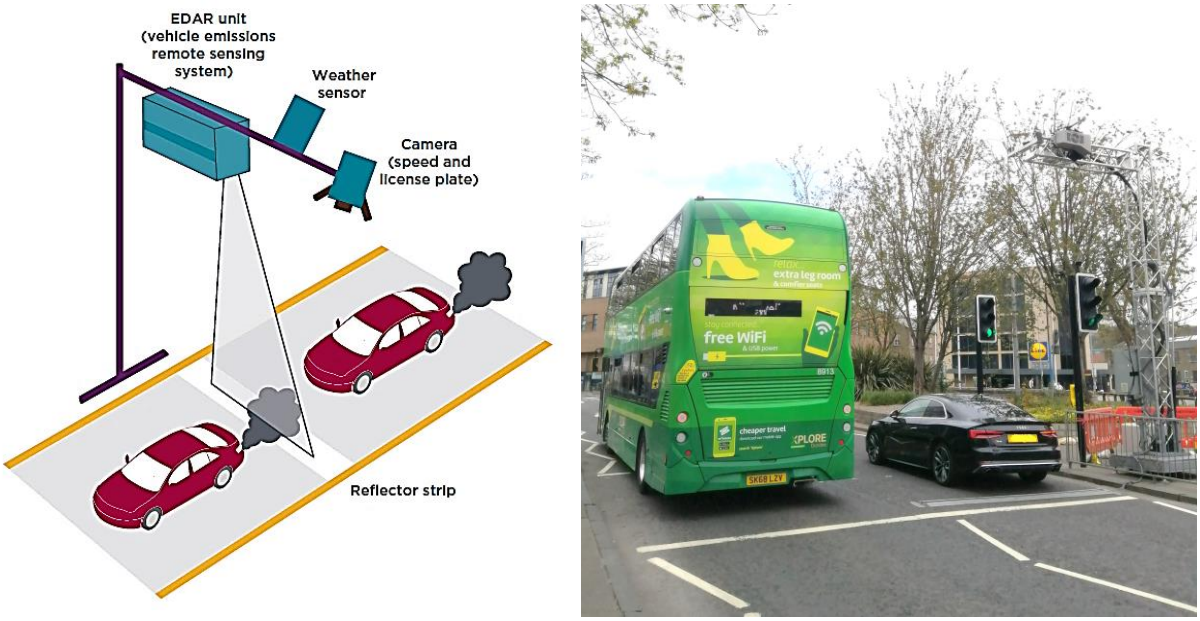
No additional monitoring activities were undertaken by the local authority in 2022.

During May 2022, Transport Scotland facilitated real-world emissions testing at a location on the West Marketgait as a part of a remote sensing study to assess real-world vehicle emissions in the four main cities in Scotland. Transport Scotland has formed a consortium with Hager Environmental & Atmospheric Technologies (HEAT), the International Council on Clean Transportation (ICCT), and Element Energy to collect real-world emissions data from on-road vehicles using remote sensing technology and develop air quality monitors adjacent and within proposed low emission zones. As part of the Air Remote Sensing Project, Emissions Detection and Reporting (EDAR) systems have been deployed near the proposed low emission zones in Aberdeen, Dundee, Edinburgh and Glasgow in 2021 and 2022. Further trials are scheduled to collect more data in these cities in 2023. The EDARs measure real-time vehicle emissions of air pollutants, including nitrogen oxides (NO and NO_2), carbon monoxides (CO), and hydrocarbons (HC). Figure 3 provides an illustration and photo of the EDAR installation in Dundee.

A report was published in June 2023 on the emissions testing campaigns carried out in 2021 in Edinburgh & Glasgow [2], however this does not include analysis of the monitoring carried out in Dundee in 2022. This will be the subject of a future report.

[2] https://www.trueinitiative.org/data/publications/assessment-of-real-world-vehicle-emissions-in-scotland-in-2021

Figure 3 Illustration of how EDAR unit measures exhaust emissions from on-road vehicles (left) and an EDAR system measuring emissions from a vehicle in Dundee (right)



3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past five years with the air quality objective of 40 µg/m^3.

For diffusion tubes, the full 2022 dataset of monthly mean values is provided in Appendix B.

The procedure specified in paragraphs 7.82 to 7.85 of statutory technical guidance LAQM.TG (22) was used to estimate the concentrations at the nearest receptor.

The annual mean background concentration used in the calculation was 11.8 µg/m^3 (from DT185) for city centre sites, and 9.4 µg/m^3, the average of concentrations from six urban background locations (DT7, DT9, DT155, DT185, DT223 and DT82) for the remainder. The above methodology has been shown in previous reports to under-estimate NO_2 concentrations at building façades in street canyon environments. Potential exceedances (> 36 µg/m^3) of the NO_2 annual mean that were identified at relevant locations near the monitoring locations are shown in Table 3.1. This information is also presented in Table C.3 in Appendix C under the **NO_2 Fall-off with Distance from the Road** heading.

Table 3.1 Locations of Potential Exceedance of the NO_2 annual mean AQO in 2022

Site ID	Location	2022 Bias Adjusted NO_2 Annual Mean (µg/m^3)	2022 Predicted annual mean NO_2 concentration at Receptor (µg/m^3)
DT 205	West Marketgait/Old Mill (23)	36.9	36.9
DT 70	Victoria Rd/Hilltown	36.3	31.3

The highest NO_2 annual mean concentrations predicted at relevant receptors were on the West Marketgait, which is part of the inner ring road; and the main bus corridor (Victoria Road/Hilltown). Both of these locations are within the Dundee AQMA. 2022 is the first year where no NO_2 monitoring location on the North West Arterial Route (Logie Street and Lochee Road) showed a potential exceedance of the NO_2 annual mean AQO.

Long term trends in NO_2 concentrations at automatic monitors with at least 5 years data capture are shown in Figure 8**.** The trend at the urban background site at Mains Loan is relatively stable.

The greatest improvements have been in Meadowside where action plan measures have been put in place, including works that have increased the separation distance between the active carriageway and receptors. Traffic movement restrictions have also been put in place on this section of Meadowside through restricting access to the northbound carriageway for all vehicles other than buses and taxis. The lockdown measures introduced as a result of the COVID-19 pandemic slightly accentuated the long-term trend downwards at some sites during 2020 and 2021, however improvements continue to be maintained. The automatic monitor at Lochee Road is showing the next best improvement. NO_2 concentrations at all locations are below the AQO, with AQ modelling of the impact of the proposed LEZ scheme on NO_2 concentrations within the LEZ area suggesting that concentrations will be further reduced.

An overview of how NO_2 annual mean concentrations are improving in different areas across the city can be seen in maps and graphs shown in Appendix D**.**

Table A.4 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 exceeded more than 18 times per year. No exceedances of the hourly mean objective were identified at automatic monitoring locations in 2022. No exceedances of the hourly mean objective were indicated by the diffusion tube annual mean concentrations in 2022 as none exceeded 60µg/m3. No automatic monitoring locations recorded occasions when the concentration was over 200µg/m^3 in 2022.

The Lochee Road automatic monitor is the only location in Dundee where the hourly mean objective has previously been exceeded. There have been no exceedances of this objective at this automatic monitor for the past 9 years. Figure 9 shows the long-term trend in the 99.8th percentile concentration of hourly means at Lochee Road. The trend line for the 16-year period that hourly levels have been monitored has been drawn using an Excel simple regression statistical program. In 2019 a negative value was identified for the first time since the AQMA for the hourly objective was declared in 2013. Diffusion tube monitoring and dispersion modelling show that the automatic monitor is not sited in the most polluted location.

The 2020 APR reported that it was considered that there should be an established downward trend before revoking the AQMA for the NO_2 hourly mean objective. While this trend has been downward since 2019, levels recorded in 2020 and 2021 will have been impacted on by restrictions associated with the COVID-19 pandemic, meaning that 2022 is the first complete year since 2019 that may be considered unimpacted. As such, it is considered that a further year of monitoring should be undertaken before concluding that this part of the AQMA can be revoked.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past five years with the air quality objective of 18µg/m^3. As per the Scottish Government Guidance note published on 17 May 2023[3], annual mean PM data collected using Palais Fidas 200 is to be corrected using factors (PM_{10} divided by 0.909 and $PM_{2.5}$ multiplied by 1.06) as identified by the "Scottish Government Equivalence Study to Investigate Particulate Matter Monitoring In Scotland Using The Fidas 200"[4], with local authorities to present both measured and corrected data for LAQM reporting. Table A.5 contains both measured and corrected data results.

Annual mean PM_{10} concentrations at monitoring sites with at least five years data are shown in Figure 10 and Figure 11. An improving trend is evident at all current monitoring locations however the pandemic impacts has slightly accentuated the long term trend downwards at some sites. Slight increases in the annual mean AQO for PM_{10} were observed across all of the PM monitoring network in 2022, however no site exceeded the Scottish annual mean objective. It is noted that PM levels can be influenced by transboundary events with PM pollution episodes co-inciding with easterly winds. One example of such an episode occurred in late March 2022 and lasted for around a week. Emissions blown in from continental Europe added to locally emitted pollutants (industrial, transport and agricultural) which were not dispersed due to warm, calm weather conditions, resulting in higher concentrations of PM_{10} being recorded at monitoring stations in Dundee. A 'Pollution episode report'[5] for this episode was published on the Scottish Air Quality website on 25 March 2022 with specific reference to monitoring stations in Dundee.

The largest decreasing trend is evident at Stannergate (OSIRIS). Traffic is not the only source of PM_{10} in the Stannergate area as it is adjacent to the Port of Dundee where numerous activities are undertaken that could give rise to fugitive emissions. 2021 monitoring data showed an increase compared to previous years, possibly contributed to by a significant amount of earth moving within the Port area to the south-east of this monitor as a part of the project to increase set down capability within the Port. There was a slight increase on the 2021 PM_{10} annual mean level during 2022 at the Stannergate monitor, with the influence of transboundary events being considered as the main contributor of this in line with other PM_{10} monitors across the city.

[3] www.scottishairquality.scot/news/local-authority-guidance-note-laqm-reporting-scottish-pm-data

[4] https://www.scottishairquality.scot/technical-reports/equivalence-study-investigate-particulate-matter-monitoring-scotland-using-fidas

[5] https://www.scottishairquality.scot/news/latest-air-pollution-episode

Table A.6 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 seven times per year.

Increases in the number exceedences of the PM_{10} daily mean objective levels were observed during 2022. One OSIRIS location (Albert Street) exceeded the number of permitted days (7) per year, with 12 exceedences predicted at this location. These results should be treated with caution as OSIRIS units are indicative monitors and, while reasonable for annual mean data, are known to over-estimate the number of daily exceedences due to the correction methodology required to correct data prior to reporting.

As outlined above, transboundary events can have a great influence on PM_{10} levels, and one such example of a transboundary pollution episode was identified during late March 2022. During this pollution episode, there were 6 exceedences of the PM_{10} daily mean limit at the Albert St OSIRIS monitor. Further analysis of the other dates where the daily mean limit had been exceeded at this location identified they co-incided with easterly winds during the months of March, April and May. Unpredictable events such as road works, fires, road gritting and demolition and construction activities are also normally linked to daily mean limit exceedances, with a period of roadworks leading to traffic congestion on Albert Street being identified in another instance.

Figure 12 shows the frequency of the daily mean PM_{10} concentrations greater than 50µg/m^3 recorded at the real-time monitors. This chart demonstrates that the 2022 Albert Street exceedance of the daily mean objective was the first such exceedence of this objective in Dundee since 2018, with the next previous exceedence being in 2015.

All of the automatic monitoring sites with at least 5 years data capture show an improving trend. It is hard however to draw conclusions from the analysis of trends in short-term PM_{10} exceedances because apart from the influence of annual transboundary events (usually in March and April) most are caused by transient and sometimes unpredictable events such as road works, fires, road gritting and demolition and construction activities.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A compares the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past five years with the air quality objective of 10µg/m^3. As per the Scottish

Government Guidance note published on 17 May 2023[6], annual mean PM data collected using Palais Fidas 200 is to be corrected using factors (PM_{10} divided by 0.909 and $PM_{2.5}$ multiplied by 1.06) as identified by the "Scottish Government Equivalence Study to Investigate Particulate Matter Monitoring In Scotland Using The Fidas 200"[7], with local authorities to present both measured and corrected data for LAQM reporting. Table A.7 contains both measured and corrected data.

Dundee City Council began monitoring for $PM_{2.5}$ at the background site at Mains Loan in October 2017, with a further analyser installed at the Lochee Road monitoring station in March 2018. Three more $PM_{2.5}$ analysers were installed in March 2019 (Whitehall Street, Seagate and Meadowside). The most recent installation being at the Urban Industrial site on Broughty Ferry Road in January 2020. All six of the $PM_{2.5}$ monitors are Palas Fidas analysers measuring both PM_{10} and $PM_{2.5}$.

No exceedances of the $PM_{2.5}$ annual mean objective were observed at any of the reference equivalent Palas Fidas monitoring locations in 2022 with or without the applied correction factor.

Four of the OSIRIS monitors are at roadside PM_{10} monitoring locations (Albert Street, Logie Street, Myrekirk Road, Stannergate) and therefore represent relevant areas for $PM_{2.5.}$ Broughty Ferry Road is an Urban Industrial monitoring location. The DEFRA Guidance does not recommend calculating $PM_{2.5}$ from PM_{10} at Industrial sites due to their unique site-specific characteristics. Chapter 7 of LAQM.TG (22) provides methodology for estimating $PM_{2.5}$ concentrations from PM_{10} measurements, with options provided for when local sites measuring both PM_{10} and $PM_{2.5}$ are and are not available. Paragraph 7.119 of LAQM.TG (22) advises that when local sites measuring both PM_{10} and $PM_{2.5}$ are available, the 'PM_{course}' can be calculated for the site by subtracting the annual average $PM_{2.5}$ concentration from the annual average PM_{10} concentration. This PM_{course} can then be used at sites of the same classification to estimate the $PM_{2.5}$ by subtracting the calculated PM_{course} split. Alternatively, Paragraph 7.120 provides a methodology of using a nationally derived factor for either background or roadside locations for when there are no local sites measuring both PM_{10} and $PM_{2.5}$. Prior to 2022, the prediction methodology used an assumed ratio of 0.7 (as described in LAQM.TG (16) (April 2021) (paragraph 7.111)) to estimate $PM_{2.5}$ levels. As there are local sites measuring both PM_{10} and $PM_{2.5}$ in Dundee, a local PM_{course} split has been identified for roadside locations (corrected FIDAS date for Lochee Rd, Meadowside, Seagate, Whitehall St), with the overall figure for Dundee in 2022 being 6.8**.**

[6] www.scottishairquality.scot/news/local-authority-guidance-note-laqm-reporting-scottish-pm-data

[7] https://www.scottishairquality.scot/technical-reports/equivalence-study-investigate-particulate-matter-monitoring-scotland-using-fidas

Table 3.2 shows estimated $PM_{2.5}$ annual mean levels, with locations where the $PM_{2.5}$ annual mean objective was estimated to be exceeded highlighted in **bold**. For years prior to 2022, the concentrations shown in Table 3.2 are estimated $PM_{2.5}$ concentrations at indicative analysers using the assumed ratio of $PM_{2.5}$ to PM_{10} of 0.7. For 2022 onwards, the estimated $PM_{2.5}$ levels are obtained using the PM_{course} identified through using local site data calculations. This

Estimated levels using the PM_{course} methodology resulted in one location (Albert Street) potentially exceeding the 10ug/m^3 annual mean objective level for 2022. As this data is obtained via an indicative monitor (OSIRIS), consideration of AQMA declaration for $PM_{2.5}$ is considered unnecessary at this stage however ongoing monitoring and assessment should continue.

Table 3.2 Estimated $PM_{2.5}$ Annual Mean Concentrations 2015 to 2022*

Year	2015	2016	2017	2018	2019	2020	2021	2022
Scottish Annual Mean Objective	*10*	*10*	*10*	*10*	*10*	*10*	*10*	*10*
Logie St (Osiris)	**10.9**	9.7	10.2	**13.2**	**10.8**	9.8	8.0	9.2
Myrekirk Tce (Osiris)	**12.9**	**10.9**	8.4	9.5	8.6	7.7	8.9	8.6
Albert St (Osiris)	**13.3**	**10.8**	10.0	**12.3**	**10.6**	9.7	7.8	**11.1**
Stannergate (Osiris)	**18.8**	**14.6**	9.8	8.3	9.3	8.1	**11.5**	10.0

* for 2015 to 2021 estimated $PM_{2.5}$ levels were obtained using an assumed ration of 0.7. Estimated $PM_{2.5}$ levels from 2022 onwards were obtained using the PM_{course} split methodology as outlined paragraph 7.119 of LAQM.TG (22).

3.2.4 Sulphur Dioxide (SO_2)

Dundee City Council does not currently monitor SO_2.

3.2.5 Carbon Monoxide, Lead and 1,3-Butadiene

Dundee City Council does not currently monitor any of these pollutants.

4 New Local Developments

4.1 Road Traffic Sources

Under this section the Council is required to identify any of the following which are new:

• Narrow congested streets with residential properties close to the kerb;

• Busy streets where people may spend one hour or more close to traffic;

• Roads with a high flow of buses and/or HGVs;

• Junctions;

• New roads constructed or proposed;

• Roads with significantly changed traffic flows; and

• Bus or coach stations.

Since the Annual Progress Report 2022 there have been none of the following identified as being new:

• Busy streets where people may spend one hour or more close to traffic;

• Roads with a high flow of buses and/or HGVs;

• Junctions;

• New roads constructed or proposed;

• Bus or coach stations.

Annual road count data (as AADT) from Dundee City Council's long-term Road Traffic Reduction Act (RTRA) Sites from 2005-2022 are presented in **Table E.1**. Unfortunately, data for some previously reported RTRA sites have not been available since 2020. Table E.1 shows that COVID-19 lockdown restrictions put in place on travel and work in 2020 greatly reduced road traffic levels across the city. Traffic levels have not fully returned to pre-pandemic levels, with traffic flows across the monitoring locations being around 10% lower than 2019 pre-pandemic levels.

Table E.2 shows the percentage growth at each of the RTRA sites since 2005. Only one site, Tay Bridge, had experienced a significant increase (>10%) in traffic flows over the period ending 2019. There is currently no relevant exposure within 10m of this location. Data for 2022 shows reduced traffic levels across the sites in Dundee compared to 2019 pre-pandemic levels. Consequently, updated assessments of NO_2 and PM_{10} are not required for those RTRA Sites where there is relevant exposure.

Bus priority measures were introduced on Meadowside in March 2021. The measures prevent general traffic (cars etc.) going north bound at the Meadowside signals near the Wellgate centre, and diverts them onto Bell Street from Meadowside to join at Victoria Street west of the Meadowside signals. As such, the flow of general traffic past the Meadowside automatic monitor is reduced, however diverted traffic now passes by the NO_2 passive diffusion tubes located on Victoria Road.

Road infrastructure changes on Lochee Road at the Cleghorn Street / Rankine Street were implemented in early 2022 to benefit road safety and to help ease congestion caused by vehicles turning right into these streets from Lochee Road. This included the installation of a central island to prevent drivers from turning right from Cleghorn Street on to Lochee Road, from Lochee Road on to Cleghorn Street, and from Rankine Street on to Lochee Road. Drivers can now no longer cross Lochee Road from Rankine Street on to Cleghorn Street or vice-versa.

4.2 Other Transport Sources

None of the following transport sources have been identified as new since the 2022 Annual Progress Report:

- Airports;
- Locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m;
- Locations with a large number of movements of diesel locomotives and potential long-term relevant exposure within 30m; and
- Ports for shipping.

4.3 Industrial Sources

Under this section the local authority is required to identify any of the following which are new:

- **Industrial installations:** new or proposed installations for which an air quality assessment has been carried out;
- **Industrial installations:** existing installations where emissions have increased substantially or new relevant exposure has been introduced;
- **Industrial installations:** new or significantly changed installations with no previous air quality assessment;
- Major fuel storage depots storing petrol;
- Petrol stations; and
- Poultry farms.

Industrial sources are regulated by the Scottish Environment Protection Agency (SEPA) under the Pollution Prevention and Control Regulations (PPC). Local authorities also have controls over

smaller industrial and commercial sources, largely through the Clean Air Act and its associated control of stack heights. As a result of these controls, there should be few sources that may be relevant to local authorities under the Local Air Quality Management (LAQM) regime. The majority of these sources will have been previously addressed and the focus is, therefore, on new installations and those with significantly changed emissions or new exposure.

A list of industrial processes in the city that are regulated by the Scottish Environmental Protection Agency (SEPA) is provided in Appendix F**.**

- **New or Proposed Installations for which an Air Quality Assessment has been Carried Out**

See Appendix F for details of industrial installations present within Dundee. No new or proposed installations resulted in an air quality assessment being carried out during 2022.

- **Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced**

No existing installations have increased emissions significantly or had new relevant receptors introduced near to them.

- **New or Significantly Changed Installations with No Previous Air Quality Assessment**

SEPA advised that a substantial variation to an existing permitted site within the Port of Dundee was granted in May 2022. In addition, a new PPC A permit relating to a timber treatment process within the Port of Dundee was granted in 2022. SEPA have advised that there are no emissions to air from this process.

- **Major Fuel (Petrol) Storage Depots**

The assessment considers benzene, with respect to the 2010 objective. There are no major fuel (petrol) storage depots within the Local Authority area.

- **Petrol Stations**

The assessment considers benzene with respect to the 2010 objective. Large petrol stations, where the annual throughput is more than 2000m^3 of petrol (2 million litres per annum) and with a busy road nearby (i.e. >30,000 annual average daily traffic flows) require consideration where there is relevant exposure (e.g. residential properties) within 10m of the pumps. All existing petrol stations have been assessed previously and there are no residences within 10m of the pumps.

Dundee City Council confirms that there are no new petrol stations meeting the specified criteria.

- **Poultry Farms**

Farms housing in excess of: 400,000 birds if mechanically ventilated; 200,000 birds if naturally ventilated; and, 100,000 birds for any turkey unit, require consideration if there is residential exposure within 100m of the poultry units. The assessment needs to consider only PM_{10}.

Dundee City Council confirms that there are no poultry farms meeting the specified criteria in Dundee.

4.4 Commercial and Domestic Sources

Under this section the Council is required to identify any of the following which are new since the last Annual Progress Report:

- Biomass[8] combustion plant – individual installations (50kW to 20MW);
- Areas where the combined impact of several biomass combustion sources may be relevant;
- Areas where domestic solid fuel burning may be relevant; and
- Combined Heat and Power (CHP) Plant.

Since the 2022 Annual Progress Report there have been no new biomass combustion installations nor areas identified where the combined impact of several biomass sources may be relevant. Smoke Control Orders cover most of the local authority area and there are currently no areas identified with significant solid fuel use, though regular enquiries / complaints to the Council about domestic solid fuel burning and planning applications for the installation of wood/solid fuel burning stoves, are received.

The requirement to consider CHP Plant is a new requirement that local authorities have had to report since the APR 2016. No new CHP plants were identified during 2022.

4.5 New Developments with Fugitive or Uncontrolled Sources

Under this section the Council is required to identify any of the following potential sources of fugitive or uncontrolled particulate matter, which are new:

- Landfill sites;
- Quarries;
- Unmade haulage roads on industrial sites;
- Waste transfer stations etc.; and
- Other potential sources of fugitive particulate emissions.

[8] Note (from Defra FAQ 2009): the term 'biomass' strictly applies to all solid fuels made from plants, i.e. coal, smokeless fuels, wood, straw etc... However, the term biomass is now frequently taken to be synonymous with renewable fuels such as wood and straw. For the purposes of air quality review and assessment the strict definition of biomass is applicable.

The Port of Dundee is an ever-changing area of activity with many varying projects to improve the facilities and capabilities of the Port undertaken in recent years. This has included the addition of increased lifting capabilities and a new quayside at the eastern end of the Port to help bring forward opportunities for decommissioning and the offshore wind farm industry. The Port also provides accommodation for jack up drilling rigs for inspection, repair and maintenance of these jack up rigs which may remain at the Port for many months at a time. The Port is a major grain handling port and has the largest grain drying facility in Scotland located within the Port boundary.

Work to create an extensive set down area for the storage of items arriving to the Port, such as wind turbine components, was undertaken in 2021 with a significant amount of earthwork carried out. The access point to this area is approximately 200m south of the Stannergate PM_{10} OSIRIS unit. A reported sharp increase in the annual mean PM_{10} concentration at this indicative monitor compared to recent years was reported in the 2022 APR, with a possible source being this project. The PM_{10} annual mean concentration at the Stannergate OSIRIS monitor was slightly higher again in 2022, however remained below the Scottish air quality objective level for PM_{10} annual mean.

As many of the activities carried out at the Port are potential sources of fugitive particulate emissions, pollutant monitoring will continue at locations adjacent to the port.

5 Planning Applications

This section identifies any major planning applications that were granted permission during 2022 that may impact on air quality. All planning applications referred to in Table 5.1 can be found on the Council's website (https://idoxwam.dundeecity.gov.uk/idoxpa-web/) using the reference numbers detailed below with each case.

Planning Application	Application Number	Air Quality Impacts
Proposed Housing Development Comprising of 56 Flats and 167 Houses (223 Units) at Mains Loan	20/00098/FULM	This was approved subject to conditions on 17 February 2022. Planning permission was approved subject to conditions for a housing development of 223 units comprising of 56 flats and 167 houses on the site of the former James Keiller Buildings, Mains Loan. An Air Quality Assessment considering the air quality impacts of the development during the construction phase (primarily the impacts of dust on the surrounding neighbourhood) and the impact on local air quality from the increase in new vehicle trips generated by the development was submitted during the application process. In respect of vehicle movement, the conclusion of the report that "no significant air quality impact is predicted on existing or future residents as a result of the development" was accepted by Environmental Health (Air Quality). Environmental Health (Air Quality) recommended planning conditions be applied to ensure the mitigation measures listed in the AQA are included in a Construction Environmental Management Plan (CEMP) that should be submitted for approval in writing by the Council prior to the commencement of works on site. This condition was attached to the planning consent.

Construction of Education and Community Facilities with Associated Parking, Landscaping, External Sports Pitches, Footpaths and Infrastructure	22/00317/FULM	This was approved subject to conditions on 27 October 2022 Planning permission was approved subject to conditions for the construction of an education and community facilities building with associated parking, landscaping, external sports pitches, footpaths and infrastructure at a 14.38ha area site. The education facility would incorporate the school rolls of Braeview Academy and Craigie High School, providing a new education campus for an anticipated 1,879 pupils. The proposed education and community facilities building would be located towards the northwest corner of the site, with a 137-space staff and visitor car park to the south. The proposals include associated external sports infrastructure, including 2 floodlit pitches to the north, floodlit sports courts to the southwest and a grass track and field area to the south. The proposal also includes associated footpaths and roads, drainage provision and landscaping. Environmental Health (Air Quality) advised that they had no objection to the proposed development, and that as the heating for the proposed development would be entirely electric an air quality assessment was not required. Planning conditions attached to the development included: - a Travel Plan must be in place and agreed with the Local Authority within one year of the development opening. - electric car charging points shall be provided at a location and number to be approved prior to opening of the development. - details of secure and covered cycle parking

Erection of Purpose-Built Student Accommodation, South Ward Road	22/00493/FULM	This was approved subject to conditions on 15 November 2022. Planning permission was granted for the erection of purpose-built student accommodation, comprising 242 bedrooms with associated amenity space, landscaping and access. An air quality report was submitted in support of the application. Environmental Health (Air Quality) recommended planning conditions be applied to ensure mitigation measures recommended within the Air Quality Assessment are implemented during construction, and that full details of the proposed heating system (and / or additional standby/emergency power generators) be agreed with the Council. Subject to a low emissions heating system being provided, the proposed development would have no significant impact on air quality. These conditions were attached to the planning consent.
Erection of new office block with 2 no. commercial units (Class 1, 2 and 3) at ground level, associated vehicular access, parking and sub-station.	22/00524/FULM	This was approved subject to conditions on 22 December 2022. Due to final decisions on aspects such as heating and stand-by power provisions not made, recommended planning conditions were put forward by Environmental Health (Air Quality). These included that full details of proposed means of providing heating (and/or additional standby/emergency power) to the building, including details of any flues or extracts or similar related works shall be submitted to and approved in writing by the planning authority. An air quality assessment may also be required depending on the size, location and fuel type of any combustion appliances. These conditions were attached to the planning approval.

6 Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

Monitoring data for 2022 indicates that were no potential exceedances of the NO_2 annual mean objective (40µg/m^3) at receptor locations within the Dundee AQMA. The NO_2 annual mean at real-time monitors were lower than recorded for 2020, with a main contribution to this improvement being the introduction of fully electric buses to the Dundee bus network in January 2022 that Xplore Dundee introduced on routes covering Lochee Road. 80% of the bus movements on the Lochee Road corridor involve the Xplore Dundee electric buses, with the other main operator, Stagecoach, running the cleanest LEZ compliant EURO VI vehicles on their routes. Traffic levels measured at the RTRA sites indicated that traffic still remains lower than 2019 pre-pandemic levels, with traffic flows being around 10% lower than 2019 pre-pandemic levels across these monitoring locations.

No exceedances of the NO_2 hourly mean objective were identified by automatic monitors or indicated by diffusion tubes in 2022. Lochee Road is the only area of the city where the hourly AQO has been exceeded previously. No exceedances of the hourly mean were recorded in 2022 and for the past 9 years the objective (18 exceedances are allowed) has been achieved. The trend line in the 99.8th percentile concentration showed a negative value for the first time in 2019 since the AQMA for the hourly mean was declared in 2013. This downward trend has continued, however, the impacts of the COVID-19 restrictions on road traffic levels during 2020 and 2021 will have been the main influence on the reduced NO_2 concentrations during those years. In 2022 we advised that it was considered necessary to refrain from removing the AQMA for the hourly mean AQO until it is clear that traffic levels have stabilised and the downward trend is evident. While traffic levels appear not to be increasing, a further year of monitoring data will help with coming to a decision on when removal of the NO_2 hourly mean aspect of the AQMA is appropriate.

No exceedances of the PM_{10} annual mean objective (18µg/m^3) were predicted during 2022, although levels across Dundee had increased slightly on 2021 levels. An improving trend remained evident at all current monitoring locations. The largest decreasing trend is evident at Stannergate (OSIRIS).

The PM_{10} daily mean objective (50µg/m^3, not to be exceeded more than 7 times per year) was met at all reference equivalent monitoring locations during 2022. The objective was exceeded at one location (Albert Street) where an indicative OSIRIS PM_{10} monitor is located, however these results should be treated with caution due to OSIRIS units being known for over-estimating daily means

due to the correction methodology utilised prior to reporting. In addition, transboundary pollution episodes were linked to most of the days that the daily mean level was exceeded.

It is hard to draw conclusions from any analysis of trends in short-term PM_{10} exceedances because apart from the influence of annual transboundary events (usually in March and April), most are caused by transient and sometimes unpredictable short-term events such as road works, fires, road gritting and demolition and construction activities.

No monitored exceedances of the $PM_{2.5}$ annual mean objective (10µg/m^3) were recorded in Dundee during 2022. One potential exceedance of the $PM_{2.5}$ annual mean objective (10µg/m^3) was identified at Albert Street using the new estimation methodology described in LAQM.TG(22). As this data is obtained via an indicative monitor (OSIRIS), consideration of AQMA declaration for $PM_{2.5}$ is considered unnecessary at this stage however ongoing monitoring and assessment should continue.

6.2 Conclusions relating to New Local Developments

Major developments containing residential properties adjacent to sections of the road network with high traffic flow were granted permission in 2022. Conditions were attached to each consent requiring mitigating measures to protect the amenity of future residents.

Traffic flows from the council's Road Traffic Reduction Act Sites from 2022 were reviewed, with traffic flow levels across the count sites remaining at around 90% of the 2019 pre-pandemic level. Measures that will assist the flow of traffic through a junction on Lochee Road were completed in early 2022. No new areas requiring assessment were identified. There were no new 'other transport' sources identified in Section 4 during 2022.

No new industrial sources requiring air quality assessments to be carried out were identified in 2022.

No new commercial or domestic sources which met the criteria outlined in Section 4 were identified during 2022.

As previously reported there is the potential for an increase in uncontrolled fugitive particulate matter as a consequence of movements of heavy vehicles over unmade ground within the port. Activities within the port were previously identified as contributing to elevated PM_{10} concentrations measured at the Stannergate monitoring station, although this had reduced in recent years. During 2021 there was a sharp increase in PM_{10} at the Stannergate monitoring station, with a possible source being the large amount of earth works undertaken in 2021 as a part of a project to increase setting down area capability. The PM_{10} annual mean concentration at the Stannergate OSIRIS monitor was slightly higher again in 2022, however remained below the Scottish air quality objective level for PM_{10} annual mean. Although this location had seen a reduction in the measured concentrations of PM_{10}, as many of the activities carried out at the Port are potential sources of fugitive particulate emissions, pollutant monitoring will continue at locations adjacent to the Port.

6.3 Proposed Actions

The 2022 monitoring data did not identify the need to declare an AQMA for any additional pollutants or objectives. None of the 2022 diffusion tubes identified any new areas of exceedance.

The following actions are proposed following the review and assessment of monitoring data and new developments:

- Continue monitoring of fugitive PM_{10} sources around the port area;
- Continue monitoring of PM_{10} and $PM_{2.5}$ on Albert Street, noting any transient activities with risk of PM_{10} / $_{2.5}$ emissions;
- Report on any new or significantly changed SEPA prescribed process;
- Monitor planning applications for new pollution sources, relevant exposure and creation of 'street canyons' while also reviewing additional information being provided for applications approved in and prior to 2023;
- Implement the action plan measures being taken forward in 2023/24;
- Continue with the review and update of the existing 2011 Air Quality Action Plan to reflect the improvements made to air quality in Dundee over the 12 years of the existing plan being in place.
- Submit the next Annual Air Quality Progress Report in 2024.

Appendix A: Monitoring Results

Table A.1 Details of Automatic Monitoring Sites 2022

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? (Y/N)	Monitoring Technique	Distance to Relevant Exposure? (m)(1)	Distance to Kerb of Nearest Road (m)(2)	Inlet Height (m)
CM 3	Broughty Ferry Road Rollalong	Urban Industrial	341970	730977	PM_{10}	Y	TEOM	0	6.88	2.93
					NO_2		Chemiluminescent[g]		6.63	2.97
					PM_{10} & $PM_{2.5}$		Fidas [k]		6.63	2.86
CM 13	Broughty Ferry Road Partisol	Urban Industrial	341971	730978	PM_{10}	Y	Partisol	0	6.11	2.84
CM 4	Lochee Road Romon	Roadside	338861	730773	NO_2	Y	Chemiluminescent[b f]	2.15 (2.24)	1.00 (1.15)	1.95 (1.77)
					PM_{10}		Beta Attenuation (BAM) [f]	2.24	1.15	2.06
					PM_{10} & $PM_{2.5}$		Fidas [f]	1.98	1.36	2.21
CM 9	Logie Street Osiris	Kerbside	338176	731298	PM_{10}	Y	Osiris (nephthalometer)	1.65	0.57	3.31
CM 12	Mains Loan	Urban Background	340972	731893	NO_2	Y	Chemiluminescent[c]	0	n/a	1.80
					PM_{10} & $PM_{2.5}$		Fidas [e]			2.43
CM 5	Seagate Romon	Roadside	340487	730446	NO_2	Y	Chemiluminescent[b]	2.00	1.10	1.70
					PM_{10}		Beta Attenuation (BAM)			2.06
					PM_{10} & $PM_{2.5}$		Fidas [h]	1.81	1.37	2.53
CM 2	Union Street Rollalong [j]	Roadside	340235	730091	NO_2	Y	Chemiluminescent[b]	3.55	1.64	2.92
					PM_{10}		Beta Attenuation (BAM)[a]		1.64	3.00
CM 6		Roadside	340278	730156	NO_2	Y	Chemiluminescent[b]	1.86	3.26	1.80

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA? (Y/N)	Monitoring Technique	Distance to Relevant Exposure? (m)(1)	Distance to Kerb of Nearest Road (m)(2)	Inlet Height (m)
	Whitehall Street Romon				PM_{10}		Beta Attenuation (BAM)	1.79	3.33	2.06
					PM_{10} & $PM_{2.5}$		Fidas [h]	1.63	3.52	2.62
CM 14	Meadowside Romon	Roadside	340243	730653	NO_2	Y	Chemiluminescent[d]	0.42	3.59 (1.60)[i]	2.26
					PM_{10}		Beta Attenuation (BAM)		3.65 (1.63)[i]	2.17
					PM_{10} & $PM_{2.5}$		Fidas [h]	0.79	3.53	2.63
CM 15	Albert Street Osiris	Kerbside	341090	731105	PM_{10}	Y	Osiris (nephthalometer)	1.54	0.89	3.15
CM 16	Broughty Ferry Road Osiris	Urban Industrial	341970	730977	PM_{10}	Y	Osiris (nephthalometer)	0	7.15	3.00
CM 17	Myrekirk Osiris	Roadside	335438	731740	PM_{10}	Y	Osiris (nephthalometer)	0.4	14.00	3.11
CM 18	Stannergate Osiris	Roadside	343322	731073	PM_{10}	Y	Osiris (nephthalometer)	1.93	1.16	3.11

Notes:

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

(2) N/A if not applicable. 'Kerb' is taken as being the edge of the carriageway with flowing traffic

[a] During 2013 equipment was updated from TEOM to BAM

[b] During 2013 equipment was updated from model ML 9841A to model API T200

[c] Equipment model up to 21 September 2022 was Thermo 42i. From 21 September 2022 it was a TAPI T200.

[d] Equipment model up to 1st March 2021 was ML 2041. From 1st March 2021 the equipment was Serinus S40 IZS configuration.

[e] During 2017 equipment was updated from TEOM to Palas Fidas

[f] On 23rd March 2018 monitoring station upgraded with new enclosure and Palas Fidas replaced BAM. NOx inlet position changed slightly old measurements shown in brackets

[g] API T200 NOx analyser relocated from closed Union Street Station in January 2016

[h] During March 2019 equipment was updated from BAM to Palais Fidas

[i] Measurements amended to reflect change in pavement width, see Erratum in Appendix C.5 APR2020, old measurements shown in brackets

[j] CM2 Union Street – was discontinued in January 2016

[k] On 8th January 2020 equipment was updated from TEOM to Palas Fidas

Figure 4 Automatic Monitoring Sites 2022

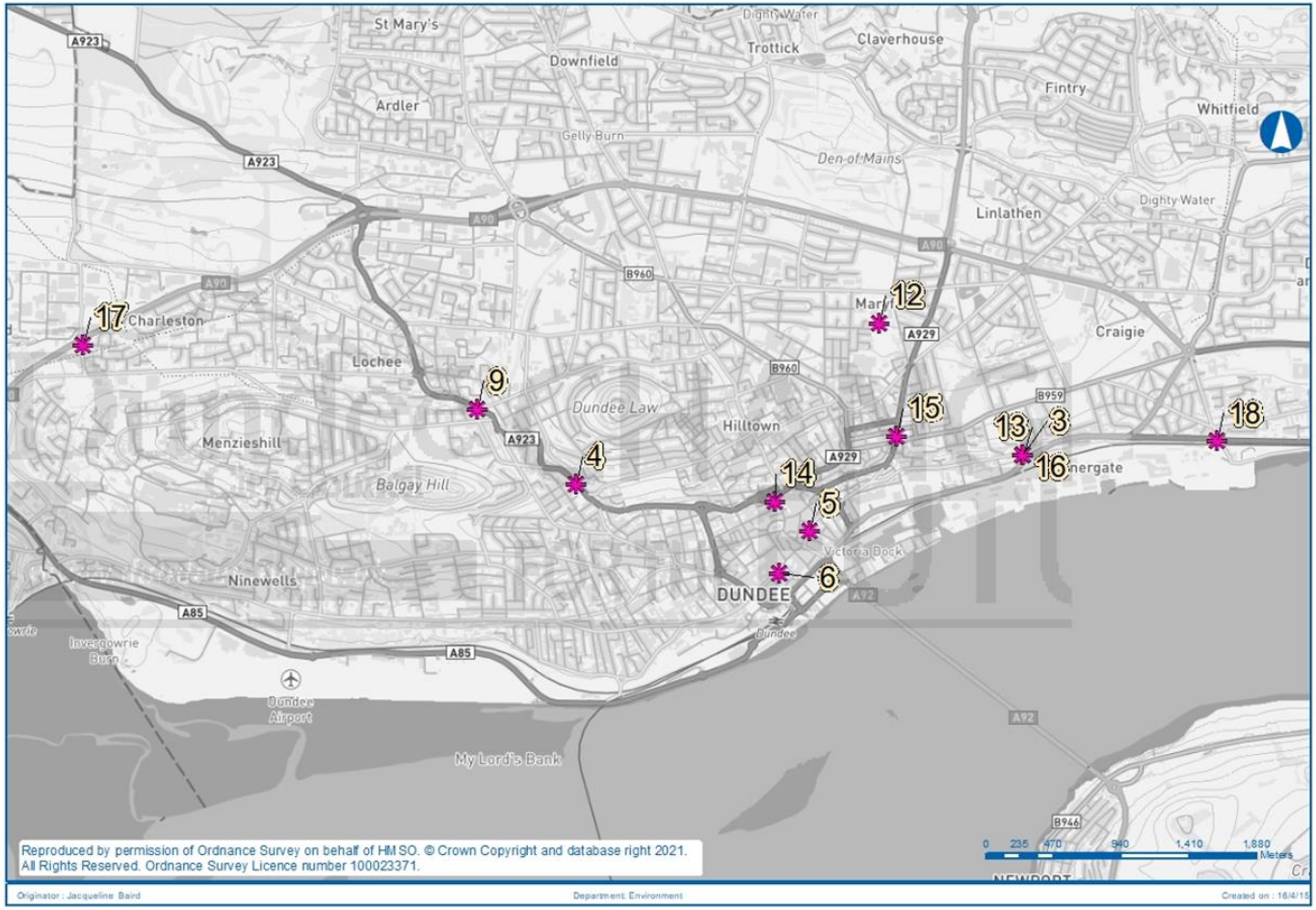


Table A.2 Details of Non-Automatic Monitoring Sites 2022

Site ID	Site Name	Site Type [a]	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) [b]	Distance to kerb of nearest road (m) [c]	Tube co-located with a Continuous Analyser?
DT 92	Abertay 2	R	340019	730612	NO_2	Y	2.01	1.95	N
DT 179	Albert St (15) (Facade)	R	341092	731121	NO_2	Y	0.25	2.04	N
DT 180	Albert St (15) (Rdside)	K	341091	731121	NO_2	Y	1.75	0.54	N
DT 167	Albert St (191)	K	341161	731535	NO_2	Y	2.70	0.62	N
DT 5	Arbroath Rd (13)	K	341111	731070	NO_2	Y	2.52	0.73	N
DT 7	Balgavies Place	UB	343082	731465	NO_2	Y	n/a	n/a	N
DT 9	Birnam Place	UB	337531	730914	NO_2	Y	n/a	n/a	N
DT 223	Broughty Ferry Rd – Lower (Cycle sign)	UB	343530	730937	NO_2	Y	n/a	2.84	N
DT 204	Broughty Ferry Rd (129)	R	342244	731066	NO_2	Y	3.57	2.27	N
DT 139	Broughty Ferry Rd (141 Downpipe)	R	343317	731072	NO_2	Y	0.20	4.32	N
DT 11	Broughty Ferry Rd (141)	R	343322	731073	NO_2	Y	1.98	1.32	N
DT 145	Broughty Ferry Rd (Greendykes)	R	342662	731112	NO_2	Y	7.72	4.10	N
DT 155	Carolina Court LP6	UB	342353	731058	NO_2	Y	n/a	n/a	N
DT 171	Claypotts / Arbroath Rd (502)	R	345347	732080	NO_2	Y	5.30	11.20	N
DT 246	Clepington Rd/ Forfar Rd_2	K	341387	732123	NO_2	Y	8.28	2.38	N
DT 188	Commercial St (9)	R	340544	730291	NO_2	Y	2.44	2.57	N
DT 84	Commercial St/Dock St (40)	R	340565	730263	NO_2	Y	0.17	2.78	N
DT 85	Dock St (21)	R	340524	730216	NO_2	Y	0.34	5.13	N
DT 156	Dock St (57)	R	340656	730343	NO_2	Y	3.25	2.53	N
DT 241	Dock St (Customs House)	R	340691	730344	NO_2	Y	1.42	3.24	N
DT 243	Dock St / Gellatly St	R	340638	730328	NO_2	Y	0.65	5.00	N
DT 233	Dock St/Trades Lane	R	340690	730382	NO_2	Y	n/a	6.14	N
DT 227	Dudhope Crescent Road (40)	K	339830	730619	NO_2	Y	1.99	0.83	N
DT 20	Dura St (100)	K	341150	731576	NO_2	Y	1.65	0.57	N
DT 214	East Dock Street (26)	R	340725	730417	NO_2	Y	0.20	3.70	N
DT 22	Eastport Roundabout	R	340651	730623	NO_2	Y	1.56	1.00	N
DT 245	Forfar Rd (104_2)	R	341435	732360	NO_2	Y	7.68	2.06	N
DT 244	Harefield Rd (14)	R	338182	731848	NO2	Y	5.05	4.53	N
DT 177	Kingsway / Strathmartine Rd (279)	R	339179	732896	NO_2	Y	3.63	3.14	N
DT 26	Kingsway East Roundabout	R	343107	731740	NO_2	Y	14.30	2.90	N
DT 27	Kingsway/ Mains Loan	R	341124	732468	NO_2	Y	15.40	6.20	N

Site ID	Site Name	Site Type [a]	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) [b]	Distance to kerb of nearest road (m) [c]	Tube co-located with a Continuous Analyser?
DT 30	Lochee Rd (138)	K	338936	730680	NO_2	Y	2.06	0.44	N
DT 31	Lochee Rd (140) Traffic Lts	R	338927	730685	NO_2	Y	0.25	2.22	N
DT 32	Lochee Rd (184)	K	338767	730856	NO_2	Y	3.19	0.73	N
DT 158	Lochee Rd (Romon) Average	R	338861	730773	NO_2	Y	2.03	1.34	Y
DT 36	Lochee Rd/Polepark Rd	K	339016	730586	NO_2	Y	9.21	0.95	N
DT 37	Logie St (114)	R	338184	731293	NO_2	Y	0.53	1.73	N
DT 38	Logie St (98)	K	338252	731258	NO_2	Y	n/a	0.84	N
DT 39	Loons Rd (1)	R	338211	731293	NO_2	Y	0.50	1.90	N
DT 237	Lower Princess St	R	340964	730855	NO_2	Y	0	2.44	N
DT 40	Marketgait (Palais Crt)	R	339953	730094	NO_2	Y	3.5	1.3	N
DT 149	Meadowside (Romon) Average	R	340243	730653	NO_2	Y	0.33	3.68	Y
DT 42	Muirton Rd (6)	R	338156	731294	NO_2	Y	0.30	1.11	N
DT 185	Murraygate (46)	UB	340409	730484	NO_2	Y	n/a	n/a	N
DT 189	Myrekirk Rd (29)	R	335420	731726	NO_2	Y	5.17	2.00	N
DT 47	Nethergate (40)	R	340230	730124	NO_2	Y	2.72	1.26	N
DT 45	Nethergate (6)	R	340274	730171	NO_2	Y	2.51	1.25	N
DT 213	Nethergate (64)	R	340196	730089	NO_2	Y	2.40	4.15	N
DT 44	Nethergate (88)	K	340163	730061	NO_2	Y	5.00	0.86	N
DT 46	Nethergate (95)	K	340033	729957	NO_2	Y	1.84	0.86	N
DT 48	Nethergate(132) / Marketgait	R	340074	729984	NO_2	Y	3.60	1.33	N
DT 239	Princes St (185)	K	341077	731031	NO_2	Y	2.40	0.60	N
DT 49	Rankine St (2)	R	338768	730900	NO_2	Y	0.40	1.76	N
DT 228	Riverside Esplanade / S. Crichton St.	R	340516	729991	NO_2	Y	1.17	2.74	N
DT 224	Seagate (112)	R	340528	730537	NO_2	Y	0	2.64	N
DT 236	Seagate (36-40)	R	340463	730420	NO_2	Y	0.20	2.76	N
DT 54	Seagate (9)	R	340467	730388	NO_2	Y	0.90	1.70	N
DT 190	Seagate (97)	R	340516	730499	NO_2	Y	0	2.26	N
DT 217	Seagate (99)	R	340535	730522	NO_2	Y	0	2.35	N
DT 159	Seagate(Romon) Average	R	340487	730446	NO_2	Y	1.81	1.29	Y
DT 55	Soapwork Lane	R	340099	730650	NO_2	Y	0	3.51	N
DT 218	South Marketgait (Lamppost 18)	R	340291	729979	NO_2	Y	n/a	2.58	N
DT 247	South Marketgait (street sign)	R	340124	729952	NO_2	Y	n/a	1.87	N
DT 151	South Rd (1 Denbank)	R	335188	731528	NO_2	Y	0.28	1.79	N
DT 162	St Andrews St / Seagate (116)	R	340532	730548	NO_2	Y	0.18	2.53	N

Site ID	Site Name	Site Type [a]	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) [b]	Distance to kerb of nearest road (m) [c]	Tube co-located with a Continuous Analyser?
DT 59	Strathmore Avenue (353)	K	339609	731871	NO_2	Y	1.45	0.67	N
DT 219	Thomson Avenue (Street Sign)	R	340542	730194	NO_2	Y	1.80	2.20	N
DT 229	Thomson Avenue / S. Crichton St.	K	340421	730078	NO_2	Y	3.05	0.86	N
DT 60	Trades Lane (31)	K	340575	730500	NO_2	Y	1.82	0.44	N
DT 184	Victoria Rd (104) / William St	R	340697	730950	NO_2	Y	1.50	1.36	N
DT 93	Victoria Rd (10b)	K	340230	730673	NO_2	Y	2.70	0.30	N
DT 191	Victoria Rd (4) - India Buildings	R	340213	730633	NO_2	Y	0	2.77	N
DT 68	Victoria Rd (60)	R	340375	730779	NO_2	Y	0.56	2.18	N
DT 70	Victoria Rd/Hilltown	R	340274	730714	NO_2	Y	2.01	1.15	N
DT 71	Victoria St/Albert St	K	341071	731072	NO_2	Y	1.70	0.75	N
DT 183	West Marketgait / Guthrie St	R	339805	730338	NO_2	Y	2.02	1.16	N
DT 205	West Marketgait/ Old Mill (23)	R	339773	730436	NO_2	Y	0.05	2.80	N
DT 231	West Marketgait/ Ward Road	R	339834	730314	NO_2	Y	0	2.70	N
DT 72	Westport (2)	R	339842	730122	NO_2	Y	2.50	0.46	N
DT 73	Whitehall Cr (4)	K	340376	730109	NO_2	Y	3.00	0.88	N
DT 161	Whitehall Cr /Union St (50)	K	340305	730051	NO_2	Y	4.78	0.64	N
DT 76	Whitehall St (1)	K	340265	730153	NO_2	Y	5.57	0.88	N
DT 81	Whitehall St (12)	R	340293	730142	NO_2	Y	2.67	3.00	N
DT 77	Whitehall St (15)	K	340322	730098	NO_2	Y	4.55	0.75	N
DT 74	Whitehall St (40)	K	340330	730106	NO_2	Y	3.57	0.78	N
DT 75	Whitehall St (5)	R	340289	730128	NO_2	Y	3.17	2.51	N
DT 160	Whitehall St (Romon) Average	R	340278	730156	NO_2	Y	1.66	3.49	Y
DT 82	Woodside Ave	UB	340776	732307	NO_2	Y	n/a	0.55	N

Notes:

a) R=Roadside, K=Kerbside, UB=Urban Background, 'Kerb' is taken as being the edge of the carriageway with flowing traffic.

b) "0" if the monitoring site is at a location of exposure (e.g. installed on, adjacent to, or equivalent to the façade of a residential property, or is representative of a residential area).

c) N/A if not applicable. (e.g.PDT at background or no relevant receptor at location).

d) New sites first located in 2022 are highlighted in green.

Figure 5 NO_2 Diffusion Tube Locations (City Centre)

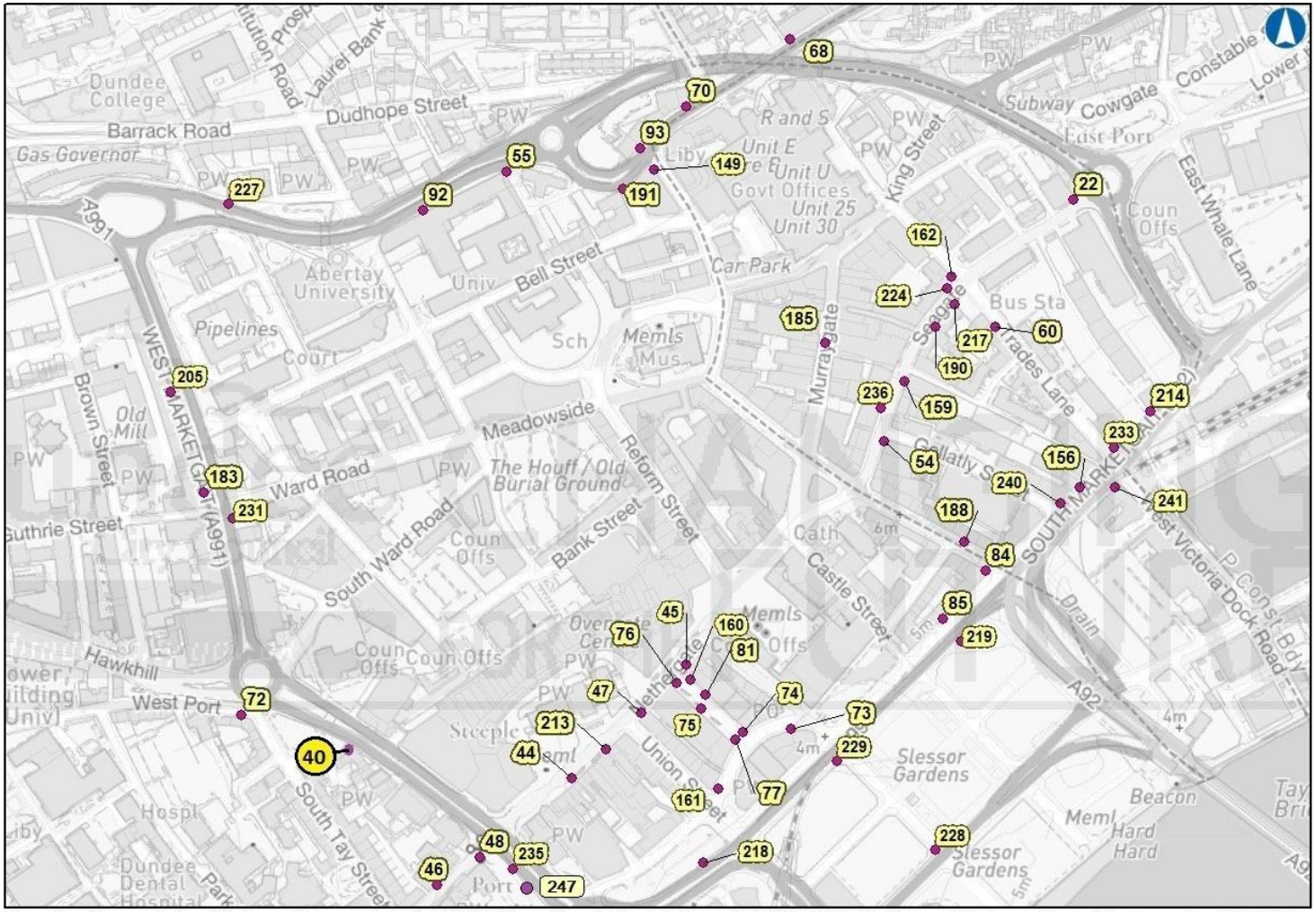


Figure 6 NO_2 Diffusion Tube Locations (East)

Figure 7 NO_2 Diffusion Tube Locations (West)

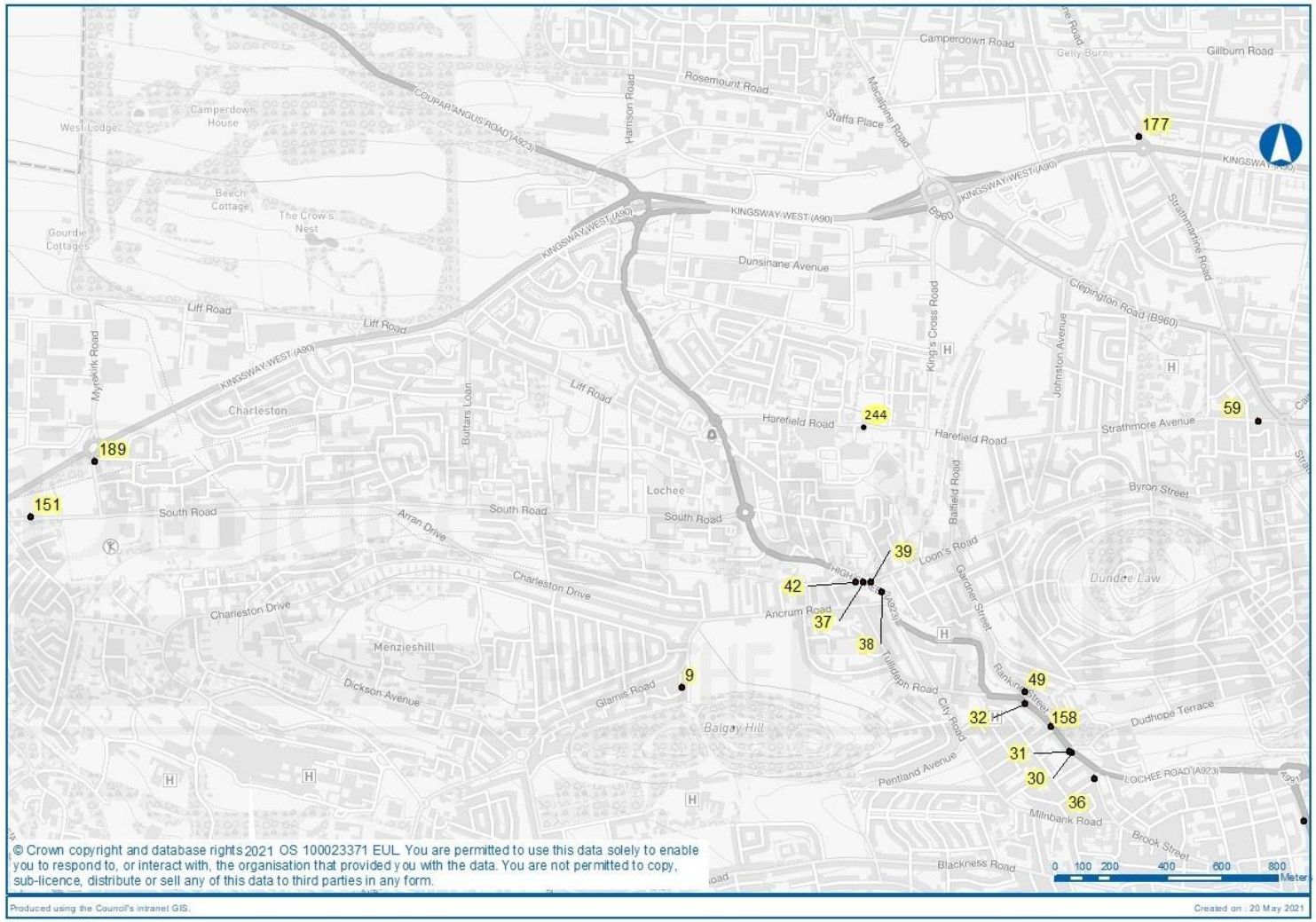


Table A.3 Annual Mean NO_2 Monitoring Results ($\mu g/m^3$)

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture 2022 (%) [2]	NO_2 Annual Mean Concentration ($\mu g/m^3$)[3]				
					2018	2019	2020	2021	2022
CM 3	Broughty Ferry Road	UI	Automatic	99.7	23.3	22.9	19.6	12.9	11.2
CM 4	Lochee Rd Romon	R	Automatic	99.8	**43.4**	**43.0**	31.2	31.7	29.0
CM 12	Mains Loan	UB	Automatic	52.8	12.3	11.0	8.5	8.4	9.1
CM 14	Meadowside Romon	R	Automatic	99.5	34.3	33.9	25.6	27.1	26.1
CM 5	Seagate	R	Automatic	90.3	**45.9**	**44.5**	28.5	30.3	26.5
CM 6	Whitehall St Romon	R	Automatic	99.8	37.5	33.4	24.0	27.5	20.1
DT 92	Abertay 2	R	PDT	83.3	37.9	36.5	26.2	29.8	26.6
DT 179	Albert St (15) (Facade)	R	PDT	83.3	33.2	30.3	24.5	24.1	19.9
DT 180	Albert St (15) (Rdside)	K	PDT	100.0	35.1	31.7	25.2	24.9	22.0
DT 167	Albert St (191)	K	PDT	100.0	32.5	30.6	20.8	23.6	20.7
DT 187	Albert St (81)	K	PDT		29.7	27.1			
DT 5	Arbroath Rd (13)	K	PDT	100.0	35.0	32.1	27.2	23.5	21.2
DT 7	Balgavies Place	UB	PDT	100.0	15.2	14.3	12.6	10.6	9.8
DT 9	Birnam Place	UB	PDT	100.0	9.3	8.5	6.5	6.7	5.8
DT 223	Broughty Ferry Rd – Lower (Cycle sign)	UB	PDT	83.3	20.2	22.0	19.1	14.2	8.9
DT 139	Broughty Ferry Rd (141 Downpipe)	R	PDT	100.0	31.1	30.1	24.4	24.1	21.5
DT 11	Broughty Ferry Rd (141)	R	PDT	100.0	36.4	36.3	26.7	26.8	23.1
DT 145	Broughty Ferry Rd (Greendykes)	R	PDT	91.7	33.6	32.2	24.7	25.4	19.6
DT 204	Broughty Ferry Rd (129)	R	PDT	100.0	40.1	37.0	27.0	26.8	26.4
DT 155	Carolina Court LP6	UB	PDT	100.0	19.7	19.4	15.7	14.6	12.5
DT 171	Claypotts / Arbroath Rd (502)	R	PDT	100.0	25.9	24.8	21.0	17.8	16.4
DT 13	Clepington Rd/ Forfar Rd	K	PDT		30.6	29.4	21.7	22.1	
DT 246	Clepington Rd/ Forfar Rd_2	R	PDT	58.3					18.6
DT 84	Commercial St/Dock St (40)	R	PDT	100.0	33.1	31.6	24.7	25.8	21.2
DT 188	Commercial St (9)	R	PDT	100.0	35.1	33.8	25.7	27.5	21.2
DT 192	Dock St (12)	R	PDT		25.9				
DT 85	Dock St (21)	R	PDT	100.0	33.7	33.1	25.7	27.0	22.3
DT 156	Dock St (57)	R	PDT	100.0	**46.4**	**44.2**	32.6	34.8	31.1
DT 240	Dock St / Gellatly St	R	PDT	100.0			28.5	28.8	25.9
DT 241	Dock St (Customs House)	R	PDT	83.3			27.8	27.2	23.0
DT 233	Dock St / Trades Lane	R	PDT	83.3		33.5	27.8	27.0	23.0
DT 227	Dudhope Crescent Rd (40)	K	PDT	100.0	39.3	38.8	28.9	29.6	25.7
DT 20	Dura St (100)	K	PDT	100.0	33.2	32.7	24.7	24.6	22.0
DT 214	East Dock Street (26)	R	PDT	91.7	31.6	32.9	27.1	27.8	22.8
DT 22	Eastport Roundabout	R	PDT	100.0	31.1	30.0	21.7	22.6	19.6
DT 83	Forfar Rd (104)	K	PDT		**41.0**	38.1	28.5	27.9	
DT 245	Forfar Rd (104)_2	K	PDT	75.0					21.1
DT244	Harefield Road (14)	R	PDT	100.0					13.9

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture 2022 (%) [2]	NO_2 Annual Mean Concentration (µg/m³)[3]				
					2018	2019	2020	2021	2022
DT 216	King Street (3)	K	PDT		32.8				
DT 177	Kingsway / Strathmartine Rd (279)	R	PDT	100.0	33.7	28.7	23.2	22.8	22.1
DT 26	Kingsway East Roundabout	R	PDT	100.0	38.3	34.1	27.6	27.4	24.8
DT 27	Kingsway/ Mains Loan	R	PDT	100.0	28.4	27.5	20.5	21.3	18.2
DT 30	Lochee Rd (138)	K	PDT	100.0	**48.4**	**45.8**	39.0	34.9	33.2
DT 31	Lochee Rd (140) Traffic Lts	R	PDT	100.0	**48.8**	**46.2**	37.6	36.1	32.4
DT 32	Lochee Rd (184)	K	PDT	100.0	33.7	32.4	29.2	24.8	25.5
DT 158	Lochee Rd (Romon) Average	K	PDT	100.0	**43.1**	**41.5**	32.4	32.0	30.4
DT 36	Lochee Rd/Polepark Rd	K	PDT	100.0	25.4	25.7	20.1	18.6	17.4
DT 37	Logie St (114)	R	PDT	100.0	**48.2**	**47.1**	**40.9**	38.6	34.1
DT 38	Logie St (98)	K	PDT	100.0	31.5	30.2	26.2	24.0	22.2
DT 39	Loons Rd (1)	R	PDT	91.7	35.5	35.1	28.9	29.8	25.3
DT 237	Lower Princess St	R	PDT	100.0		29.8	21.2	21.8	19.4
DT 40	Marketgait (Palais Crt)	R	PDT	100.0					16.6
DT 182	Meadowside (28)	K	PDT		35.0				
DT 149	Meadowside (Romon) Average	R	PDT	100.0	40.4	37.7	27.9	28.1	25.8
DT 238	Meadowside Halls	R	PDT			28.4			
DT 42	Muirton Rd (6)	R	PDT	100.0	25.0	24.1	19.0	19.7	17.7
DT 185	Murraygate (46)	UB	PDT	100.0	21.0	21.6	14.3	13.8	11.8
DT 189	Myrekirk Rd (29)	R	PDT	100.0	29.4	28.3	21.4	21.7	19.3
DT 44	Nethergate (88)	K	PDT	100.0	**41.3**	39.0	26.5	28.5	23.8
DT 45	Nethergate (6)	R	PDT	100.0	37.2	32.2	24.6	25.8	20.8
DT 46	Nethergate (95)	K	PDT	100.0	30.2	30.7	19.0	20.4	19.2
DT 47	Nethergate (40)	R	PDT	91.7	36.7	33.3	22.0	25.0	19.5
DT 48	Nethergate(132) / Marketgait	R	PDT	91.7	28.4	27.2	20.3	20.7	20.8
DT 213	Nethergate (64)	R	PDT	100.0	37.6	34.6	25.9	28.3	22.4
DT 207	Pitkerro Road (42)	R	PDT		33.0				
DT 239	Princes St (185)	K	PDT	100.0		39.9	30.6	30.8	26.4
DT 49	Rankine St (2)	R	PDT	100.0	38.5	36.7	28.6	25.9	24.8
DT 228	Riverside Esplanade / S. Crichton St.	R	PDT	100.0	29.1	25.4	20.6	21.4	19.2
DT 236	Seagate (36 - 40)	R	PDT	100.0		35.1	26.6	26.2	20.5
DT 50	Seagate (101)	R	PDT		38.3				
DT 190	Seagate (97)	R	PDT	100.0	**41.7**	**41.0**	29.0	29.9	25.6
DT 217	Seagate (99)	R	PDT	100.0	**41.3**	37.9	28.3	29.3	23.9
DT 224	Seagate (112)	R	PDT	100.0	37.6	37.1	29.1	27.9	25.4
DT 54	Seagate (9)	R	PDT	100.0	29.5	28.8	21.3	22.4	17.7
DT 159	Seagate(Romon) Average	K	PDT	100.0	40.0	39.1	26.5	28.4	24.2
DT 55	Soapwork Lane	R	PDT	100.0	34.2	33.7	25.6	24.2	23.6
DT 151	South Rd (1 Denbank)	R	PDT	91.7	32.5	30.6	23.2	23.3	20.9
DT 235	South Marketgait / Nethergate	R	PDT			23.7	17.4	17.9	

Site ID	Site Name	Site Type	Monitoring Type	Valid Data Capture 2022 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$)(3)				
					2018	2019	2020	2021	2022
DT 247	South Marketgait (street sign)	R	PDT	50.0					24.9
DT 218	South Marketgait (lamp post 18)	R	PDT	100.0	32.4	29.3	20.6	21.5	19.4
DT 56	St Andrews St (26)	K	PDT			26.2			
DT 162	St Andrews St PB (façade)	R	PDT	100.0	33.7	32.4	25.3	24.8	21.2
DT 59	Strathmore Avenue (353)	K	PDT	83.3	32.4	31.6	23.6	25.7	22.9
DT 219	Thomson Avenue (street sign)	R	PDT	100.0	31.6	30.3	22.7	22.3	19.4
DT 229	Thomson Avenue / South Crichton St.	K	PDT	100.0	28.9	27.9	21.7	21.2	20.0
DT 60	Trades Lane (31)	K	PDT	100.0	25.3	23.8	18.3	17.6	15.7
DT 184	Victoria Rd (104) / William St	R	PDT	100.0	28.4	27.2	20.2	21.3	18.7
DT 191	Victoria Rd (4) - India Buildings	R	PDT	100.0	29.3	28.9	21.9	22.9	20.2
DT 68	Victoria Rd (60)	R	PDT	100.0	33.4	33.0	26.8	26.3	22.7
DT 93	Victoria Rd (10b)	K	PDT	100.0	31.5	31.3	24.8	24.9	22.3
DT 70	Victoria Rd/Hilltown	R	PDT	100.0	**49.2**	**48.3**	38.0	**40.6**	36.3
DT 71	Victoria St/Albert St	K	PDT	100.0	28.0	26.8	21.8	20.6	17.5
DT 183	West Marketgait / Guthrie St	R	PDT	100.0	**41.4**	38.3	34.0	32.7	29.3
DT 205	West Marketgait / Old Mill (23)	R	PDT	100.0	**47.0**	**47.1**	36.1	36.5	36.9
DT 231	West Marketgait / Ward Road	R	PDT	100.0	31.2	33.5	24.5	23.5	21.5
DT 72	Westport (2)	R	PDT	100.0	31.5	28.4	19.9	17.6	17.3
DT 73	Whitehall Cr (4)	K	PDT	100.0	32.3	30.7	23.6	23.4	18.9
DT 161	Whitehall Cr /Union St (50)	K	PDT	91.7	24.1	23.2	16.9	16.7	14.5
DT 76	Whitehall St (1)	K	PDT	91.7	**42.5**	40.3	31.8	33.0	25.5
DT 81	Whitehall St (12)	R	PDT	100.0	38.4	35.4	27.9	28.9	21.4
DT 77	Whitehall St (15)	K	PDT	100.0	32.9	31.0	22.9	23.6	19.1
DT 74	Whitehall St (40)	K	PDT	100.0	36.8	33.4	24.9	27.8	21.4
DT 75	Whitehall St (5)	R	PDT	100.0	39.3	35.8	27.7	27.5	20.3
DT 160	Whitehall St (Romon) Average	R	PDT	100.0	38.3	34.6	23.8	27.2	20.1
DT 82	Woodside Ave	UB	PDT	100.0	13.4	11.4	9.1	8.5	7.7

Notes: Exceedances of the NO_2 annual mean objective of $40\mu g/m^3$ are shown in **bold**. Borderline values are shown in orange.

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

(1) R=Roadside, K=Kerbside, UB=Urban Background

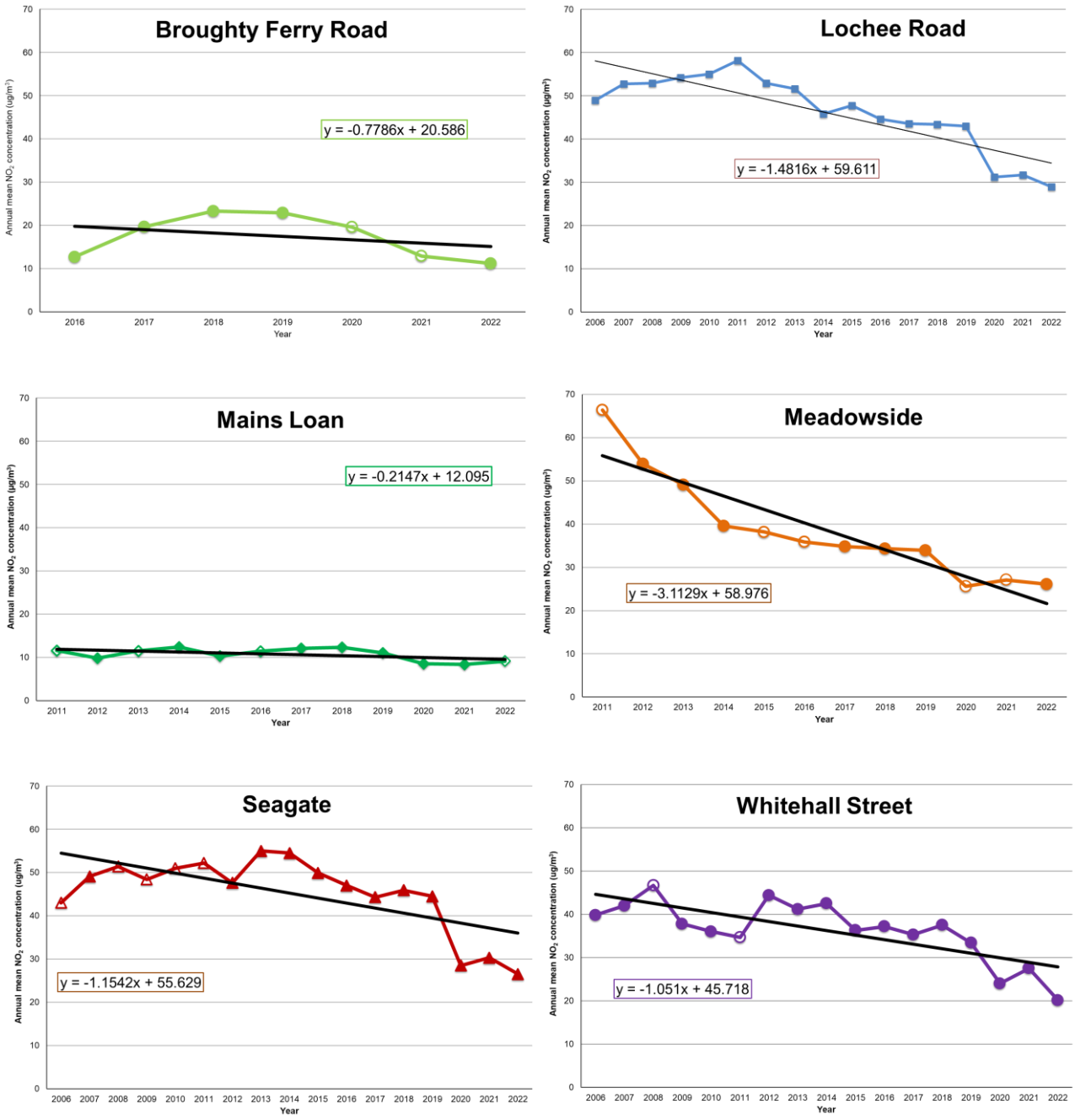
(2) data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) Means for diffusion tubes have been corrected for bias.

All means have been "annualised" as per LAQM.TG(22) (TG(16) for 2018 – 2021 data) if valid data capture for the full calendar year is less than 75% (highlighted by shading). See Appendix C for details.

(4) New sites first located in 2022 are highlighted in green.

Figure 8 Trends in Annual Mean NO_2 at Automatic Monitors



NO_2 monitoring results – 1-hour mean.

Table A.4 1-Hour Mean NO_2 Monitoring Results, Number of 1-Hour Means > 200µg/m^3

Site ID	Site Name	Site Type (1)	Monitoring Type	Valid Data Capture 2022 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2018	2019	2020	2021	2022
CM3	Broughty Ferry Rd	UI	Automatic	99.7	0	0	0 (61.1)	0 (61.9)	0
CM4	Lochee Rd Romon	R	Automatic	99.8	6	2	0	0	0
CM12	Mains Loan	UB	Automatic	52.8	0	0	0	0	0 (58.4)
CM14	Meadowside Romon	R	Automatic	99.5	0	0	0 (95.1)	0 (107.2)	0
CM5	Seagate	R	Automatic	90.3	0	0	0	0	0
CM6	Whitehall St Romon	R	Automatic	99.8	0	0	0	0	0

Notes:

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

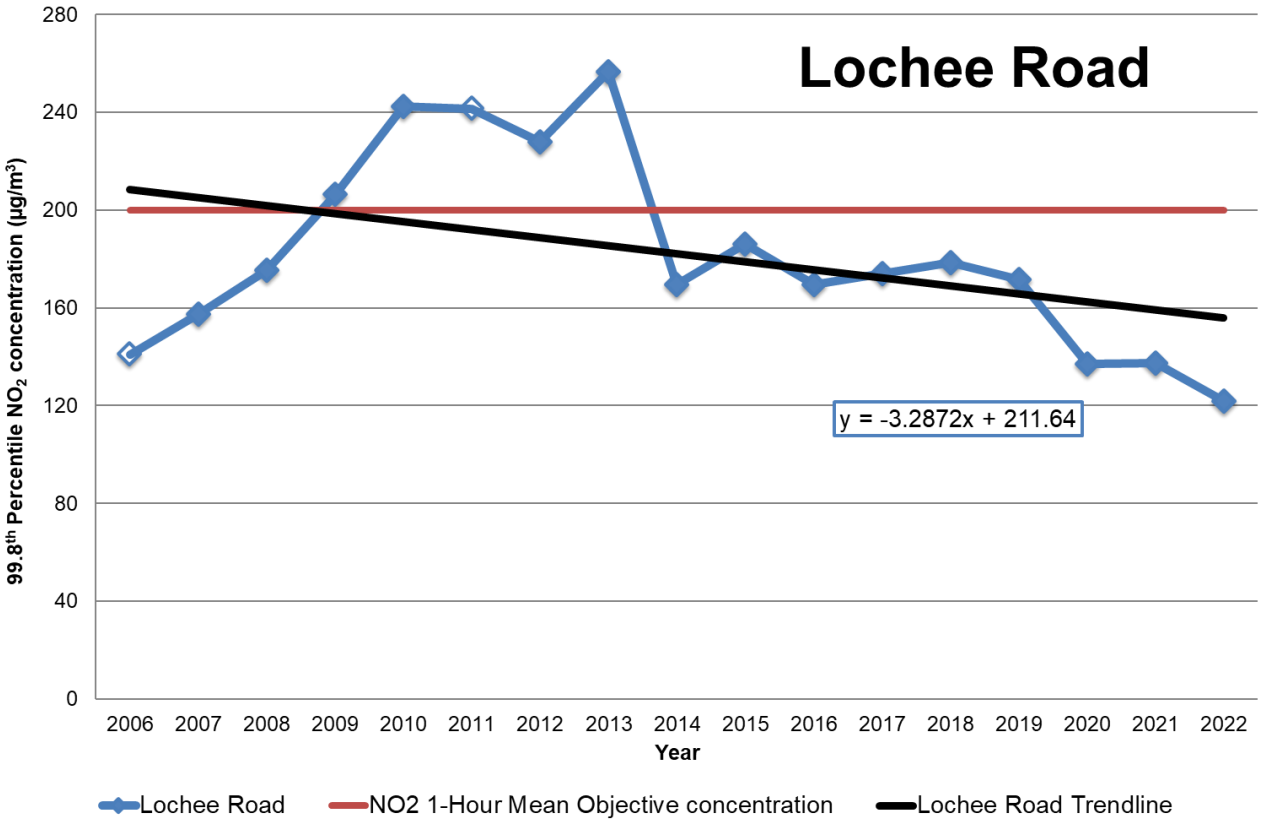
If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

(1) R=Roadside, K=Kerbside, UB=Urban Background, UI=Urban Industrial

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

Figure 9 Trend in 99.8th percentile of hourly mean NO_2 concentrations at Lochee Road



PM_{10} monitoring results – Annual Mean

Table A.5 Annual Mean PM_{10} Monitoring Results (µg/m^3)

Site ID	Site Name	Site Type(1)	Monitoring Type	Valid Data Capture 2022 (%)(2)	PM_{10} Annual Mean Concentration (µg/m^3)(3)				
					2018	2019	2020	2021	2022(4)
CM 4	Lochee Rd (BAM/Fidas)	R	Automatic	100	12.6	11.8	9.8	10.7	12.5 (13.8)
CM 5	Seagate (BAM/Fidas)	R	Automatic	100	15.6	13.7	9.6	11.0	13.6 (15.0)
CM 14	Meadowside (BAM/Fidas)	R	Automatic	99	15.3	14.1	9.1	10.1	12.0 (13.2)
CM 6	Whitehall Street (BAM/Fidas)	R	Automatic	100	15.7	11.9	7.9	8.3	10.2 (11.2)
CM 12	Mains Loan (TEOM/Fidas)	UB	Automatic	99	9.1	9.2	7.0	7.5	8.9 (9.8)
CM 3	Broughty Ferry Rd (TEOM/Fidas)	UI	Automatic	95	12.3*	13.6	8.9	10.1	11.8 (13.0)
CM 13	Broughty Ferry Rd (Partisol)	UI	Automatic	99	11.2	11.3	10.0*	10.2*	11.5
CM 16	Broughty Ferry Rd (OSIRIS)	UI	Automatic	92	11.3*	11.2	9.7	9.9*	11.6
CM 9	Logie St (OSIRIS)	K	Automatic	84	**18.9**	15.4*	14.0*	11.4*	15.1
CM 17	Myrekirk Tce (OSIRIS)	R	Automatic	92	13.5	12.3*	11.0	12.8*	14.5
CM 15	Albert St (OSIRIS)	K	Automatic	92	17.5*	15.1	13.9*	11.1	17.9
CM 18	Stannergate (OSIRIS)	R	Automatic	87	11.9*	13.3*	11.5	16.4*	16.8

Notes: Exceedences of the PM_{10} annual mean objective of 18µg/m^3 are shown in **bold** (borderline values are orange).

(1) R=Roadside, K=Kerbside, UB=Urban Background, UI=Urban Industrial

(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%). * indicates data capture less than 85%

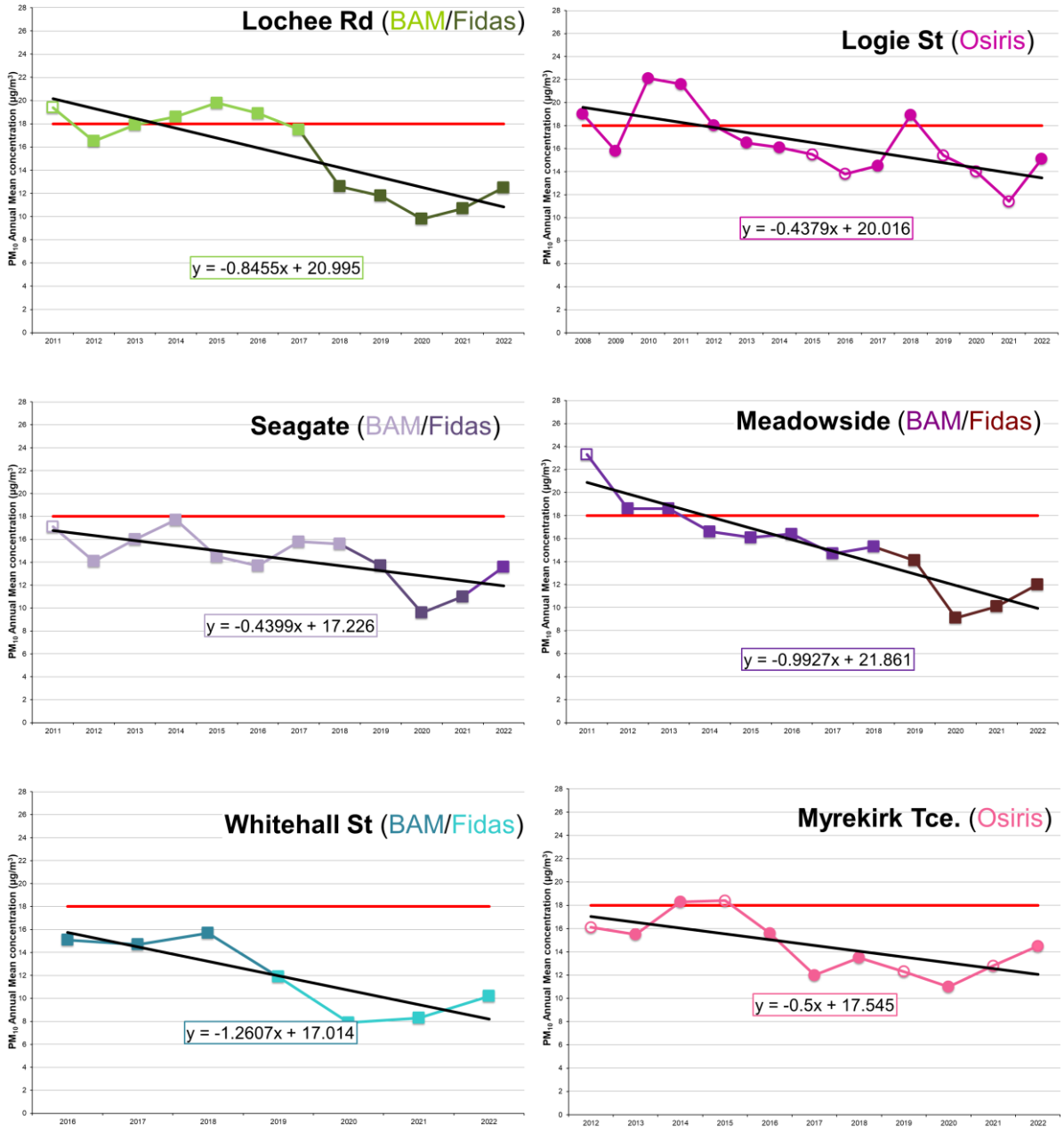
(3) All means have been "annualised" as per LAQM.TG(22) if valid data capture for the full calendar year is less than 75% (highlighted by shading). See Appendix C for details.

(4) Corrected results as per the Scottish Government Guidance note published on 17 May 2023* advising that annual mean PM data collected using Fidas 200 is to be corrected using factors (PM_{10} divided by 0.909 and $PM_{2.5}$ multiplied by 1.06) identified by the "Scottish Government Equivalence Study to Investigate Particulate Matter Monitoring In Scotland Using The Fidas 200". Local authorities are to present both measured and corrected data for LAQM reporting.

* www.scottishairquality.scot/news/local-authority-guidance-note-laqm-reporting-scottish-pm-data

PM_{10} monitoring results – Annual Means trends

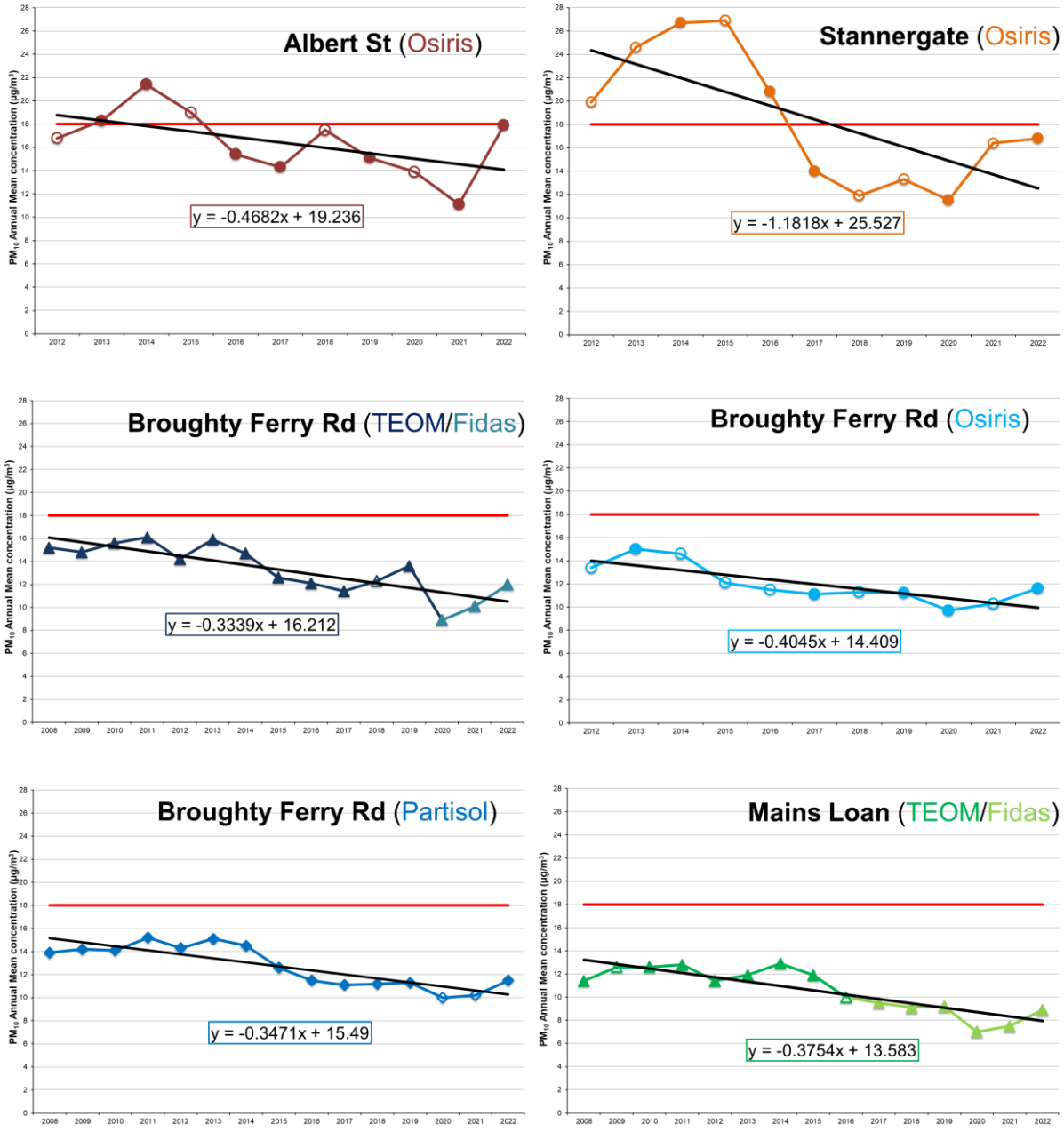
Figure 10 Trends in Annual Mean PM_{10} Concentrations at Automatic Monitors



Notes:

1) Graphs show the trends (**black** lines) in the PM_{10} annual mean concentrations measured at the continuous analysers.
2) A minimum of five years data is required to show a valid trend. More years (data points) give greater certainty in the trend.
3) The trend line equation is shown. Decreasing trends have a negative "x" value, increasing trends a positive "x" value.
4) For strict comparison with the annual mean objective of 18µg/m^3(shown by the **red** line), data capture should be greater than 85%. Annual means where data capture was below 85% are shown by a 'hollow' marker.
5) Means have been "annualised" as per LAQM.TG(22) if valid data capture for the full calendar year is less than 75%. See **Appendix C** for details.

Figure 11 Trends in Annual Mean PM_{10} Concentrations at Automatic Monitors



Notes:

1) Graphs show the trends (**black** lines) in the PM_{10} annual mean concentrations measured at the continuous analysers.
2) A minimum of five years data is required to show a valid trend. More years (data points) give greater certainty in the trend.
3) The trend line equation is shown. Decreasing trends have a negative "x" value, increasing trends a positive "x" value.
4) For strict comparison with the annual mean objective of 18µg/m^3(shown by the **red** line), data capture should be greater than 85%. Annual means where data capture was below 85% are shown by a 'hollow' marker.
5) Means have been "annualised" as per LAQM.TG(22) if valid data capture for the full calendar year is less than 75%. See **Appendix C** for details.

Explanation of Methodology for **Figure 10** and **Figure 11** has been generated using the LINEST function in Microsoft Excel. This function can be used to return a value that describes the slope of a best fit straight line for a number of points (in this case 5 or more values) i.e. simple linear regression. A negative value denotes a downwards slope hence an improving trend and a positive

value denotes an upwards slope or worsening trend. The magnitude of the number generated by the LINEST function can be used to compare the magnitude of the (improving or worsening) trend.

PM_{10} monitoring results – Daily mean

Table A.6 24-Hr Mean PM_{10} Monitoring Results, Number of PM_{10} 24-Hr Means > 50µg/m^3

Site ID	Site Name	Site Type(1)	Monitoring Type	Valid Data Capture 2022 (%)(2)	PM10 24-Hour Means > 50µg/m3 (3)				
					2018	2019	2020	2021	2022
CM 4	Lochee Rd (BAM/Fidas)	R	Automatic	100	1	1	0	0	4
CM 5	Seagate (BAM/Fidas)	R	Automatic	100	1	1	0	0	4
CM 14	Meadowside (BAM/Fidas)	R	Automatic	99	4	3 (43.4)	0	0	5
CM 6	Whitehall Street (BAM/Fidas)	R	Automatic	100	4 (39.8)	1	0	0	2
CM 12	Mains Loan (TEOM/Fidas)	UB	Automatic	99	0	1	0	0	2
CM 3	Broughty Ferry Rd (TEOM/Fidas)	UI	Automatic	95	0 (25.6)	1	0	0	5
CM 13	Broughty Ferry Rd (Partisol)	UI	Automatic	99.5	0	0	0 (24.5)	0 (21.8)	4
CM 16	Broughty Ferry Rd (Osiris)	UI	Automatic	92.1	1 (34.2)	1	0	0 (22.8)	1
CM 9	Logie St (Osiris)	K	Automatic	84.1	**11**	3 (41.1)	0 (30.3)	1 (25.7)	5 (46.0)
CM 17	Myrekirk Tce (Osiris)	R	Automatic	92.0	2	1 (39.7)	0	0 (27.0)	2
CM 15	Albert St (Osiris)	K	Automatic	92.0	5 (46.0)	7	0 (38.5)	0	**12**
CM 18	Stannergate (Osiris)	R	Automatic	87.1	0 (25.7)	1 (32.9)	0	3 (43.9)	4

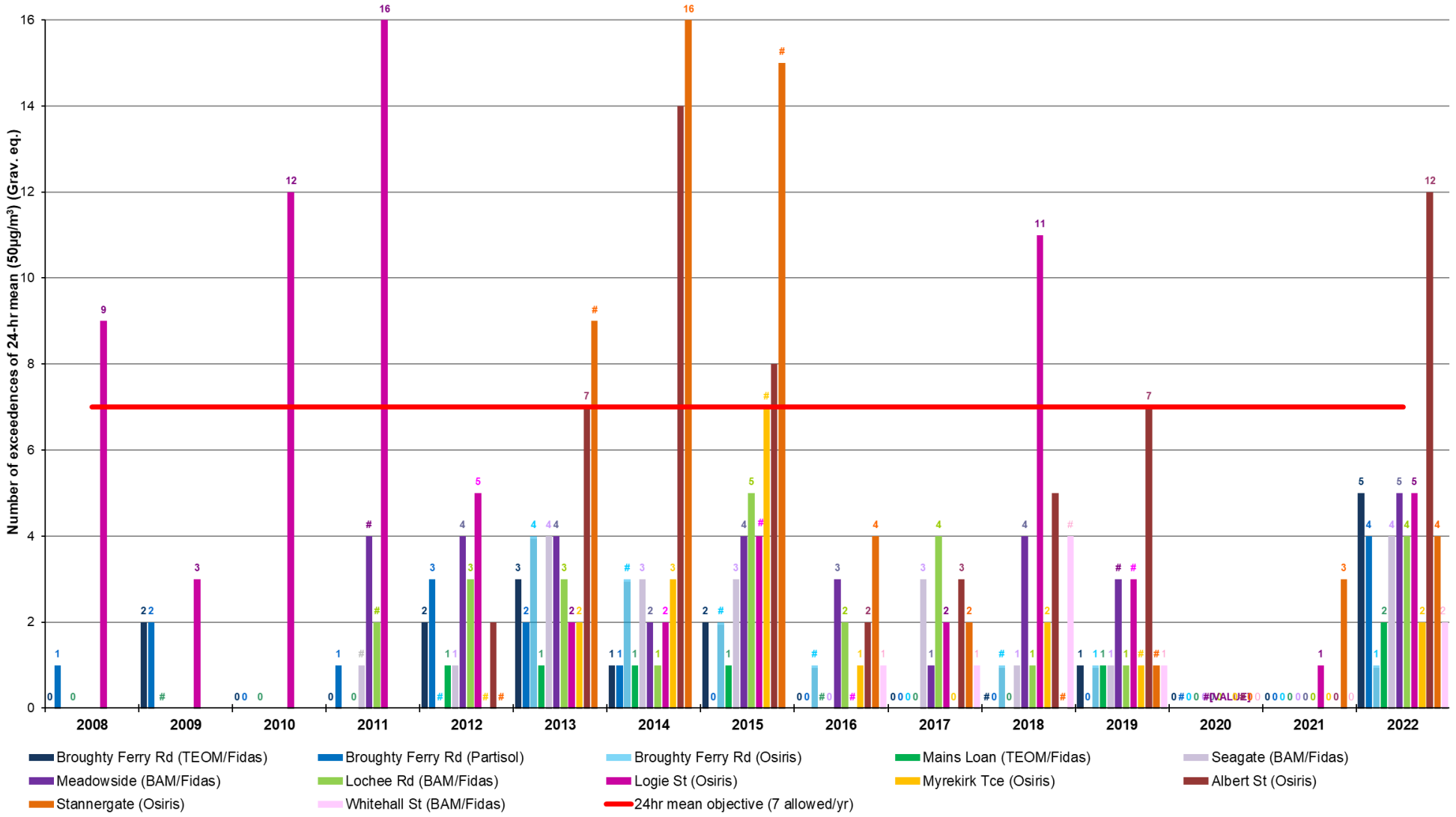
Notes: Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 7 times/year) are shown in **bold**.

(1) R=Roadside, K=Kerbside, UB=Urban Background, UI= Urban Industrial

(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) If the period of valid data is less than 85%, the 98.08th percentile of 24-hour means is provided in brackets (and shaded grey).

Figure 12 24-hour mean PM_{10} concentrations greater than 50ug/m3



$PM_{2.5}$ monitoring results – Annual Mean

Table A.7 Annual Mean $PM_{2.5}$ Monitoring Results (µg/m^3)

Site ID	Site Name	Site Type(1)	Monitoring Type	Valid Data Capture 2022 (%)(2)	$PM_{2.5}$ Annual Mean Concentration (µg/m^3)(3)(4)				
					2018	2019	2020	2021	2022(5)
CM 3	Broughty Ferry Rd (Fidas)	UI	Automatic	95	n/a	n/a	4.4	4.9	6.0 (6.3)
CM 4	Lochee Rd (Fidas)	R	Automatic	100	5.7	6.4	5.2	5.7	6.5 (6.9)
CM 5	Seagate (Fidas)	R	Automatic	100	5.5	6.9*	5.0	5.7	6.7 (7.1)
CM 14	Meadowside (Fidas)	R	Automatic	99	n/a	6.6*	4.6	5.3	5.8 (6.1)
CM 6	Whitehall Street (Fidas)	R	Automatic	100	n/a	6.3*	4.3	4.7	5.7 (6.1)
CM 12	Mains Loan (Fidas)	UB	Automatic	99	5.5	5.5	4.1	4.4	5.2 (5.5)

Notes: Exceedences of the PM2.5 annual mean objective of 10µg/m^3 are shown in **bold** (borderline values are orange).

(1) R=Roadside, K=Kerbside, UB=Urban Background, UI=Urban Industrial

(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) All means have been "annualised" as per LAQM.TG(22) if valid data capture for the full calendar year is less than 75% (highlighted by shading). See **Appendix C** for details.

(4) * indicates data capture less than 85%

(5) Corrected results as per the Scottish Government Guidance note published on 17 May 2023* advising that annual mean PM data collected using Fidas 200 is to be corrected using factors (PM_{10} divided by 0.909 and $PM_{2.5}$ multiplied by 1.06) identified by the "Scottish Government Equivalence Study to Investigate Particulate Matter Monitoring In Scotland Using The Fidas 200". Local authorities are to present both measured and corrected data for LAQM reporting.

* www.scottishairquality.scot/news/local-authority-guidance-note-laqm-reporting-scottish-pm-data

Appendix B: Full Monthly Diffusion Tube Results for 2022

Table B.1 NO_2 2022 Monthly Diffusion Tube Results (µg/m^3)

Site Id. (DT)	Location	x	y	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.80)[5]
92	Abertay 2	340019	730612	M	M	44.5	35.4	25.2	22.9	25.0	29.9	29.7	36.2	45.6	37.6	33.2	83.3	1.0	33.2	26.6
179	Albert St (15)(Façade)	341092	731121	24.8	23.9	36.6	28.3	22.8	17.5	21.1	24.0	24.2	26.0	M	M	24.9	83.3	1.0	24.9	19.9
180	Albert St (15)(Roadside)	341091	731121	25.7	24.4	35.4	31.0	21.1	19.2	21.0	25.2	25.2	25.8	38.5	37.7	27.5	100.0	1.0	27.5	22.0
167	Albert St (191)	341161	731535	19.2	15.4	36.0	34.0	21.5	17.1	18.2	23.7	20.5	25.1	43.3	36.4	25.9	100.0	1.0	25.9	20.7
5	Arbroath Rd (13)	341111	731070	31.4	29.2	34.7	23.0	19.9	19.9	20.6	24.7	20.9	27.0	32.8	34.1	26.5	100.0	1.0	26.5	21.2
223	B/ Ferry Rd Lower (Cycle sign)	343530	730937	19.8	16.9	13.0	7.8	M	5.6	5.5	7.4	9.2	9.9	16.5	M	11.2	83.3	1.0	11.2	8.9
204	B/Ferry Rd (129)	342244	731066	35.4	32.1	39.2	31.9	26.4	43.4	23.2	28.1	27.6	28.6	38.1	42.0	33.0	100.0	1.0	33.0	26.4
139	B/Ferry Rd (141) Downpipe	343317	731072	35.1	32.5	30.8	19.8	23.9	19.8	21.2	24.6	24.9	26.9	29.1	34.5	26.9	100.0	1.0	26.9	21.5
145	B/Ferry Rd Greendykes	342662	731112	M	28.8	32.3	23.1	21.1	18.7	18.0	23.2	21.9	24.9	27.2	30.9	24.6	91.7	1.0	24.6	19.6
7	Balgavies Pl	343082	731465	16.3	14.6	17.9	8.6	7.0	6.4	7.2	9.2	8.1	11.8	20.1	19.8	12.3	100.0	1.0	12.3	9.8
9	Birnam Pl	337531	730914	10.6	6.9	8.3	6.3	4.0	5.4	4.2	5.7	5.3	7.5	10.5	12.4	7.3	100.0	1.0	7.3	5.8
11	Broughty Ferry Rd (141)	343322	731073	40.3	32.5	30.9	24.5	24.5	20.8	20.6	26.6	29.1	28.6	30.7	37.0	28.8	100.0	1.0	28.8	23.1
155	Carolina Court Lp6	342353	731058	21.5	17.9	18.7	12.5	8.8	13.5	9.4	11.9	13.3	14.3	21.7	24.4	15.7	100.0	1.0	15.7	12.5
171	Claypotts / Arbroath Rd (502)	345347	732080	33.5	28.2	21.1	14.7	14.0	13.0	12.2	16.7	17.0	19.3	24.6	32.2	20.5	100.0	1.0	20.5	16.4
246	Clepington Rd/ Forfar Rd_2	341385	732121	M	M	M	21.8	16.9	15.2	M	M	20.4	24.0	31.4	34.4	23.4	58.3	0.996	23.3	18.6
188	Commercial St (9)	340544	730291	24.7	26.8	34.1	29.2	22.4	17.1	21.3	24.8	24.6	25.9	30.8	36.4	**26.5**	100.0	1.0	**26.5**	21.2
84	Commercial St /Dock St (40)	340565	730263	30.2	29.9	32.1	24.3	20.4	17.2	21.5	24.3	22.6	26.3	32.8	36.4	**26.5**	100.0	1.0	**26.5**	21.2
85	Dock St (21)	340524	730216	31.6	31.1	33.3	26.4	22.7	17.6	22.4	25.1	26.2	26.6	32.5	38.3	**27.8**	100.0	1.0	**27.8**	22.3
156	Dock St (57)	340656	730343	51.7	42.7	43.5	32.9	32.2	28.5	28.8	33.9	33.9	39.6	45.7	53.3	**38.9**	100.0	1.0	**38.9**	31.1
241	Dock St (Customs House)	340691	730344	32.6	28.3	41.1	30.1	25.1	20.3	22.6	27.9	27.2	31.9	M	M	**28.7**	83.3	1.0	**28.7**	23.0
240	Dock St/Gellatly St	340638	730328	39.3	38.5	35.4	26.6	23.3	21.8	22.9	27.8	27.6	32.7	41.3	50.7	**32.3**	100.0	1.0	**32.3**	25.9

Site Id. (DT)	Location	x	y	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.80)[5]
233	Dock St/Trades Lane	340690	730382	34.5	32.3	37.5	30.4	24.5	21.1	22.7	25.4	23.8	M	M	35.0	**28.7**	83.3	1.0	**28.7**	23.0
227	Dudhope Crescent Road (40)	339830	730619	42.0	34.2	38.2	28.5	24.5	23.7	23.3	28.6	28.3	29.1	39.5	46.1	**32.2**	100.0	1.0	**32.2**	25.7
20	Dura St (100)	341150	731576	29.9	29.2	33.7	27.3	22.9	19.0	21.4	25.9	23.6	28.4	29.8	39.4	**27.5**	100.0	1.0	**27.5**	22.0
214	East Dock St (26)	340725	730417	31.7	32.8	35.2	28.2	23.3	19.9	20.4	26.6	28.1	M	34.5	32.3	**28.5**	91.7	1.0	**28.5**	22.8
22	Eastport Roundabout	340651	730623	26.3	24.5	28.8	23.9	18.7	13.8	20.0	23.3	24.9	24.7	30.2	35.2	**24.5**	100.0	1.0	**24.5**	19.6
245	Forfar Rd (104)_a	341437	732360	M	M	M	23.4	24.4	19.9	23.2	26.0	22.6	28.8	34.8	34.8	26.4	75.0	1.0	26.4	21.1
244	Harefield Road (14)	338183	731849	19.1	14.2	22.7	17.1	11.2	10.2	11.5	13.7	15.7	17.3	27.0	28.1	**17.3**	100.0	1.0	**17.3**	13.9
26	Kingsway East Roundabout	343107	731740	36.2	34.9	41.4	27.4	26.5	22.2	24.3	29.3	26.0	31.1	38.8	34.3	**31.0**	100.0	1.0	**31.0**	24.8
27	Kingsway/ Mains Loan	341124	732468	20.0	16.8	28.4	27.0	20.0	13.5	16.1	20.2	24.9	21.2	34.2	30.6	**22.7**	100.0	1.0	**22.7**	18.2
177	Kingsway/Strathmartine Rd (N)	339179	732896	32.9	32.5	34.9	20.9	21.9	21.8	19.4	23.6	19.7	27.7	38.7	37.5	**27.6**	100.0	1.0	**27.6**	22.1
30	Lochee Rd (138)	338936	730680	50.0	48.2	49.8	38.8	34.1	31.0	31.4	37.8	34.7	40.7	46.6	55.5	**41.6**	100.0	1.0	**41.6**	33.2
31	Lochee Rd (140)(Traffic Lts)	338927	730685	43.4	45.8	46.9	37.3	32.2	30.2	31.6	36.9	37.5	39.6	48.4	55.8	**40.5**	100.0	1.0	**40.5**	32.4
32	Lochee Rd (184)	338767	730856	39.9	37.6	43.1	26.4	22.5	20.9	19.9	25.0	24.7	35.2	43.2	43.9	**31.9**	100.0	1.0	**31.9**	25.5
	Lochee Rd (Romon 1)			46.5	45.3	43.7	31.8	30.2	28.5	26.8	32.0	33.4	38.6	43.5	51.5	**37.7**	100.0	1.0	**37.7**	30.1
	Lochee Rd (Romon 2)			49.6	47.7	44.1	30.5	29.5	28.3	27.4	32.6	34.0	37.9	42.6	49.1	**37.8**	100.0	1.0	**37.8**	30.2
	Lochee Rd (Romon 3)			49.4	46.6	44.1	30.1	31.3	29.9	27.9	32.8	34.3	38.5	46.6	51.2	**38.6**	100.0	1.0	**38.6**	30.8
158	Lochee Rd (Romon) Average	338861	730773	48.5	46.5	44.0	30.8	30.3	28.9	27.4	32.5	33.9	38.3	44.2	50.6	**38.0**	100.0	1.0	**38.0**	30.4
36	Lochee Rd/Polepark Rd	339016	730586	25.1	20.2	27.6	20.9	15.8	14.0	13.5	18.3	19.0	20.8	31.1	35.1	**21.8**	100.0	1.0	**21.8**	17.4
37	Logie St (114)	338184	731293	43.8	49.2	48.1	42.1	34.8	32.5	32.2	40.6	35.6	41.3	55.0	57.0	**42.7**	100.0	1.0	**42.7**	34.1
38	Logie St (98)	338252	731258	38.0	35.3	32.7	22.9	19.4	19.6	19.2	21.7	22.7	27.6	33.5	39.9	**27.7**	100.0	1.0	**27.7**	22.2
39	Loons Rd (1)	338211	731293	33.3	M	36.5	35.7	24.7	21.1	22.1	28.9	30.3	31.0	39.8	44.5	**31.6**	91.7	1.0	**31.6**	25.3
237	Lower Princess St	340964	730855	23.1	23.3	33.9	24.5	19.2	18.2	18.6	23.7	19.9	19.5	36.0	31.6	**24.3**	100.0	1.0	**24.3**	19.4
40	Marketgait (Palais Crt)	339953	730094	23.3	21.9	26.4	22.1	14.8	14.5	15.4	16.6	17.4	19.7	30.6	26.3	**20.8**	100.0	1.0	**20.8**	16.6
	Meadowside (Romon 1)			36.7	35.4	42.2	31.9	27.8	23.0	23.2	26.3	28.3	31.8	41.0	39.0	**32.2**	100.0	1.0	**32.2**	25.8
	Meadowside (Romon 2)			38.6	36.3	42.4	31.1	26.1	22.4	23.0	26.7	28.0	32.5	41.4	39.3	**32.3**	100.0	1.0	**32.3**	25.9

Site Id. (DT)	Location	x	y	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.80)[5]
	Meadowside (Romon 3)			39.2	35.0	39.7	29.3	25.8	24.7	24.2	26.6	27.2	33.4	38.7	41.6	**32.1**	100.0	1.0	**32.1**	25.7
149	Meadowside (Romon) Average	340243	730653	38.2	35.6	41.4	30.8	26.6	23.4	23.5	26.5	27.8	32.6	40.4	40.0	**32.2**	100.0	1.0	**32.2**	25.8
42	Muirton Rd (6)	338156	731294	18.3	17.6	33.8	24.0	17.2	15.1	14.8	18.3	19.4	20.9	35.7	30.4	**22.1**	100.0	1.0	**22.1**	17.7
185	Murraygate (46)	340409	730484	17.7	14.0	19.0	13.9	10.8	8.5	10.8	11.9	8.7	15.5	22.5	23.3	**14.7**	100.0	1.0	**14.7**	11.8
189	Myrekirk Rd (29)	335420	731726	33.8	27.6	26.1	20.1	19.0	15.1	18.2	21.5	23.0	22.6	26.1	37.1	**24.2**	100.0	1.0	**24.2**	19.3
48	Nethergate (132)/Marketgait	340074	729984	25.9	25.3	29.2	22.2	M	18.2	21.8	23.4	24.4	23.3	38.2	34.6	**26.0**	91.7	1.0	**26.0**	20.8
47	Nethergate (40)	340230	730124	22.9	21.6	33.0	25.3	M	17.3	20.6	22.7	20.6	20.8	32.5	31.0	**24.4**	91.7	1.0	**24.4**	19.5
45	Nethergate (6)	340274	730171	30.0	29.0	30.8	22.9	20.5	20.6	23.2	23.2	19.8	26.3	33.8	31.4	**26.0**	100.0	1.0	**26.0**	20.8
213	Nethergate (64)	340196	730089	30.6	34.3	36.2	23.7	23.4	22.6	22.9	21.5	20.4	26.4	37.6	35.8	**28.0**	100.0	1.0	**28.0**	22.4
44	Nethergate (88)	340163	730061	28.2	28.4	39.3	32.8	26.0	22.0	25.2	27.1	25.3	27.3	38.2	36.5	**29.7**	100.0	1.0	**29.7**	23.8
46	Nethergate (95)	340033	729957	24.5	26.5	30.2	25.0	20.6	15.3	16.1	22.9	22.1	22.6	30.0	32.9	**24.1**	100.0	1.0	**24.1**	19.2
239	Princes St (185)	341077	731031	25.5	27.3	45.0	40.6	29.9	20.6	25.6	31.2	29.8	32.0	47.4	40.9	**33.0**	100.0	1.0	**33.0**	26.4
49	Rankine St (2)	338768	730900	42.3	39.1	38.0	25.4	21.7	20.5	21.3	24.6	28.7	29.9	35.1	44.9	**31.0**	100.0	1.0	**31.0**	24.8
228	Riverside Esplanade/S. Crichton St.	340516	729991	26.8	25.1	29.2	22.8	20.5	18.1	18.7	21.2	20.9	22.9	29.9	31.3	**24.0**	100.0	1.0	**24.0**	19.2
224	Seagate (112)	340528	730537	37.4	38.2	32.5	25.7	26.7	23.5	29.0	29.2	27.3	33.8	38.1	39.7	**31.8**	100.0	1.0	**31.8**	25.4
236	Seagate (36-40)	340463	730420	33.1	30.7	6.2	25.6	21.6	17.4	22.9	25.4	24.4	27.3	34.5	38.4	**25.6**	100.0	1.0	**25.6**	20.5
54	Seagate (9)	340467	730388	24.8	23.8	30.2	6.5	18.2	14.4	18.0	21.0	20.2	22.7	31.9	33.6	**22.1**	100.0	1.0	**22.1**	17.7
190	Seagate (97)	340516	730499	30.5	29.3	39.5	33.5	25.8	21.8	30.1	32.0	26.9	31.4	47.2	36.4	**32.0**	100.0	1.0	**32.0**	25.6
217	Seagate (99)	340535	730522	25.1	30.4	39.0	31.6	23.3	21.7	26.9	31.4	23.4	29.4	39.8	35.8	**29.8**	100.0	1.0	**29.8**	23.9
	Seagate (Romon 1)			31.3	31.1	36.5	30.9	24.8	21.9	27.8	30.6	26.9	32.3	35.9	38.8	**30.7**	100.0	1.0	**30.7**	24.6
	Seagate (Romon 2)			31.6	26.2	37.9	31.1	24.2	21.8	28.1	29.6	25.6	30.5	36.9	38.4	**30.2**	100.0	1.0	**30.2**	24.1
	Seagate (Romon 3)			30.7	30.5	35.6	30.9	24.9	21.1	28.0	30.0	26.1	30.4	36.7	35.5	**30.0**	100.0	1.0	**30.0**	24.0
159	Seagate (Romon) Average	340487	730446	31.2	29.3	36.7	31.0	24.6	21.6	28.0	30.1	26.2	31.1	36.5	37.6	**30.3**	100.0	1.0	**30.3**	24.2
55	Soapwork Lane	340099	730650	38.8	34.8	37.7	26.4	22.9	17.3	18.9	22.9	26.9	29.8	37.1	40.2	**29.5**	100.0	1.0	**29.5**	23.6
218	South Marketgait (Lamppost 18)	340291	729979	24.0	22.7	27.5	27.5	19.1	15.2	19.2	22.4	24.7	24.3	31.9	32.4	**24.2**	100.0	1.0	**24.2**	19.4

Site Id. (DT)	Location	x	y	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.80)[5]
247	South Marketgait (street sign)	340125	729952	M	M	M	M	23.1	23.3	25.4	27.8	M	M	40.3	41.8	**30.3**	50.0	1.027	**31.1**	24.9
151	South Road (1 Denbank)	335188	731528	M	26.6	28.8	25.7	21.1	19.6	21.5	25.9	23.9	27.2	31.9	35.6	**26.2**	91.7	1.0	**26.2**	20.9
162	St Andrews St/Seagate(116)	340532	730548	28.6	27.1	32.9	25.9	21.2	17.7	22.6	23.5	22.7	27.4	34.5	33.6	**26.5**	100.0	1.0	**26.5**	21.2
59	Strathmore Ave (353)	339609	731871	31.4	28.5	M	31.6	24.3	19.0	21.8	28.1	M	24.7	38.7	38.3	**28.6**	83.3	1.0	**28.6**	22.9
219	Thomson Avenue (Street Sign)	340542	730194	25.9	22.3	28.7	24.7	19.4	18.1	19.1	21.3	20.6	23.6	32.6	35.4	**24.3**	100.0	1.0	**24.3**	19.4
229	Thomson Avenue/S.Crichton St	340421	730078	28.2	27.0	31.4	22.7	19.9	17.9	18.7	20.2	23.5	27.1	29.5	34.3	**25.0**	100.0	1.0	**25.0**	20.0
60	Trades Lane (31)	340575	730500	22.0	19.7	23.9	17.8	13.9	10.7	14.7	16.5	18.1	20.9	27.8	29.9	**19.7**	100.0	1.0	**19.7**	15.7
93	Victoria Rd (10)	340230	730673	33.6	29.3	35.8	29.0	23.3	16.3	19.0	23.9	25.3	27.0	33.5	38.4	**27.9**	100.0	1.0	**27.9**	22.3
184	Victoria Rd (104)/William St)	340697	730950	23.0	19.0	31.2	25.3	18.8	17.0	18.2	21.8	19.8	24.6	30.7	31.7	**23.4**	100.0	1.0	**23.4**	18.7
191	Victoria Rd (4 India Buildings)	340213	730633	28.8	27.2	32.5	24.6	18.2	13.5	16.2	19.8	23.1	25.9	35.2	37.6	**25.2**	100.0	1.0	**25.2**	20.2
68	Victoria Rd (60)	340375	730779	30.4	28.5	37.7	29.8	22.3	18.7	21.3	23.9	25.4	28.7	36.8	37.7	**28.4**	100.0	1.0	**28.4**	22.7
70	Victoria Rd/Hilltown	340274	730714	66.3	55.2	53.3	36.5	40.1	29.3	34.4	36.7	41.7	47.1	46.0	58.2	**45.4**	100.0	1.0	**45.4**	36.3
71	Victoria St / Albert St	341071	731072	22.5	20.5	30.6	20.7	17.2	13.0	14.3	19.9	22.1	19.9	28.5	32.9	**21.8**	100.0	1.0	**21.8**	17.5
205	West Marketgait/ Old Mill (23)	339773	730436	50.0	54.4	49.5	33.6	31.2	28.4	29.5	46.4	36.5	63.4	74.3	56.2	**46.1**	100.0	1.0	**46.1**	36.9
231	West Marketgait/ Ward Road	339834	730314	31.0	34.2	30.1	24.4	22.3	16.2	16.9	21.7	23.5	30.2	36.1	35.6	**26.9**	100.0	1.0	**26.9**	21.5
183	West Marketgait/Guthrie St	339805	730338	48.0	45.5	43.4	31.9	28.0	26.7	26.7	29.8	32.9	37.4	43.6	45.3	**36.6**	100.0	1.0	**36.6**	29.3
72	Westport (2)	339842	730122	25.3	27.7	24.8	16.9	17.4	17.2	15.3	17.8	15.9	23.1	29.4	28.4	**21.6**	100.0	1.0	**21.6**	17.3
73	Whitehall Cr (4)	340376	730109	26.4	25.1	29.9	20.3	18.8	16.3	18.1	21.2	20.1	23.8	29.1	33.7	**23.6**	100.0	1.0	**23.6**	18.9
161	Whitehall Cr/Union St (50)	340305	730051	20.5	17.5	23.1	15.0	13.8	11.8	14.0	14.6	15.8	M	24.7	28.7	**18.1**	91.7	1.0	**18.1**	14.5
76	Whitehall St (1)	340265	730153	33.0	36.0	39.5	29.5	25.3	24.7	29.2	M	25.2	31.5	37.7	39.7	**31.9**	91.7	1.0	**31.9**	25.5
81	Whitehall St (12)	340293	730142	25.1	24.4	34.1	29.6	21.2	17.6	22.3	24.1	23.9	24.9	36.0	38.4	**26.8**	100.0	1.0	**26.8**	21.4
77	Whitehall St (15)	340322	730098	28.9	24.5	27.9	21.4	19.4	15.8	19.4	20.6	19.5	23.4	31.7	33.7	**23.9**	100.0	1.0	**23.9**	19.1
74	Whitehall St (40)	340330	730106	27.9	29.0	32.3	26.7	21.9	18.1	22.1	22.9	23.3	26.6	33.4	36.5	**26.7**	100.0	1.0	**26.7**	21.4
75	Whitehall St (5)	340289	730128	30.0	26.6	30.8	21.5	19.9	20.1	21.5	23.4	19.3	26.2	32.0	32.9	**25.4**	100.0	1.0	**25.4**	20.3
	Whitehall St (Romon 1)			M	25.8	31.5	24.2	22.2	19.1	21.3	24.3	20.7	25.4	31.9	34.6	**25.5**	91.7	1.0	**25.5**	20.4

Site Id. (DT)	Location	x	y	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.80)[5]
	Whitehall St (Romon 2)			26.8	22.9	32.0	13.2	21.8	18.2	22.3	23.7	21.6	24.4	32.5	33.3	**24.4**	100.0	1.0	**24.4**	19.5
	Whitehall St (Romon 3)			25.9	26.4	31.3	24.9	20.8	18.6	21.8	23.2	21.8	25.2	32.3	34.2	**25.5**	100.0	1.0	**25.5**	20.4
160	Whitehall St (Romon) Average	340278	730156	26.4	25.0	31.6	20.8	21.6	18.6	21.8	23.7	21.4	25.0	32.2	34.0	**25.2**	100.0	1.0	**25.2**	20.1
82	Woodside Ave	340776	732307	12.4	7	11.3	8.4	5.9	5.7	5.2	7.2	7.6	10.6	16.7	16.9	**9.6**	100.0	1.0	**9.6**	7.7

Notes

(1) Exceedances of the NO_2 annual mean objective are shown in **bold.** (Borderline values are coloured orange).

(2) NO_2 annual means greater than 60µg/m3 are shown in **bold & underlined**, indicating a potential exceedance of the NO_2 1-hr mean objective

(3) Sites shaded green were monitoring locations installed in 2022.

(4) 'M' means that the diffusion tube was either missing or else interference meant that the results were considered invalid.

(5) See Appendix C for details on bias adjustment.

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

New or Changed Sources Identified Within Dundee City Council During 2022

Dundee City Council has not identified any new sources relating to air quality within the reporting year of 2022.

Additional Air Quality Works Undertaken by Dundee City Council During 2022

Dundee Low Emission Zone scheme development

The proposed Dundee LEZ Scheme was submitted for approval to the Scottish Ministers in February 2022. This application was approved as submitted, with the Dundee LEZ Scheme then being introduced on 30 May 2022. No further air quality assessment of the LEZ scheme was undertaken during 2022, however SEPA continued to update their air quality modelling as appropriate with receipt of new traffic information such as bus operator fleet data and timetable.

Full details of the final Dundee LEZ scheme are available on the LEZ pages of the DCC website – www.dundeecity.gov.uk/lez , with a map of the LEZ area shown within Chapter 2 of this report. The website also contains the following reports and other documents produced during the LEZ development process.

SEPA Dundee Emissions Analysis Report (1.42MB PDF)

SEPA Low Emissions Zone Dundee Evidence Report September 2021 (4.2MB PDF)

QA/QC of Diffusion Tube Monitoring

Monitoring of NO_2 concentrations using passive diffusion tubes (PDT) is widely used throughout the UK. Provided that care is taken with the storage, handling and analysis of the tubes and an appropriate "bias-adjustment" factor is applied, the overall uncertainty of the annual mean is expected to be about +/-20%. The key issues to be considered are the performance of the laboratory, the precision of the diffusion tubes and the application of a suitable bias adjustment factor. These issues are considered in turn below.

Laboratory Performance

The diffusion tubes used by Dundee City Council are supplied by Gradko and analysed by Tayside Scientific Services utilising the 20% Triethanolamine (TEA) in water preparation method. Diffusion tubes are exposed for 4 to 5 weeks in accordance with the recommended dates supplied by Defra. The method for preparing and analysing tubes has remained unchanged since 2001. Two diffusion tubes from each monthly batch are used as blanks. These tubes are not exposed but are taken round during the monthly deployment and collection and stored in the refrigerator during the

exposure period. They are analysed along with the appropriate batch of exposed tubes. The purpose of the blanks is to determine whether contamination occurred during the preparation or deployment.

Defra and the Devolved Administrations advise that diffusion tubes used for Local Air Quality Management should be obtained from laboratories that have demonstrated satisfactory performance in the AIR Proficiency Testing (PT) scheme. Laboratory performance in AIR PT is also assessed, by the National Physical Laboratory (NPL) alongside laboratory data from the monthly NPL Field Intercomparison Exercise carried out at Marylebone Road, central London.

AIR is an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT started in April 2014 and combines two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme. AIR NO_2 PT forms an integral part of the UK NO_2 Network's QA/QC and is a useful tool in assessing the analytical performance of those laboratories supplying diffusion tubes to Local Authorities for use in the context of Local Air Quality Management (LAQM). With consent from the participating laboratories, LGC Standards provides summary proficiency testing data to the LAQM Helpdesk for hosting on the webpages at http://laqm.defra.gov.uk/diffusion-tubes/qa-qc-framework.html . This information is updated on a quarterly basis following completion of each AIR PT round.

Tayside Scientific Services demonstrated satisfactory performance in the latest report for 2021.

All diffusion tube changeovers during 2022 were in accordance with the diffusion tube calendar.

Diffusion Tube Annualisation

Annualisation of data was required for two diffusion tube sites with less than 75% data capture in 2022. The methodology outlined in Box 7.9 of LAQM.TG(22) was used. The urban background sites used are shown in Tables C.1 and C.2 below along with the annualisation factors applied to the data.

Table C.1 DT 246 Clepington Rd / Forfar Rd_2 annualisation

Period Adjustment Calculation for April to June, September to December

Urban Background Locations	Data Capture %	Annual Mean, A_m ($\mu g/m^3$)	Period Mean, P_m ($\mu g/m^3$)	Ratio, A_m/P_m	Average Ratio, R_a
DT 7 Balgavies Pl	100.0	12.25	11.69	1.048	
DT 9 Birnam Place	100.0	7.26	7.34	0.988	
DT 155 Carolina Court Lp6	100.0	15.66	15.50	1.010	0.996
DT 185 Murraygate (46)	100.0	14.72	14.74	0.998	
DT 82 Woodside Ave	100.0	9.58	10.26	0.933	
Site to be annualised					
DT 246 Clepington Rd/ Forfar Rd_2	58.3	23.3	23.4		

Table C.2 DT 247 South Marketgait (street sign) annualisation

Period Adjustment Calculation for May to August, November & December

Urban Background Locations		Data Capture %	Annual Mean, A_m ($\mu g/m^3$)	Period Mean, P_m ($\mu g/m^3$)	Ratio, A_m/P_m	Average Ratio, R_a
DT 7	Balgavies Pl	100.0	12.25	11.62	1.055	
DT 9	Birnam Place	100.0	7.26	7.03	1.032	
DT 155	Carolina Court Lp6	100.0	15.66	14.95	1.047	1.027
DT 185	Murraygate (46)	100.0	14.72	14.63	1.006	
DT 82	Woodside Ave	100.0	9.58	9.60	0.997	
Site to be annualised						
DT 247	**South Marketgait (Street Sign)**	50.0	31.1	30.3		

Diffusion Tube Bias Adjustment Factors

Dundee City Council have applied a local bias adjustment factor of 0.80 to the 2022 monitoring data. A summary of passive diffusion tube bias adjustment factors used by Dundee City Council over the past five years is presented in Table C.3.

Table C.3 Bias Adjustment Factor

Year	Local or National	If National, Version of National Spreadsheet	PTD Bias Adjustment Factor
2022	Local	-	0.80
2021	Local	-	0.85
2020	Local	-	0.85
2019	Local	-	0.85
2018	Local	-	0.84

Suitable Bias Adjustment Factor

The discussion and calculation of a suitable bias adjustment factor is detailed below:

The diffusion tubes are supplied by Gradko and analysed by Tayside Scientific Services utilising the 20% Triethanolamine (TEA) in water preparation method. The bias adjustment factor available on the LAQM Support Website for Tayside Scientific Services is 0.75[9] (Spreadsheet Version

[9] https://laqm.defra.gov.uk/wp-content/uploads/2023/07/Database_Diffusion_Tube_Bias_Factors_v06_23-FINAL.xlsx

Number: 06/23). This is based the kerbside National inter-comparison site at Marylebone Road (0.75).

Factor from Local Co-location Studies

Dundee City Council co-locates three NO_2 diffusion tubes with each of the roadside automatic NO_2 analysers. Co-location studies were carried out at 4 automatic monitoring locations in 2022. The factor for each study is shown in Table C.4 along with the factor for the national inter-comparison site at Marylebone Road in London. A minimum of 9 months is required to make a valid bias calculation. All 4 of the Dundee City Council co-location studies met the criteria in 2022. The QA/QC procedures for all the Dundee City Council automatic analysers used in the bias-calculation is equivalent to the Automatic Urban and Rural Network (AURN), which is run by the national government. Tayside Scientific Services have demonstrated satisfactory performance for the analysis of diffusion tubes over quarterly AIR-PT/WASP rounds in 2021. The automatic analyser period means are calculated from mid-day on tube changeover days.

Table C.4 Bias Factors from 2022 Co-location Studies and National Bias Adjustment Spreadsheet (Version 06/23_final)

Site Name	Site Type[1]	Length of Study (months)	PDT[2] Mean Conc. (Dm) (µg/m^3)	Analyser Mean Conc. (Cm) (µg/m^3)	% DC[3]	Bias (B)	Tube Precision & average CV [4]	Bias Adjustment Factor (A) (Cm/Dm)	Adjusted Tube Mean (µg/m3)
Lochee Road	R	12	38	29	99	30% (22% - 39%)	G (2.4%)	0.77 (0.72 - 0.82)	29 (27 - 31)
Seagate	R	12	30	26	99	18% (6% - 21%)	G (3%)	0.84 (0.73 - 1.00)	25 (22 - 30)
Whitehall Street	R	11	26	20	99	27% (19% - 35%)	G (2.7%)	0.79 (0.74 - 0.84)	20 (19 - 21)
Meadowside	R	12	32	26	99	23% (13% - 32%)	G (3.1%)	0.82 (0.76 - 0.88)	26 (24 - 28)
Marylebone Road Intercomparison	K	12	56	42	n/a	33.0%	G	**0.75**	

1 - R= Roadside, K= Kerbside

2 - PDT = Passive Diffusion Tube for NO_2

3 - %DC = Percentage Data Capture on the automatic analyser for the periods used

4 - Tube precision is determined as follows: **G** = Good precision - coefficient of variation (CV) of diffusion tube replicates is considered G when the CV of eight or more periods is less than 20%, and the average CV of all monitoring periods is less than 10%; **P** = Poor precision - CV of four or more periods >20% and/or average CV >10%; **S** = Single tube, therefore not applicable; **na** = not available.

Discussion of choice of factor to use

The majority of NO_2 diffusion tubes operated by Dundee City Council are located at roadside or kerbside locations. In view of this it is normally considered appropriate to use an overall factor derived from roadside and kerbside sites. A manual approximate orthogonal regression calculation using Bias B figures (obtained from the precision and accuracy spreadsheets[10]) was

[10] http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html

carried out for the local roadside sites separately and incorporating the national inter-comparison kerbside site at Marylebone Road. The calculation was carried out in accordance with the guidance within LAQM.TG22 Chapter 7: NO_x and NO_2 Monitoring, NO_2 by Diffusion Tubes. (see Table C.5). The factor obtained using only local roadside sites was 0.80, and 0.79 when the kerbside site at Marylebone Road was included. The 0.80 bias correction factor represents a more conservative approach and has been used to bias correct the diffusion tube data presented in this report.

Table C.5 Manual Approximate Orthogonal Regression Calculation 2022

Co-location Sites 2021	Site Type[1]	Bias Factor A	Bias B	Manual orthogonal regression Calculation as para 2.4 AQC doc[2]		
				Express as a factor	Add 1	Inverse
Lochee Road	R	0.77	30%			
Seagate	R	0.84	18%			
Whitehall St	R	0.79	27%			
Meadowside	R	0.82	23%			
Mean Local		0.81	24.5%	0.245	1.245	**0.80**
National: Marylebone Road Intercomparison	K	0.75	33.0%			
Combined Local & National: Mean Combined		0.79	26.2%	0.262	1.262	**0.79**

Notes:

1 - R= Roadside, K= Kerbside

2 - Paragraph 2.4 of AQC's report states, "For most purposes, a reasonable approximation of our method can be derived by averaging the bias values, expressed as a factor, i.e. -16% is -0.16. Next add 1 to this value, e.g. -0.16 + 1.00 equals 0.84 in this example, then take the inverse to give the bias adjustment factor 1/0.84 = 1.19. (This will not be exactly the same as the correction factor calculated using orthogonal regression, but will be reasonably close). IT IS IMPORTANT NOT TO AVERAGE THE ADJUSTMENT FACTORS."

NO_2 Fall-off with Distance from the Road

Fall-off-with-distance calculations were required for two non-automatic monitoring sites, where the annual mean concentrations were greater than 36µg/m^3 and the monitoring site is not located at a point of relevant exposure. Details of the sites, and the methodology used are included in Table 3.1 in Section 3.2.1. The measurements used in the calculation are contained in Table A.2.

Table C.6 NO_2 Fall of With Distance Calculations (concentrations presented in ug/m^3)

Site ID	Distance (m): Monitoring Site to Kerb	Distance (m): Receptor to Kerb	Monitored Concentration (Annualised and Bias Adjusted	Background Concentration	Concentration Predicted at Receptor	Comments
DT 70	1.15	3.16	36.3	11.8	31.3	
DT 205	2.80	2.85	36.9	9.7	36.9	*Predicted concentration at Receptor within 10% the AQS objective.*

QA/QC of Automatic Monitoring

All automatic analysers (excluding Osiris units) are audited twice yearly by an external consultant, Ricardo. The gas analysers do not have on-site gases and are manually calibrated every 3 weeks by Ricardo using National Physical Laboratory (NPL) traceable gas.

Dundee City Council secured funding from the Scottish Executive to commission Ricardo to assist with data management and ratification procedures. Dundee joined the 'Calibration Club' run by Ricardo at the end of 2006. Ricardo have ratified all the real-time monitoring data reported on the Scottish Air Quality Website from 2006 onwards under contract from the Scottish Government.

http://www.scottishairquality.scot/latest/summary?view=la

All instruments (excluding OSIRIS units) are serviced and calibrated every 6 months by the equipment supplier. OSIRIS units undergo quarterly flow checks and filter changes as well as annual service and calibration by the manufacturer (Turnkey Instruments).

The Partisol is a semi-automatic reference equivalent PM_{10} analyser. It contains 16 'Emfab' filters, each is exposed for 24 hours allowing for 2 weeks continuous operation (usually with two blanks). The filters are supplied by the equipment manufacturer and conditioned and weighed before and after the sampling period by Tayside Scientific Services using in-house procedures.

The Fidas 200 is a nephalometer, which is calibrated using a HEPA filter and 'CalDust' by Ricardo (Local Site Operator) every 3 weeks for the first 6 months following installation. Thereafter it is calibrated during the twice-yearly service and audits.

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

Dundee has used several methods for monitoring particulate matter (PM_{10}) within the city, with the type of analyser used at all the main monitoring stations changing in recent years to Fidas analysers.

Prior to 2022, data from the Fidas was not required to be adjusted, however as a result of the "Scottish Government Equivalence Study to Investigate Particulate Matter Monitoring In Scotland

Using The Fidas 200"[11], the Scottish Government advised in May 2023 that Fidas PM_{10} monitoring data requires correction by dividing by 0.909, while $PM_{2.5}$ monitoring data is to be corrected by multiplying by 1.06.

Both TEOM and OSIRIS monitors have heated inlets. These tend to drive off volatile organic particulate matter and in consequence the measured concentrations tend be lower than those measured by gravimetric reference standard monitors. The historic TEOM PM_{10} data presented in this report was corrected using the Volatile Correction Methodology (VCM). (The Partisol is a reference equivalent method and had been used historically to determine a local correction factor for the TEOMs, which were designated as non-equivalent in 2006.)

DCC has five OSIRIS analysers which have been in their current locations since at least 2012. These are also non-equivalent but their measurements are considered indicative of particulate concentrations. Annually, post service, all 5 OSIRIS monitors are co-located in-house and their data is compared with that of a designated "master" to derive, if necessary, individual adjustment factors. The factors used to adjust the 2022 data can be made available on request. The "master" OSIRIS unit has been co-located with the Partisol at the urban industrial site at Broughty Ferry Road since September 2012, thus allowing the OSIRIS results presented in this report to be gravimetrically corrected prior to reporting. The gravimetric factor applied to 2022 data was 1.207. This methodology although reasonable for annual mean data, has a tendency to over-estimate the number of daily mean exceedances. Consequently, these results should be treated with some caution.

For comparison with the NAQS objectives annual mean concentrations are calculated from an hourly time base**.**

Automatic Monitoring Annualisation

Annualisation of data was required for one automatic monitoring site with less than 75% data capture in 2022. The methodology outlined in Box 7.9 of LAQM.TG(22) was used. The urban background sites used are shown in the Table C.7 below along with the annualisation factors applied to the data.

[11] https://www.scottishairquality.scot/technical-reports/equivalence-study-investigate-particulate-matter-monitoring-scotland-using-fidas

Table C.7 Period Adjustment Calculation for CM12, Mains Loan NO_2 Annual Mean 2022

Period Adjustment Calculation for CM12, Mains Loan NO_2 Annual Mean 2022

Urban Background Locations	Data Capture %	Annual Mean, A_m ($\mu g/m^3$)	Period Mean, P_m ($\mu g/m^3$)	Ratio, A_m/P_m	Average Ratio, R_a
Falkirk Grangemouth MC	85.94	14.00	17.62	0.794	
Grangemouth Moray	99.17	12.33	15.32	0.805	
Aberdeen Erroll Park	99.46	16.55	19.37	0.854	**0.833**
Edinburgh St Leonards	97.80	12.97	14.59	0.889	
Glasgow Townhead	99.12	16.80	20.42	0.822	
Site to be annualised					
CM12, Mains Loan - NO_2	52.79	**7.6**	9.08		

NO_2 Fall-off with Distance from the Road

No automatic NO_2 monitoring locations within Dundee City Council required distance correction during 2022.

Appendix D: Overview of NO_2 Annual Mean Concentrations across the City

Notes:

1) Graphs show the NO_2 annual mean concentrations measured at the passive diffusion tube locations and continuous monitoring stations that are highlighted in the accompanying map.

2) 'Hollow' markers for the graphs denote for that year there was <85% data capture at continuous monitor (CM) locations or <75% data capture for passive diffusion tube (DT) locations

Union Street and Whitehall Street

Figure 13 NO_2 Monitoring locations in Union St and Whitehall St

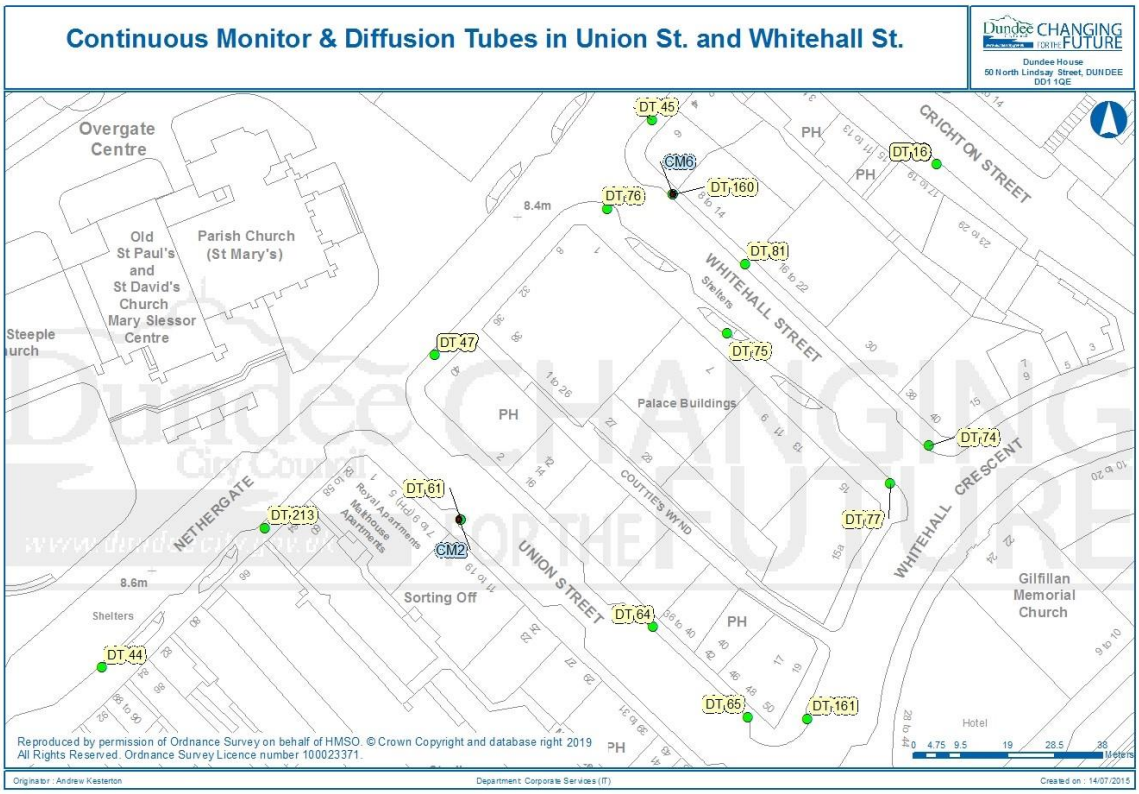


Figure 14 Overview of NO_2 Concentrations in Union St and Nethergate (east of Marketgait)

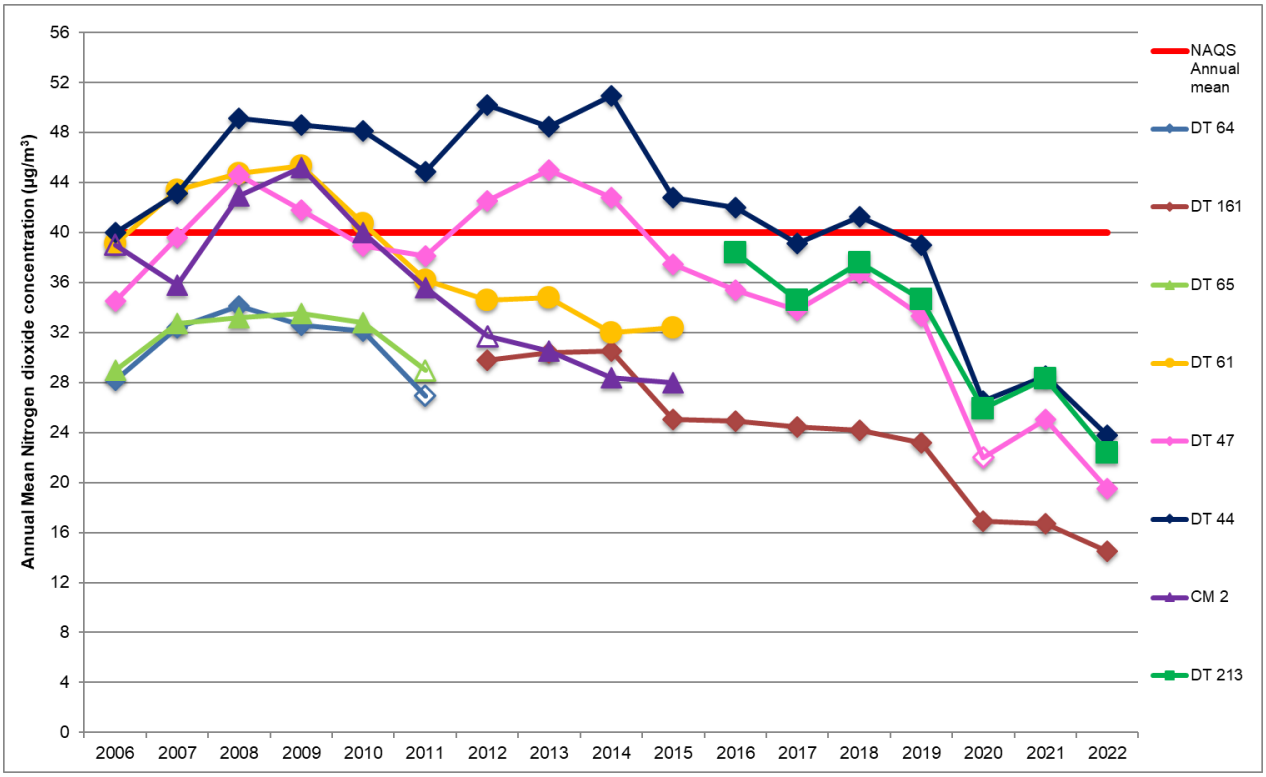
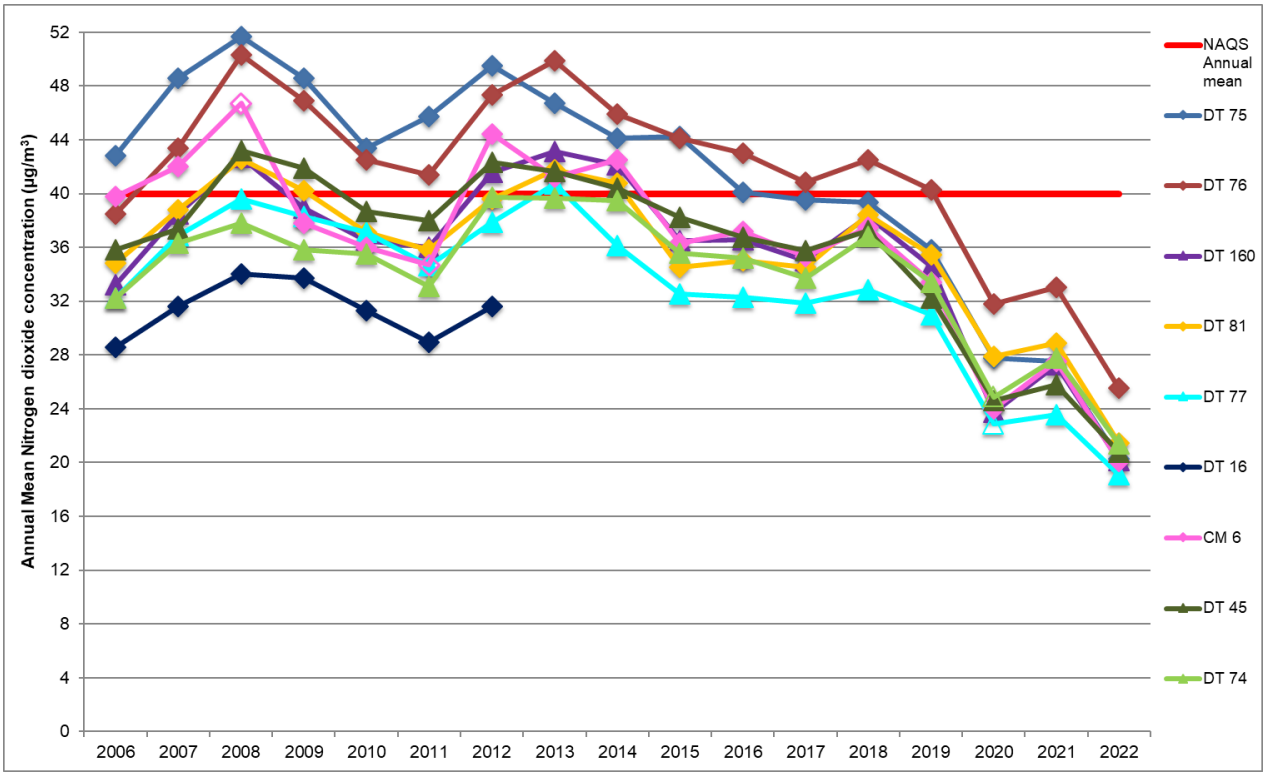


Figure 15 Overview of NO_2 Concentrations in Whitehall St and Crichton St.



Seagate

Figure 16 NO_2 Monitoring locations in Seagate

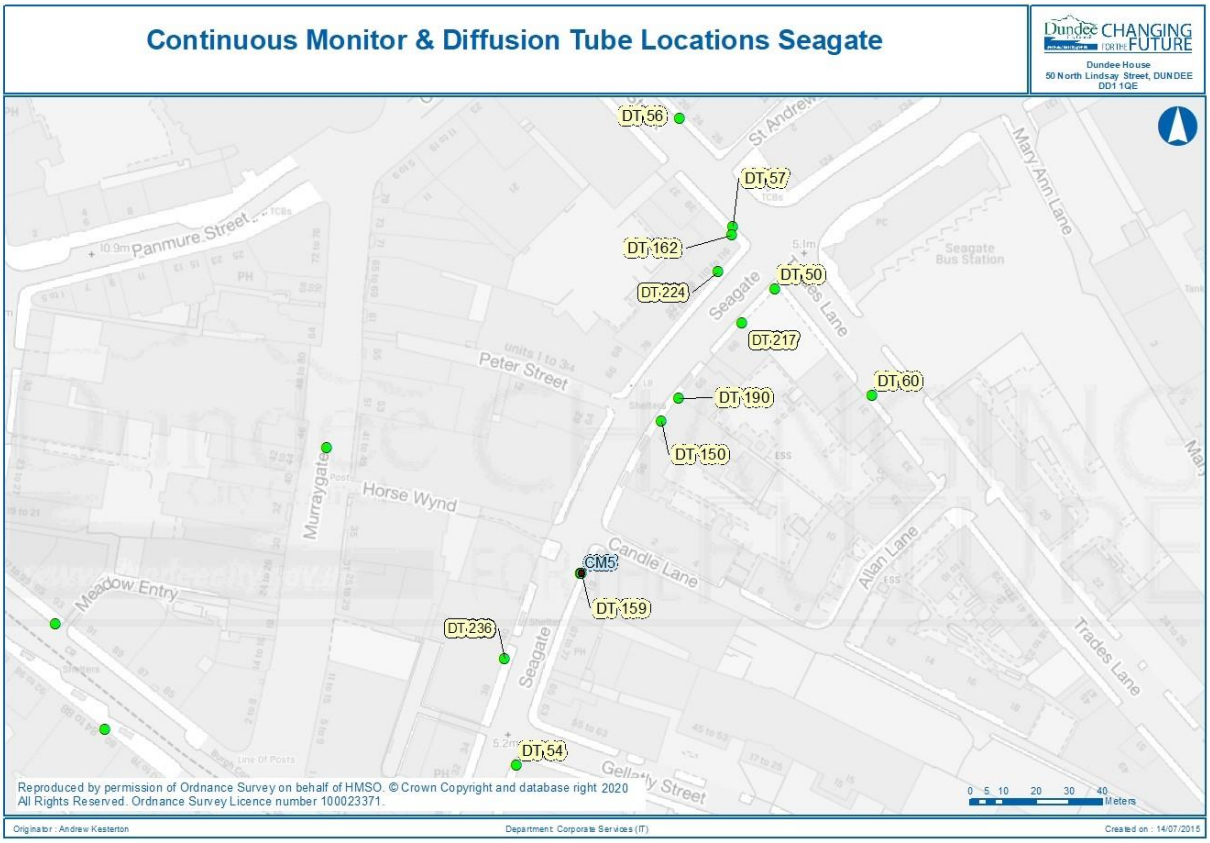
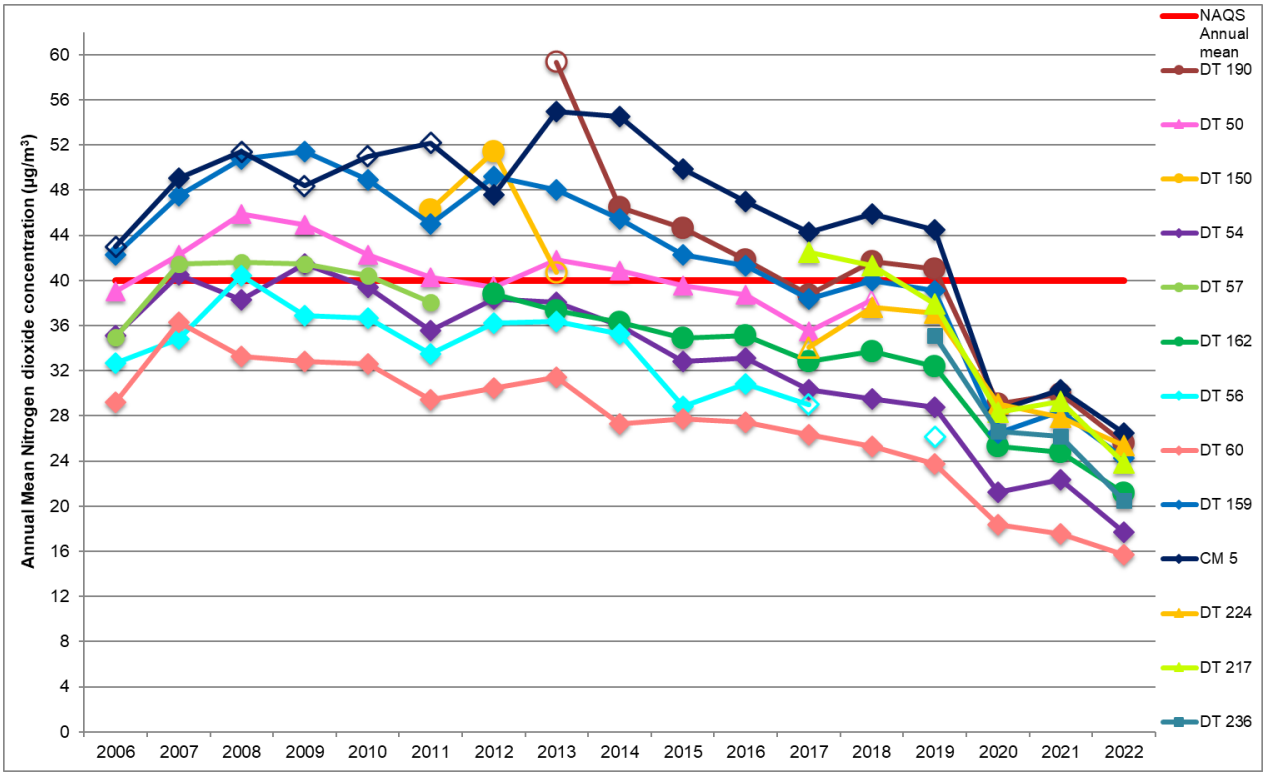


Figure 17 Overview of NO_2 Concentrations in Seagate



Nethergate

Figure 18 NO_2 Diffusion Tube Locations in Nethergate

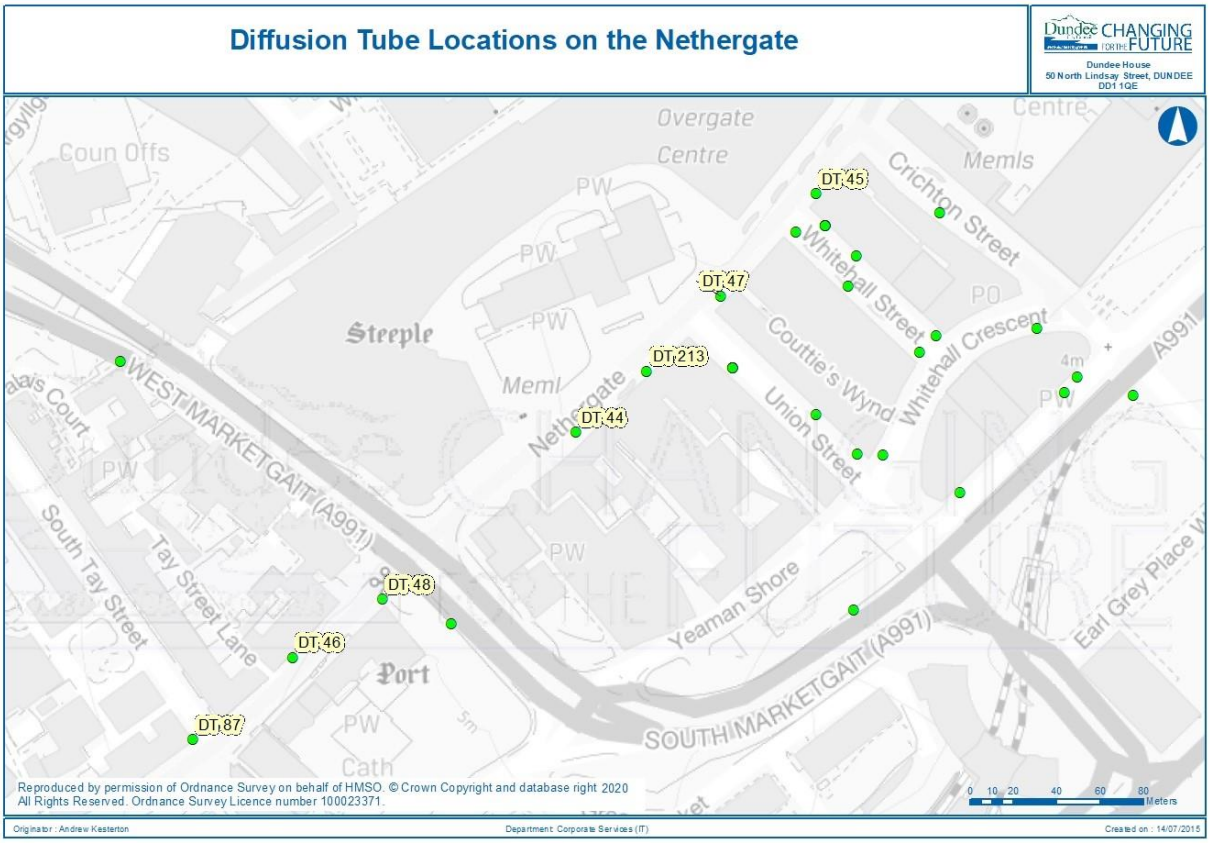
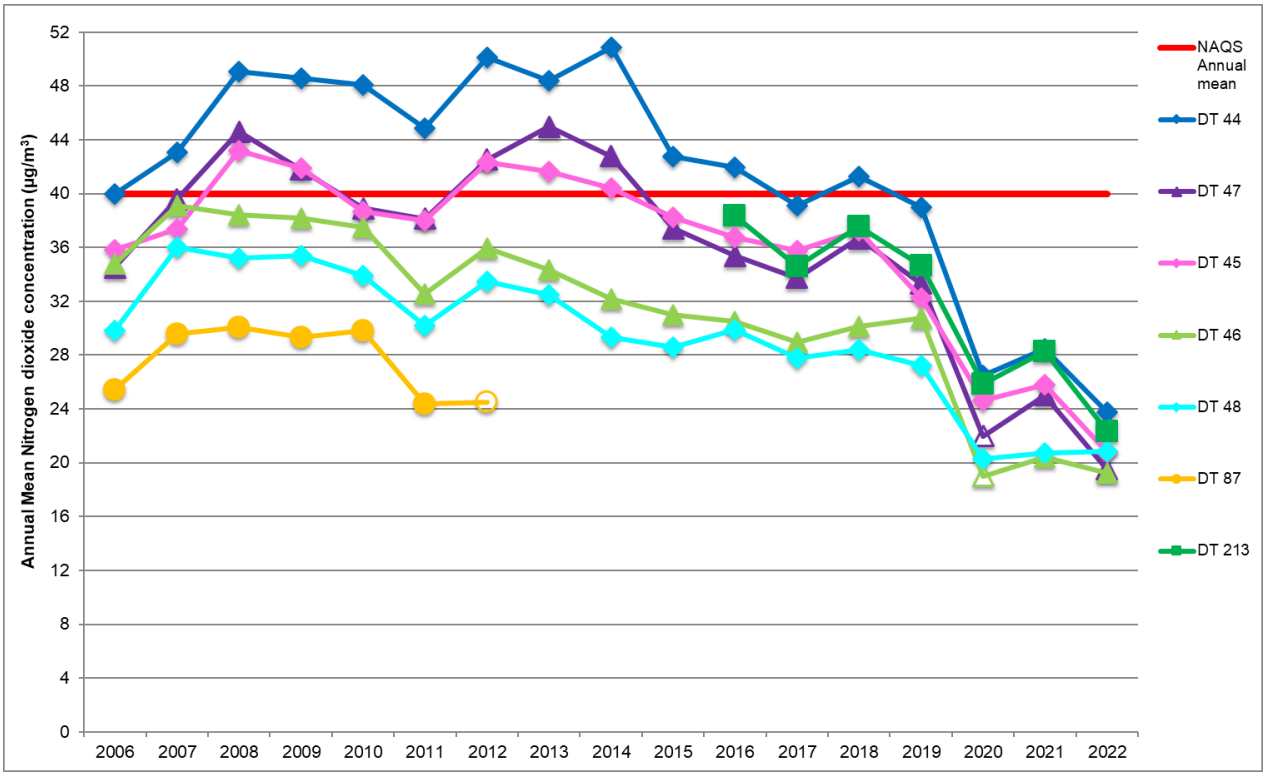


Figure 19 Overview of NO_2 Diffusion Tube Concentrations in Nethergate



Victoria Road / Meadowside

Figure 20 NO_2 Diffusion Tube Locations in Victoria Road / Meadowside

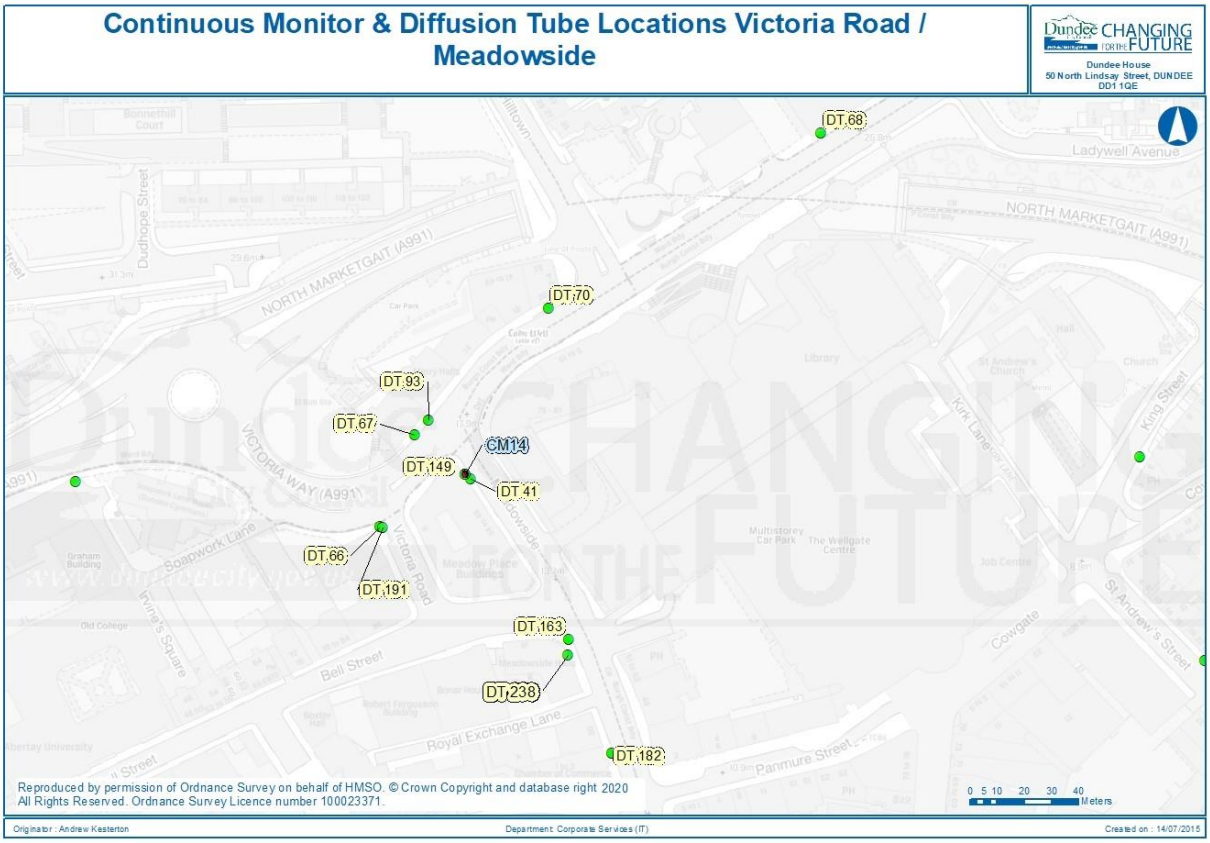
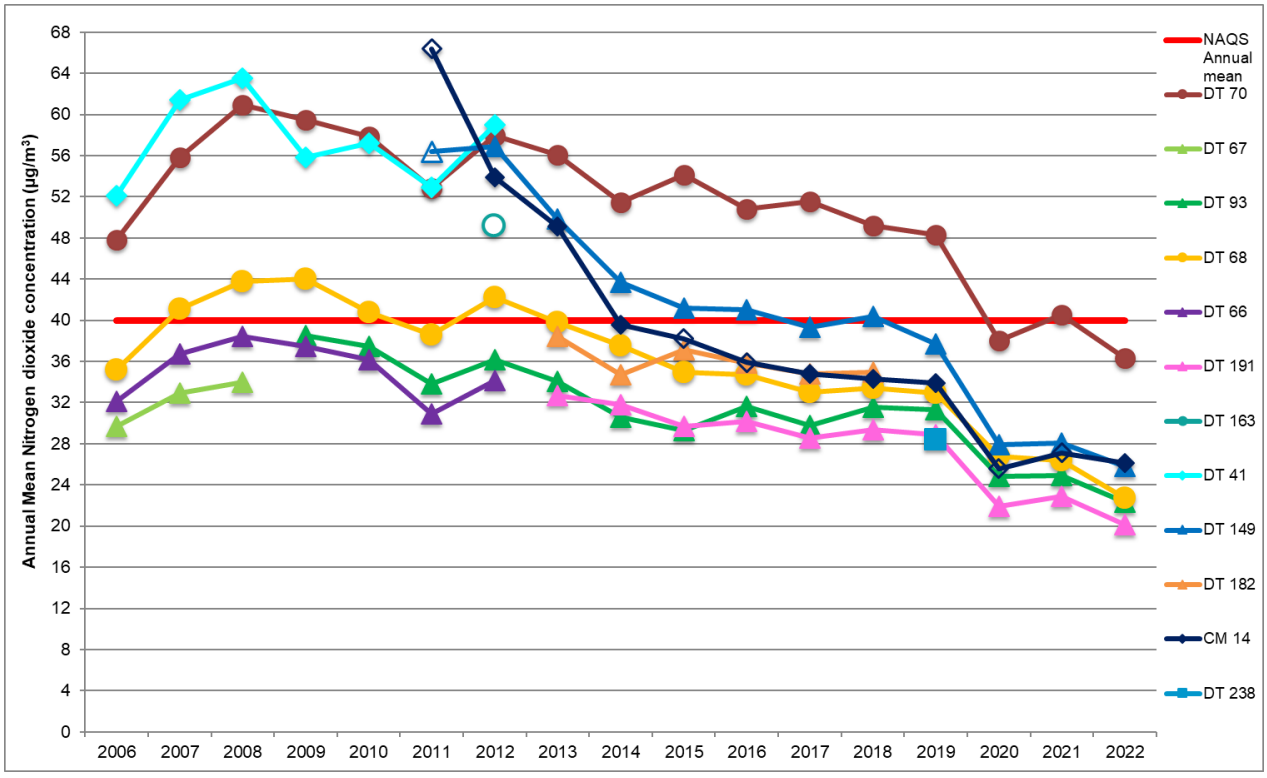


Figure 21 Overview of NO_2 Concentrations in Victoria Rd / Meadowside



Albert Street / Dura Street

Figure 22 NO_2 Diffusion Tube Locations in Albert Street / Dura Street

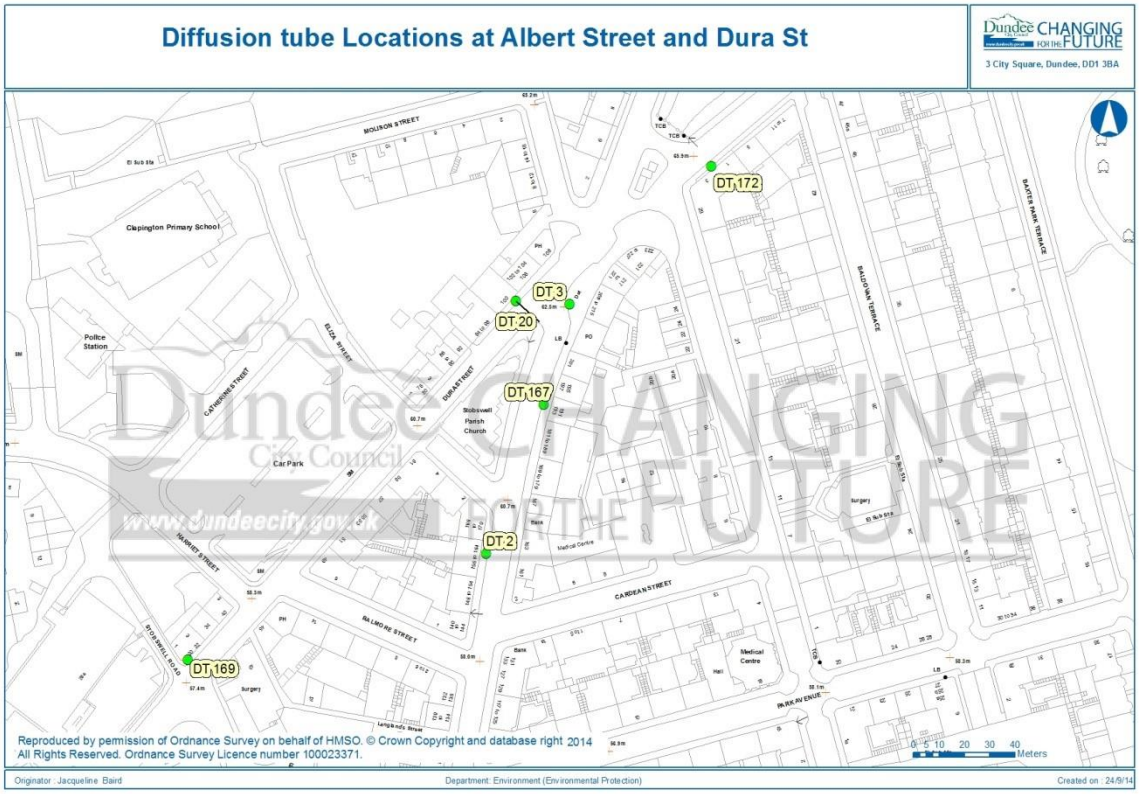
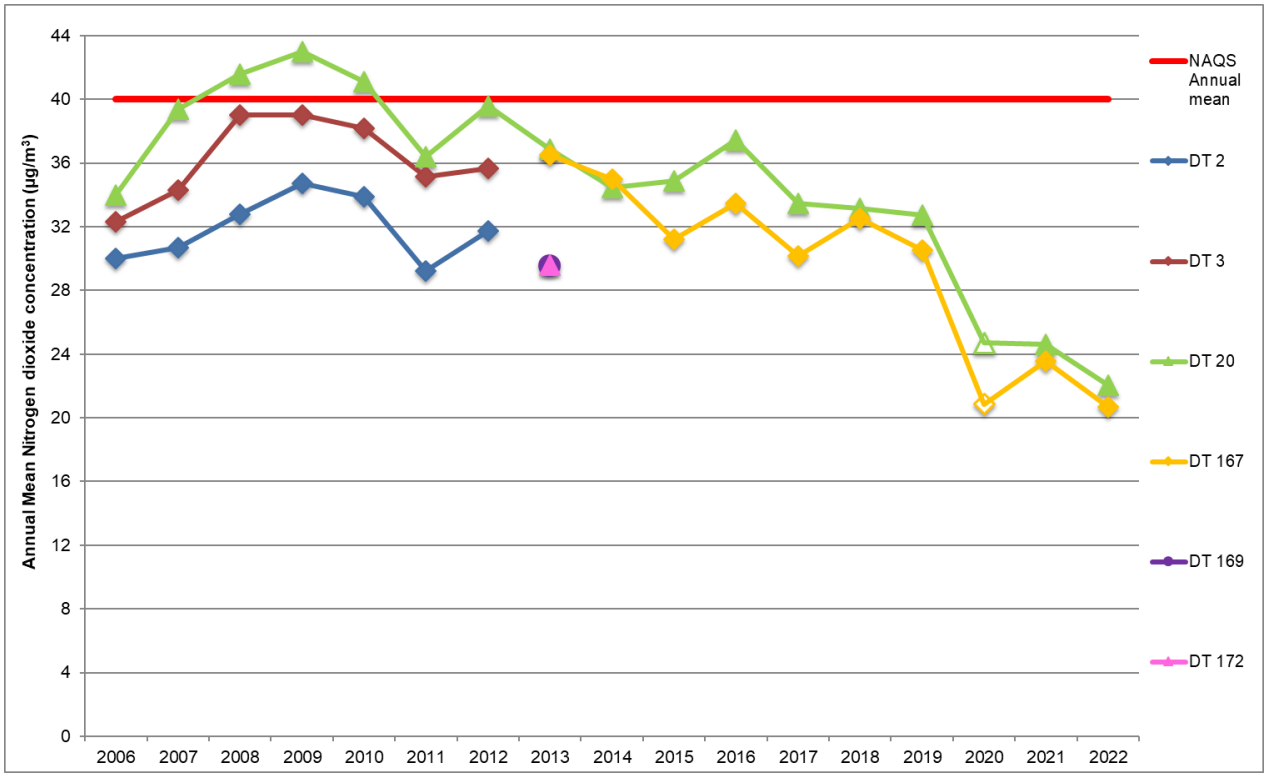


Figure 23 Overview of NO_2 Diffusion Tube Concentrations in Albert St / Dura St



Lochee Road

Figure 24 NO_2 Monitoring Locations in Lochee Road

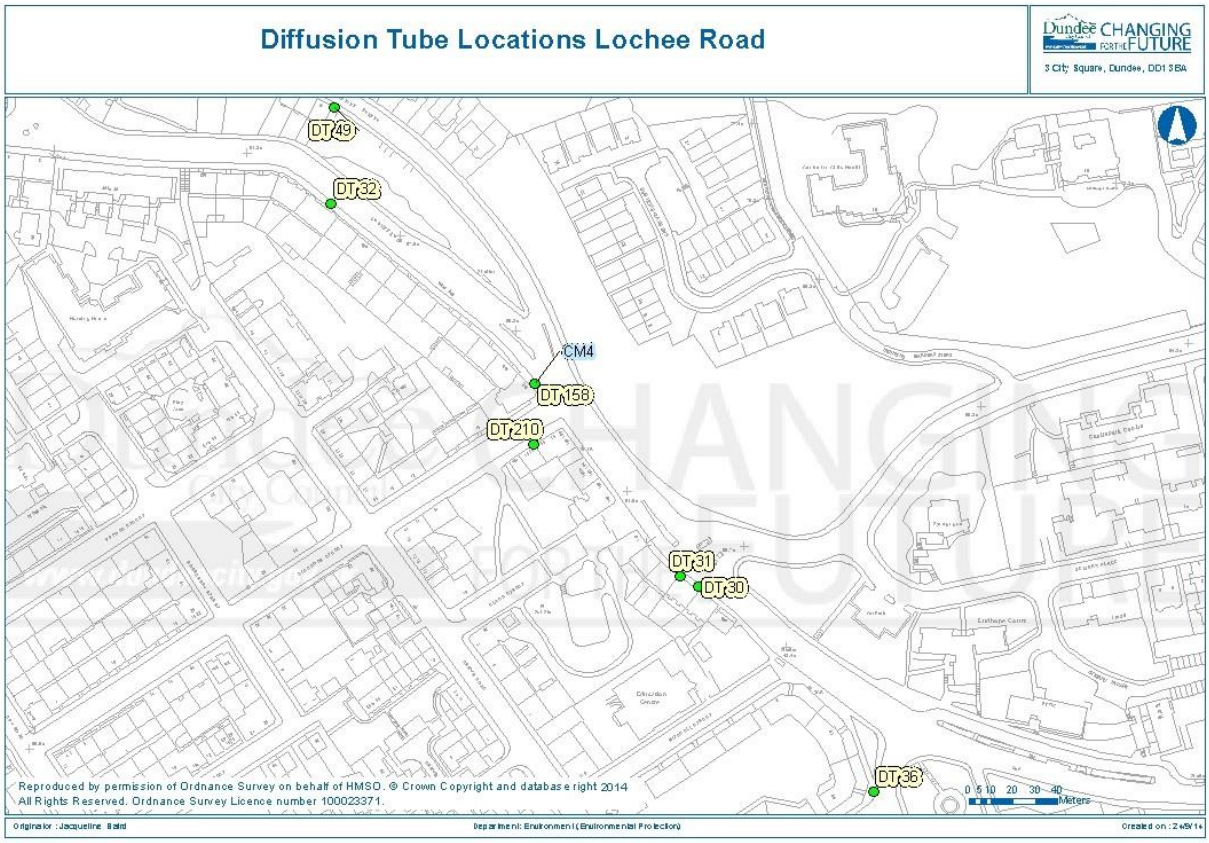
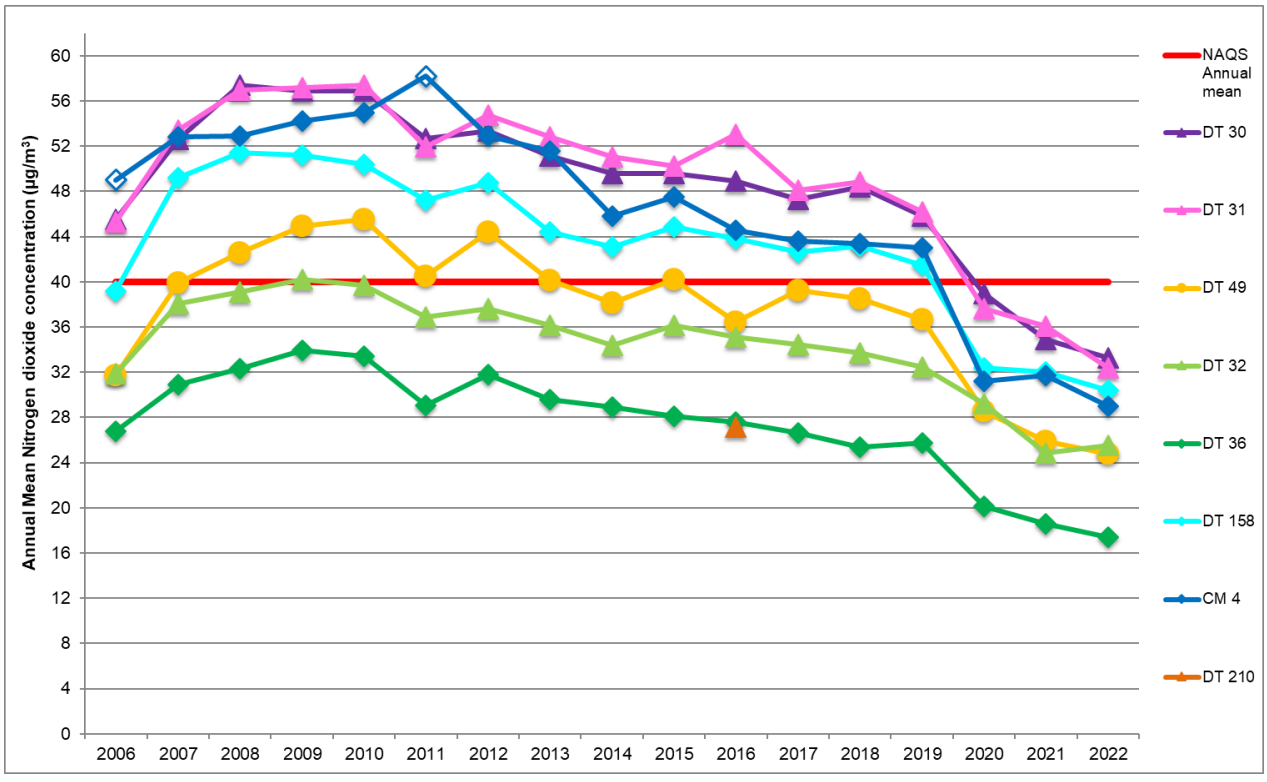


Figure 25 Overview of NO_2 Concentrations at Lochee Rd



Logie Street

Figure 26 NO_2 Diffusion Tube Locations in Logie Street

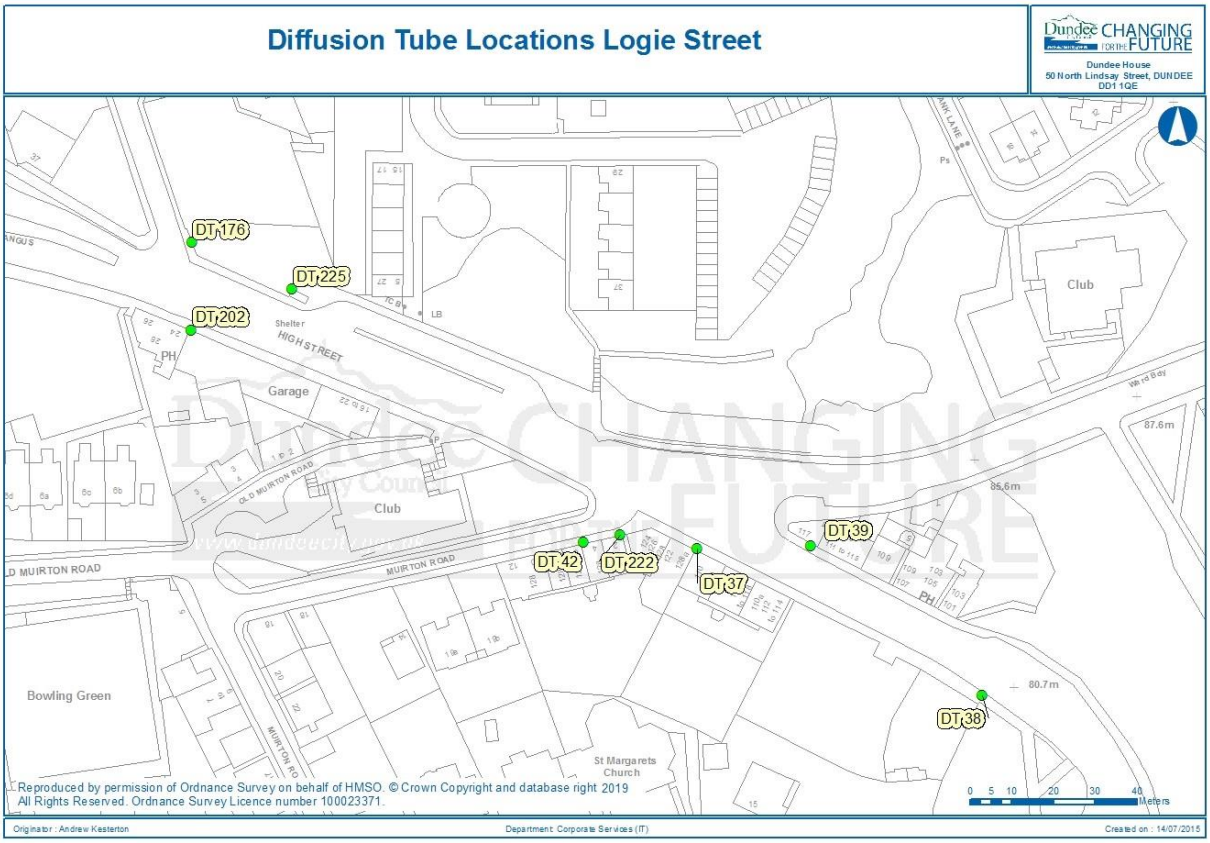
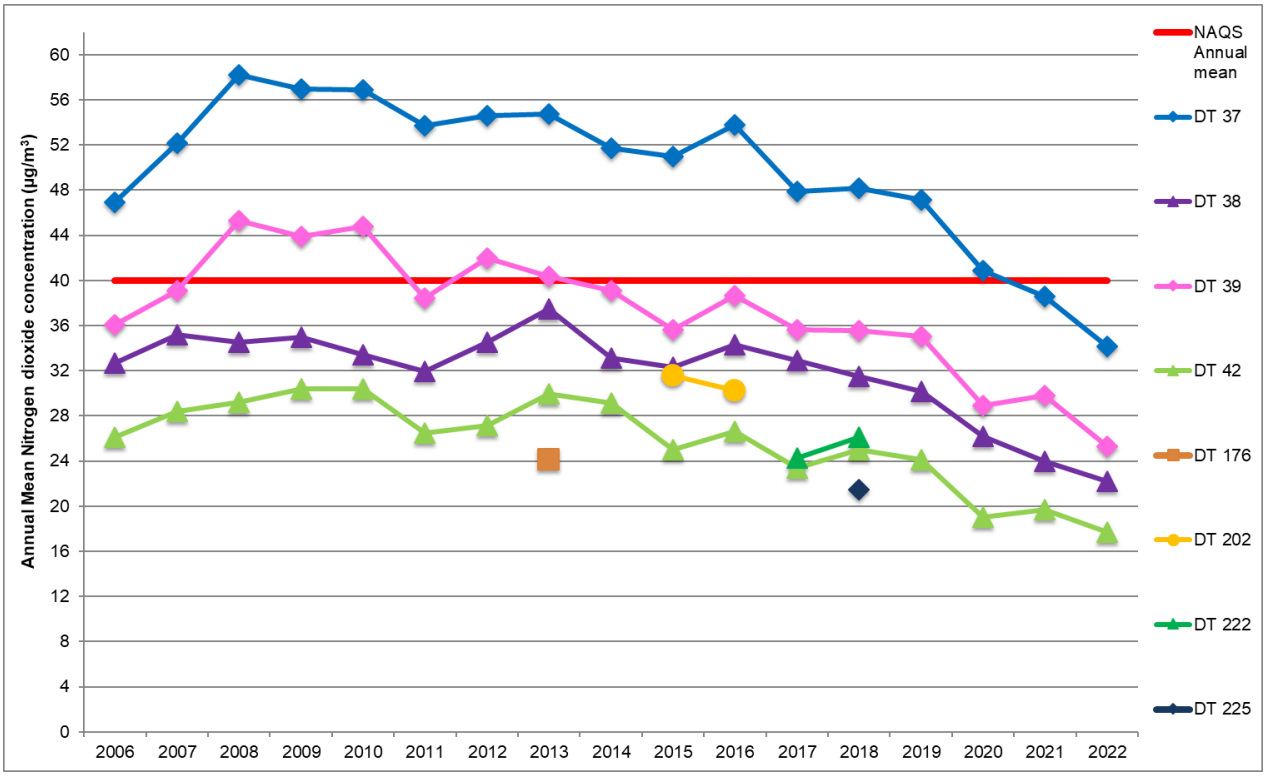


Figure 27 Overview of NO_2 Diffusion Tube Concentrations in Logie Street



Albert Street / Arbroath Road

Figure 28 NO_2 Diffusion Tube Locations in Albert Street / Arbroath Road

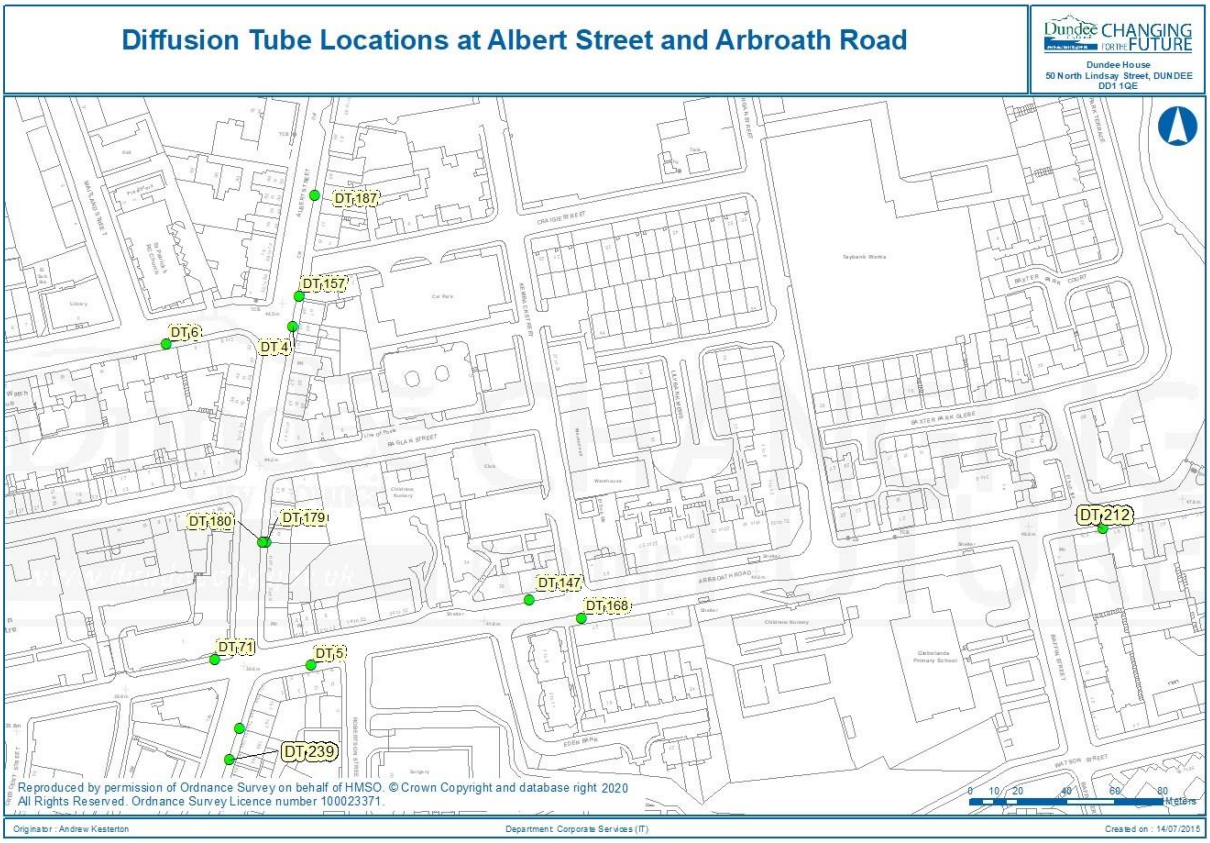
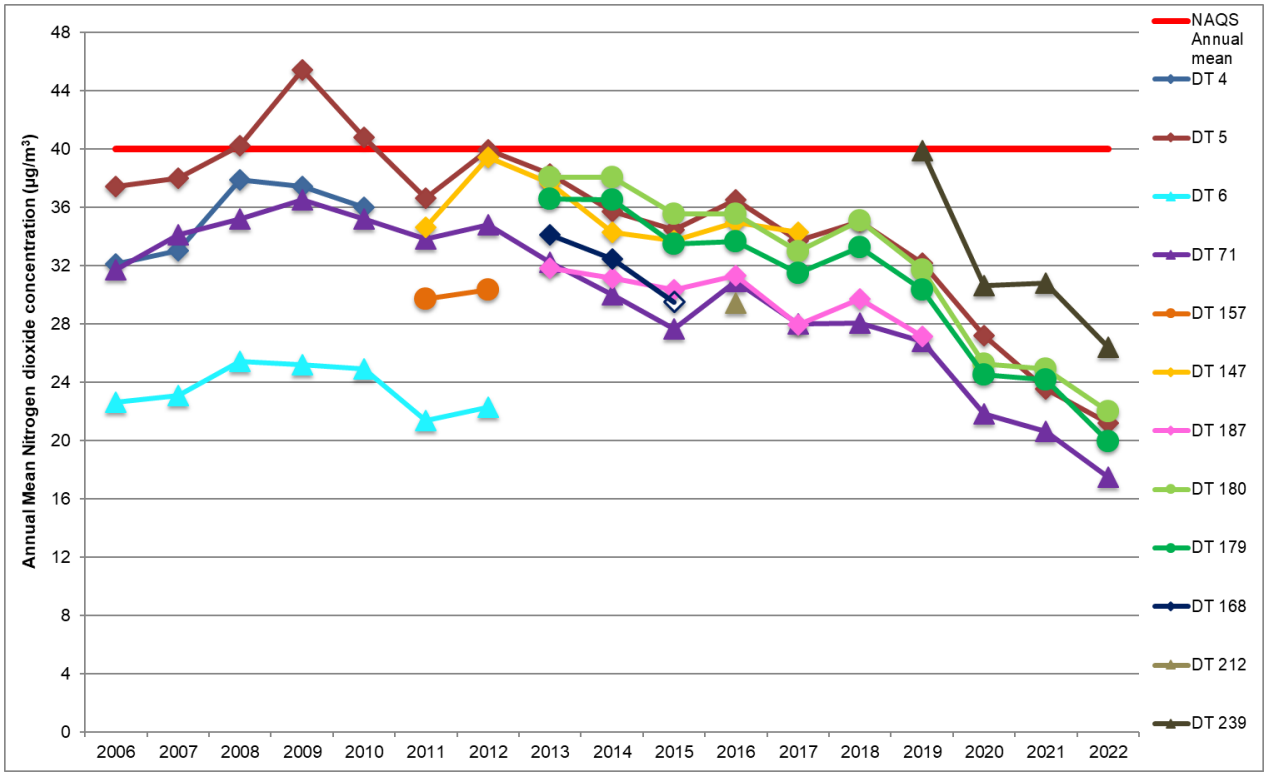


Figure 29 Overview of NO_2 Diffusion Tube Concentrations in Albert St / Arbroath Rd.



Kingsway / Forfar Road

Figure 30 NO_2 Diffusion Tube Locations on / near the Kingsway

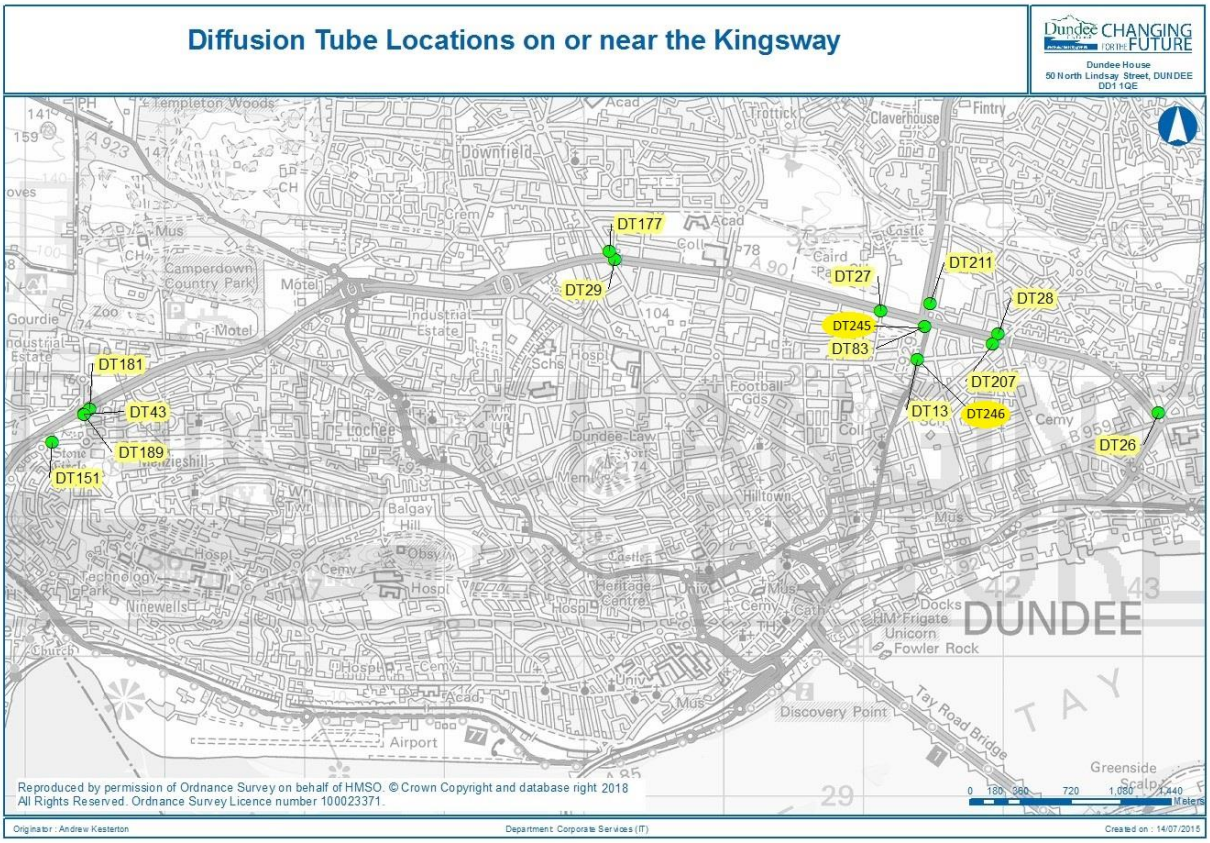
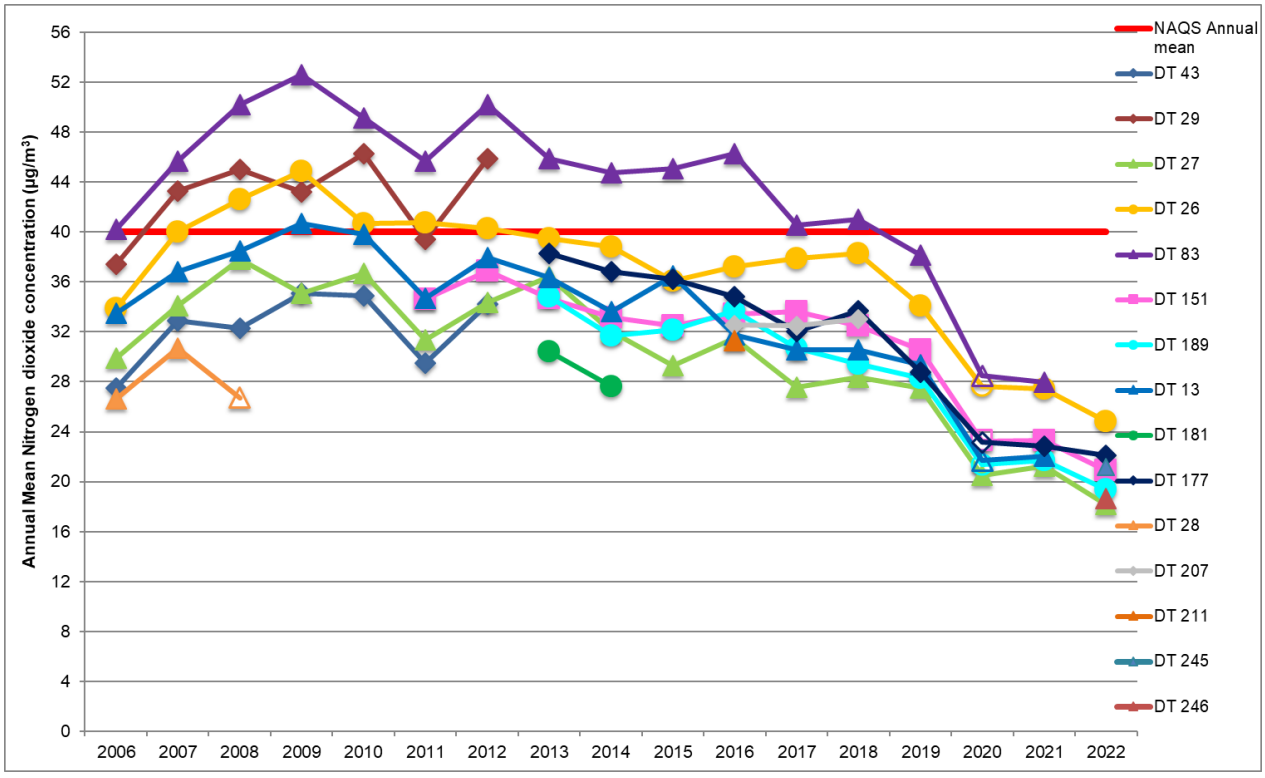


Figure 31 Overview of NO_2 Diffusion Tube Concentrations on/near the Kingsway



Bus Corridor

Figure 32 Other NO_2 Diffusion Tube Locations on Bus Corridor

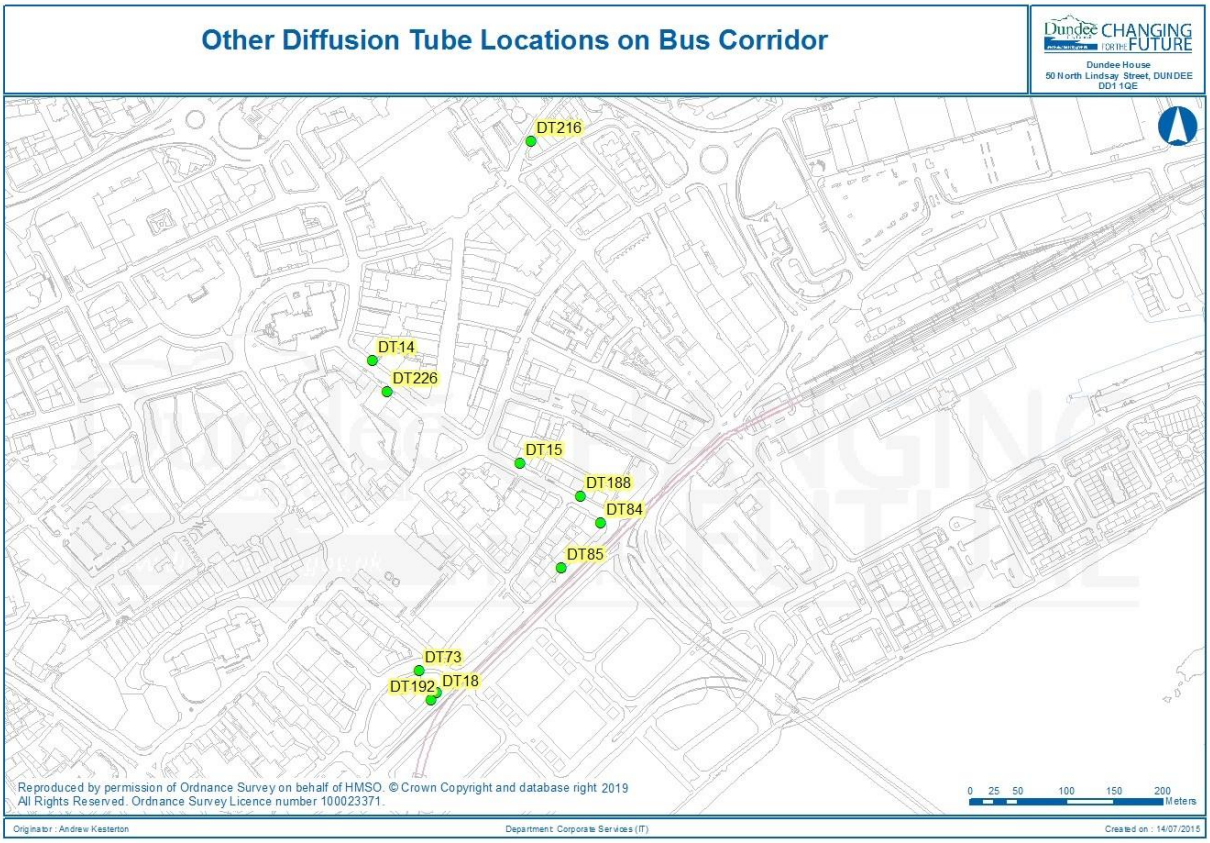
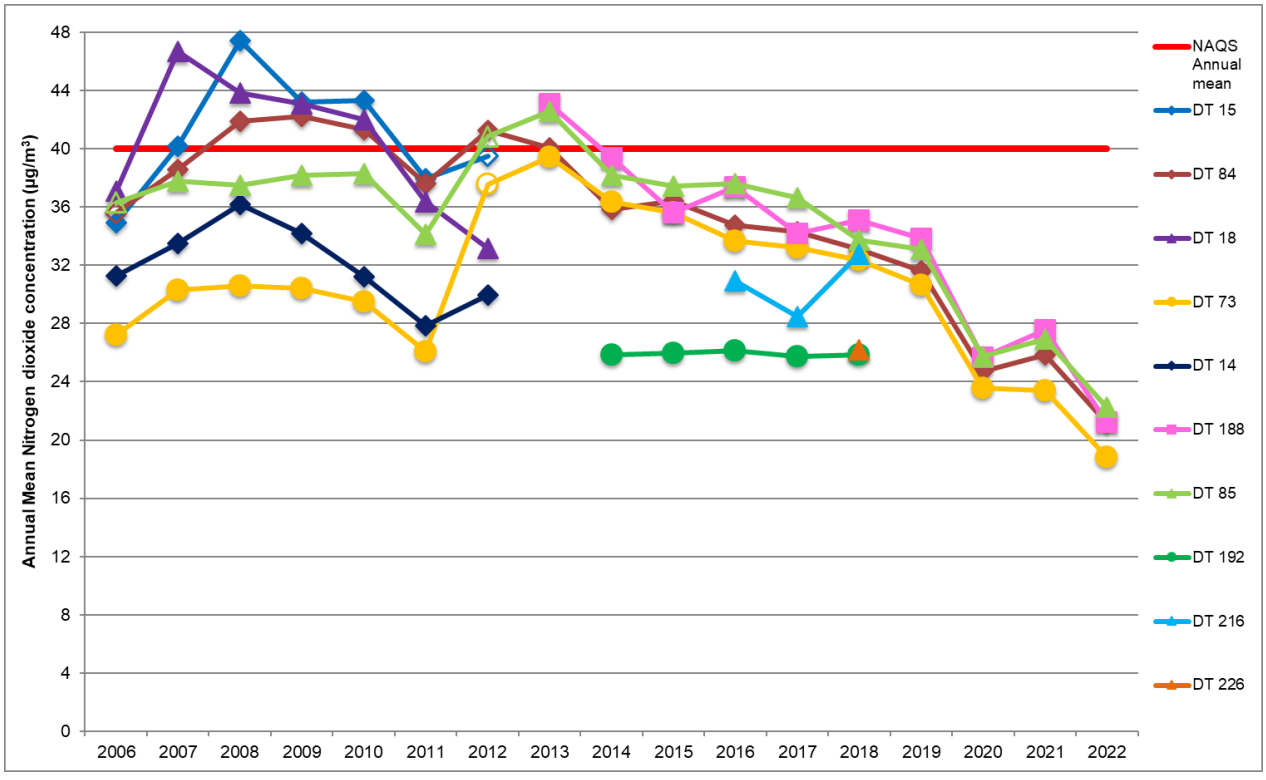


Figure 33 Overview of NO_2 Diffusion Tube Concentrations on Bus Corridor



Inner Ring Road

Figure 34 NO_2 Diffusion Tube Locations on the Inner Ring Road

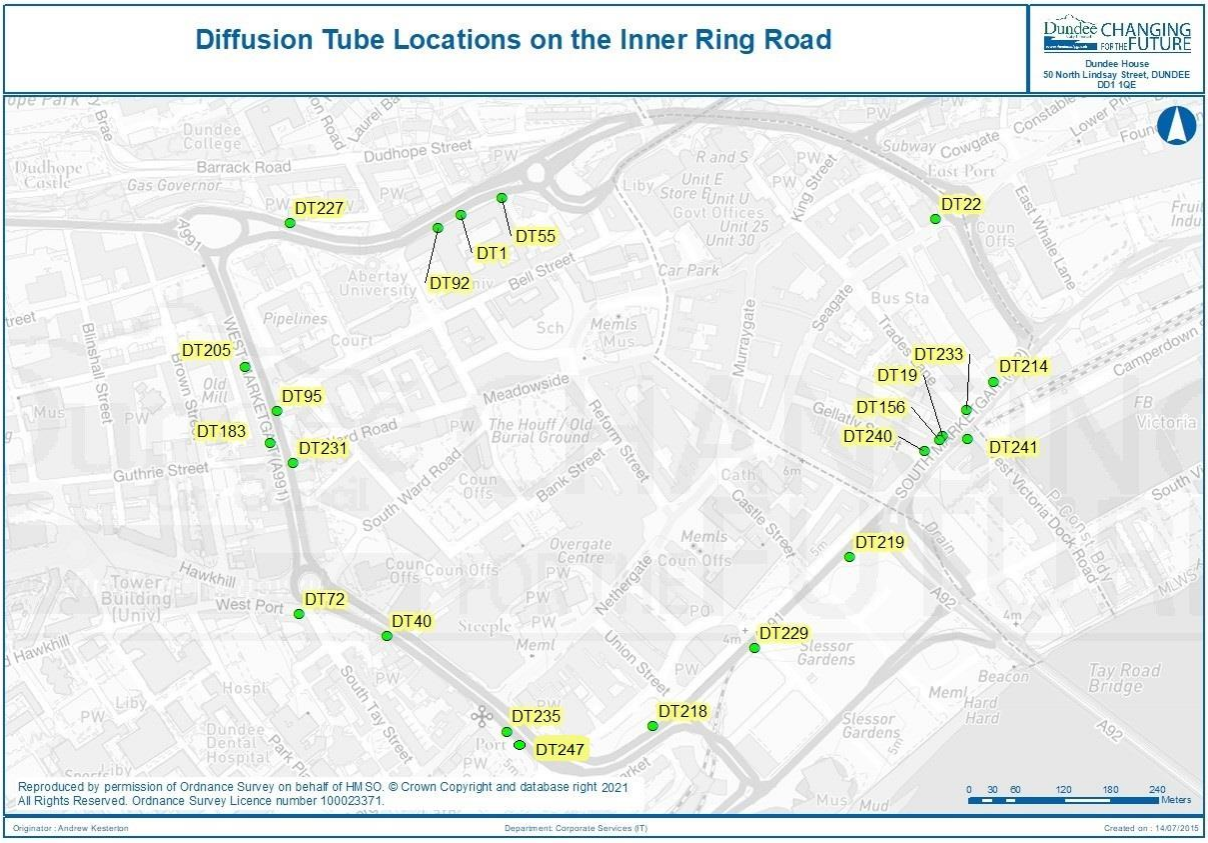


Figure 35 Overview of NO_2 Diffusion Tube Concentrations on Inner Ring Road (West & North Marketgait)

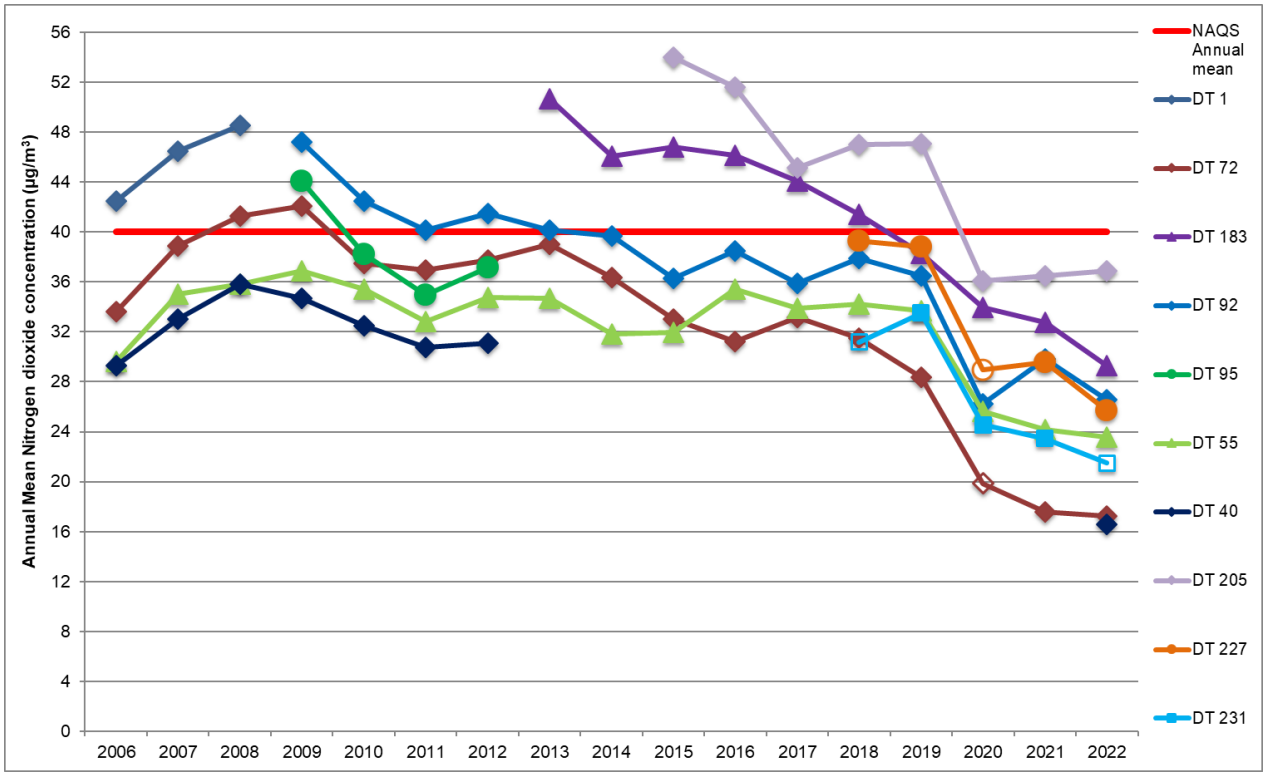
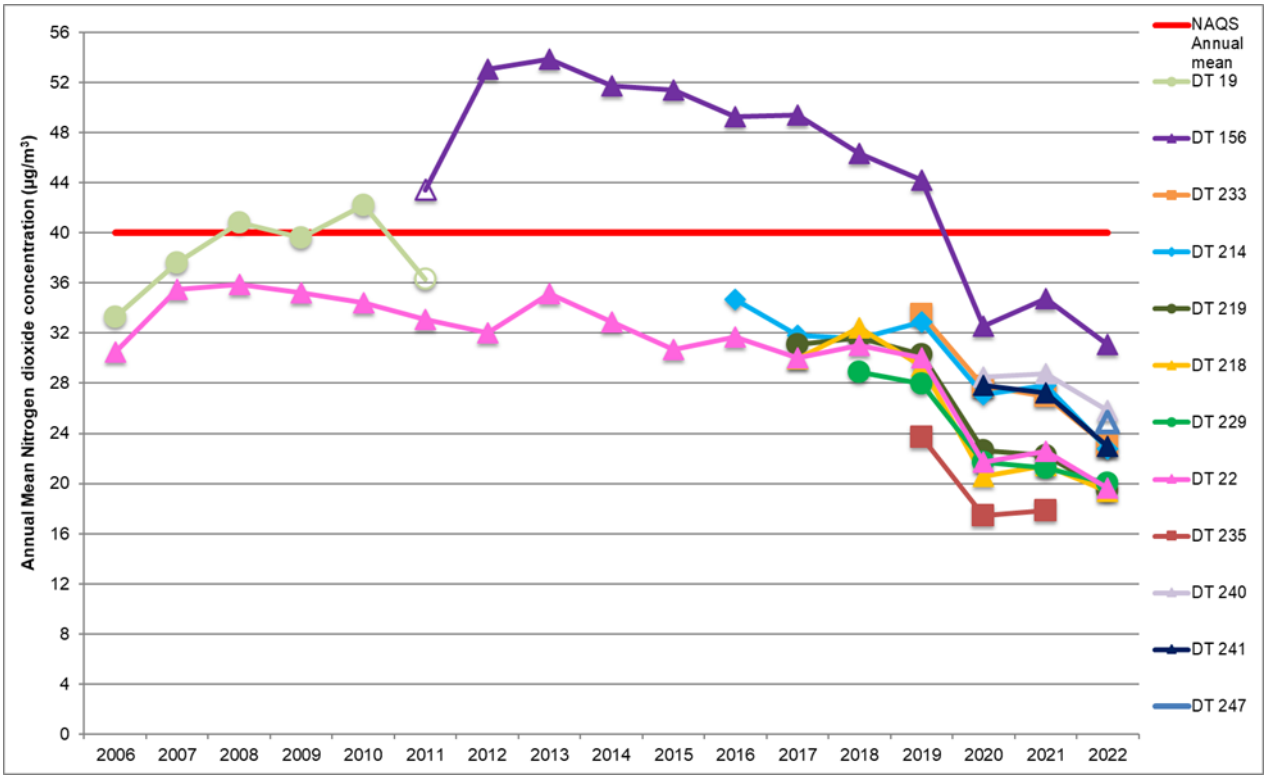


Figure 36 Overview of NO_2 Diffusion Tube Concentrations on Inner Ring Road (East & South Marketgait)



Stannergate

Figure 37 NO_2 Diffusion Tube Locations at Stannergate Roundabout

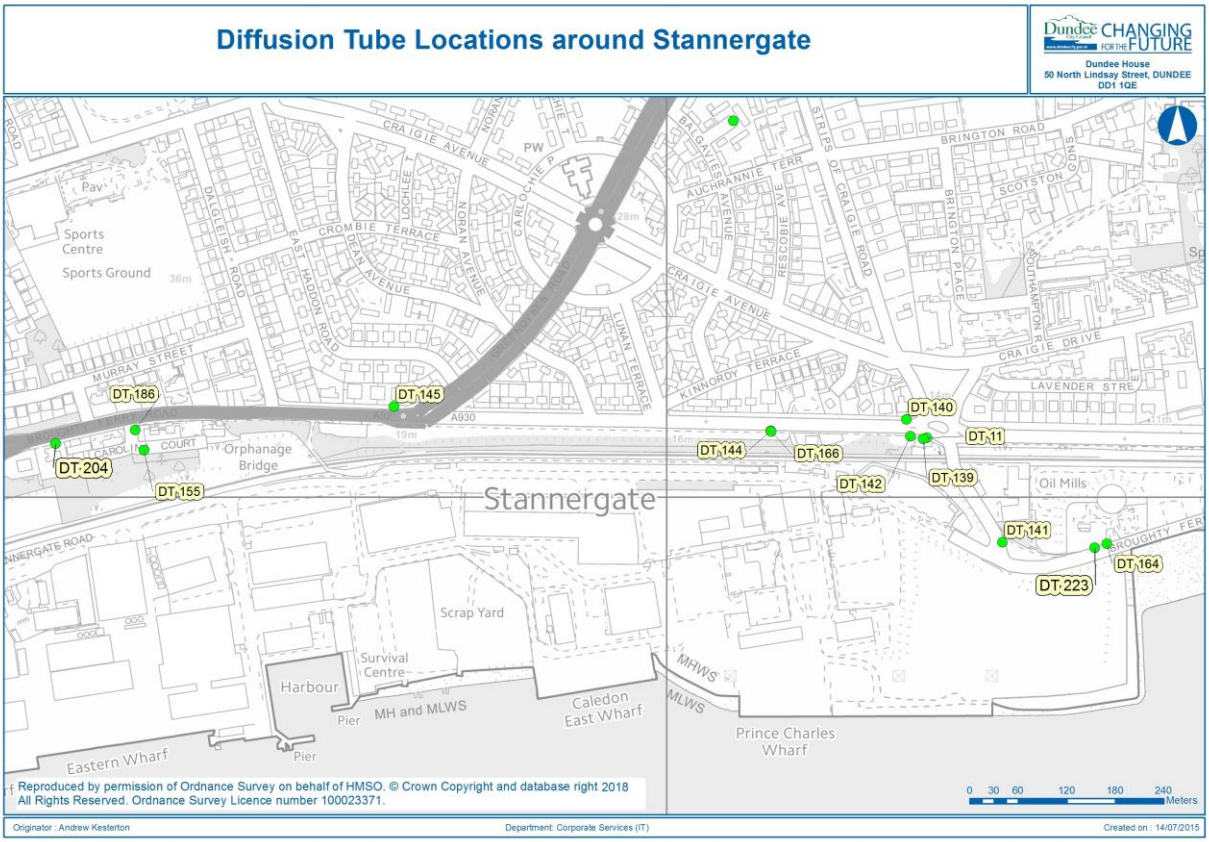
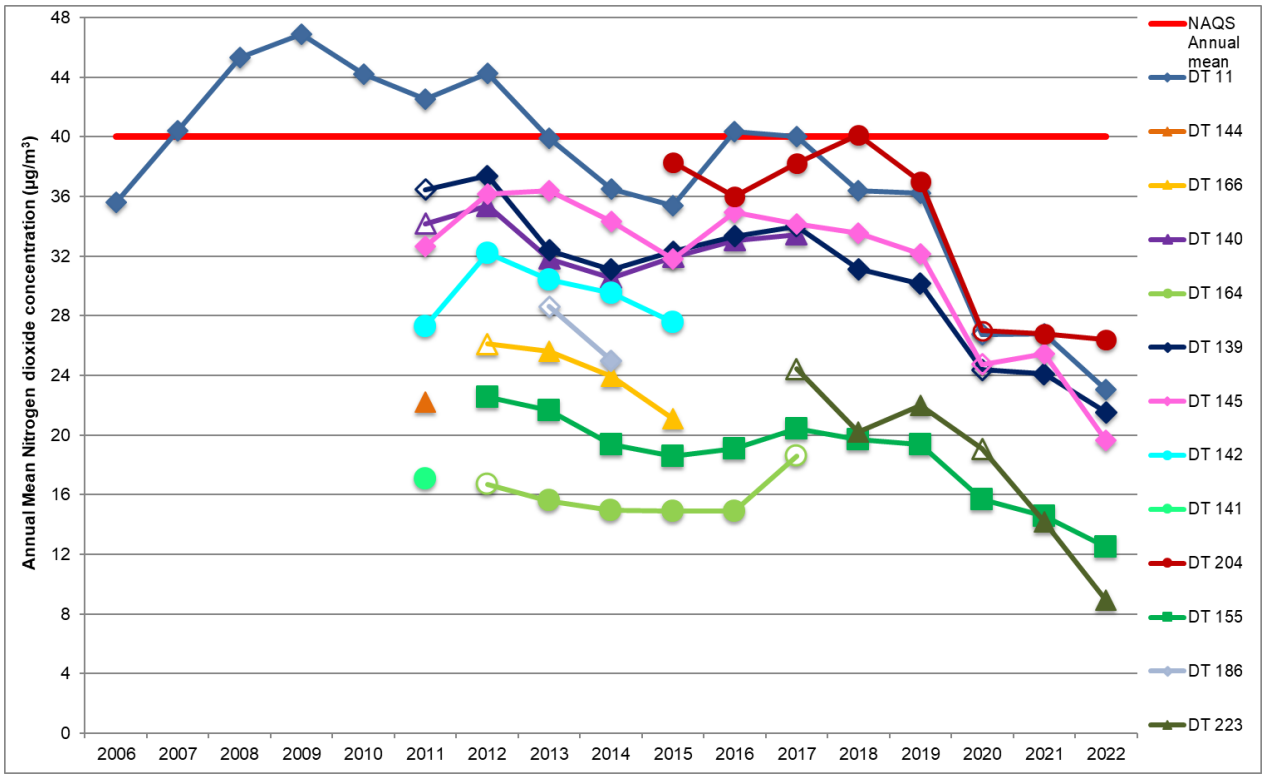


Figure 38 Overview of NO_2 Diffusion Tube Concentrations at Stannergate Roundabout



Strathmore Avenue

Figure 39 NO_2 Diffusion Tube Locations at Strathmore Avenue

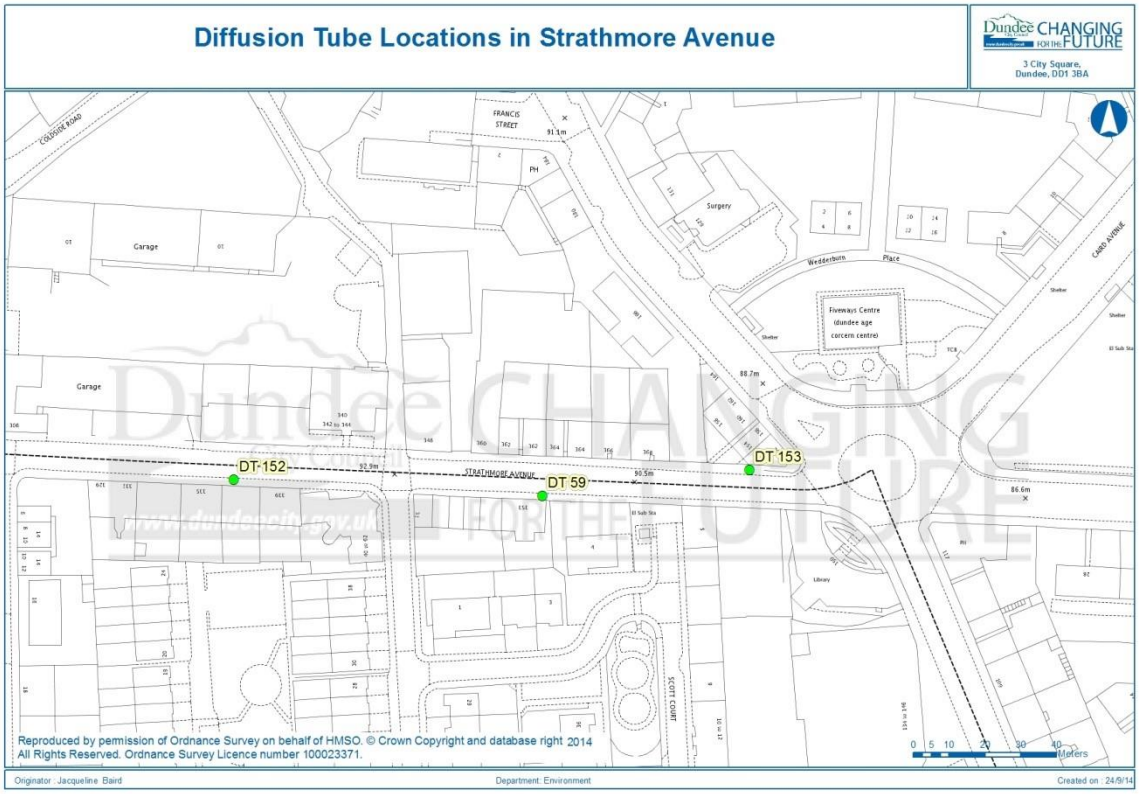
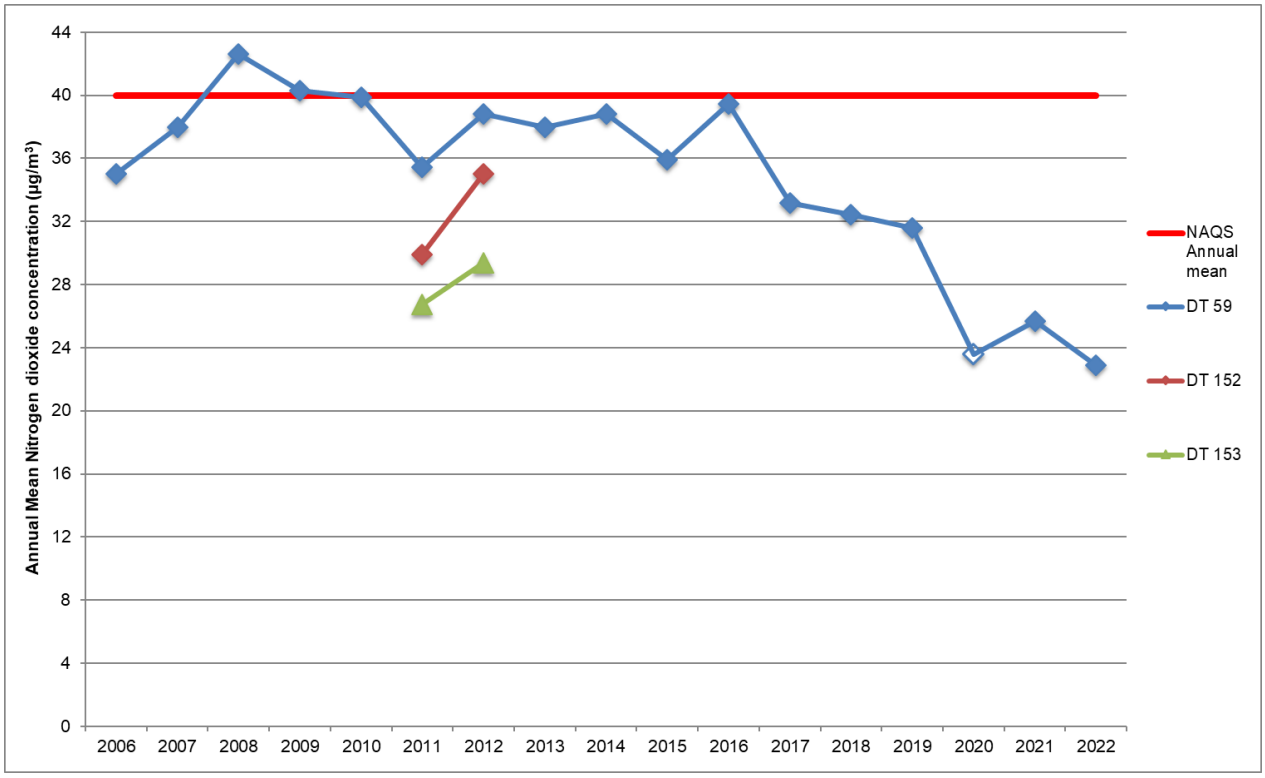


Figure 40 Overview of NO_2 Diffusion Tube Concentrations at Strathmore Avenue



Urban Background Locations

Figure 41 Urban Background NO_2 Monitoring Locations

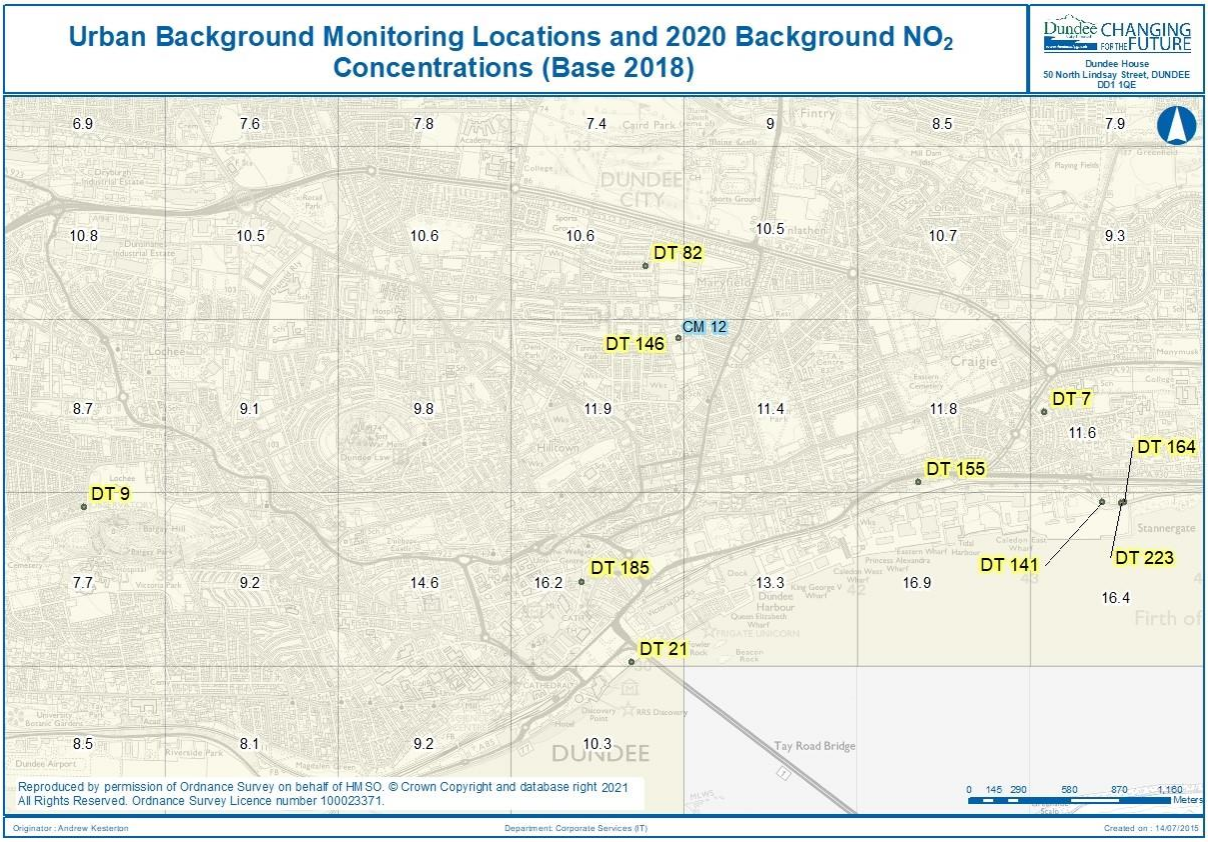
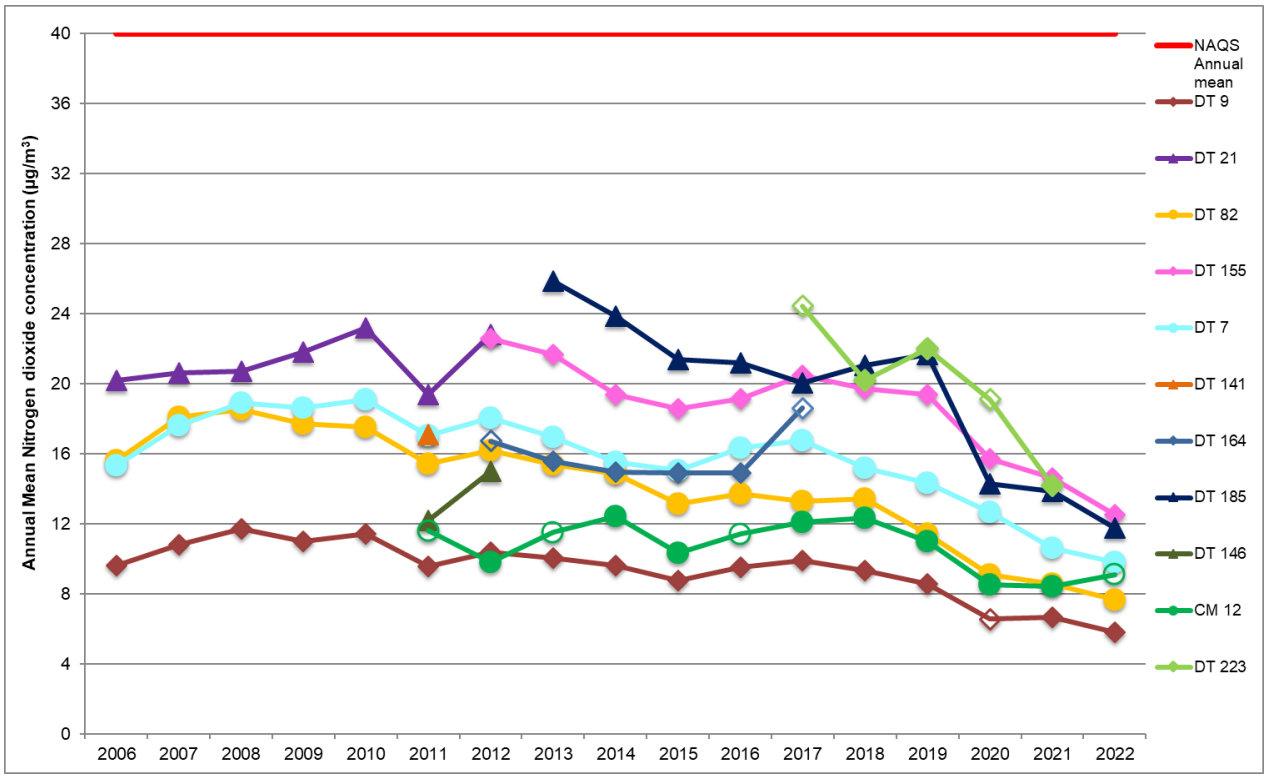
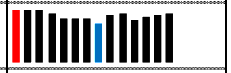


Figure 42 Overview of NO_2 Concentrations at Urban Background Locations



Appendix E: Road Traffic data

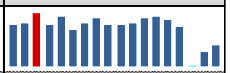
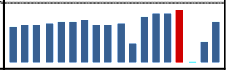
Table E.1 Road Traffic Reduction Sites - Annual Average Daily Traffic (AADT)

RTRA count location	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Bar Chart
Arbroath Rd (E of Kenilworth Ave)	13186	13335	14054	13153	13846	12869	13283	13697	13142	13174	13287	13642	13784	13526	13030	10194	11207	11754	
Blackness Rd (W of Marchfield)	6574	6675	6435	6195	6145	5938	5911	5844	5102	5509	5676	6487	5819	5810	5540	4115	4419	4884	
Broughty Ferry Rd (E of Dalgleish Rd)	31956	31802	31535	30098	27640	27756	27315	24741	29322	30272	26809	28161	29190	29832					
Dens Rd (S of Hillbank Rd)	10852	10664	10672	11023	10833	10083	10062	10178	9744	9707	10315	10322	10756	10409	9961	7900	8723	8934	
Forfar Rd (N of Janefield Pl)	9278	9640	9880	8222	9224	9213	8861	9053	8768	9063	9209	8876	8991	9283	9055	6869	7437	7228	
Hilltown (N of Stirling St)	6024	5710	5895	5701	5753	5656	5416	5492	5608	4268	5782	5828	5491	4601	4392	4491	4668	5118	
Lochee Rd (N of Rankine St)	13477	13681	13438	13286	13296	12983	12684	11603	11285	11880	11821	11770	12453	12928	13135	9943	9080	11783	
Perth Rd (E of Windsor St)	8341	7434	7583	7531	7695	7352	7053	7184	7180	7214	7328	6650	7316	7912	7495	5101	6009	6686	
Pitkerro Rd (S of Baxter Park)	10107	9522	9975	9950	9789	9359	8623	8608	8827	8899	9085	9126	9584	8710	8774	7295	7908	8346	
Rankine St (N of Lochee Rd)	8098	7294	8069	7927	7605	7121	7115	6862	7188	6939	7118	7035	7043	7484	7282				
Riverside Dr (nr Airport)	18875	19056	18918	19045	17907	17654	17024	15900	16213	15932	15923	17343	17503	15791	17315	12794	14985	16218	
Rosebank St (N of Kinloch St)	4821	4867	4722	4623	4528	4603	4426	4489	4621	4587	4655	4615	4183	4015	4070	3326	3604	3901	
Tay Bridge	24475	24686	24748	25045	25406	25235	25484	24753	24770	24925	21762	25993	26631	26633	27250	18312	22048	25407	

Note: 1) Heights of the bars in the charts are relative to the range of values across all sites.

2) The red and blue bars are the highest and lowest count, respectively, at that count location.

Table E.2 Road Traffic Reduction Sites - Percentage Growth

RTRA count location	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Bar Chart
Arbroath Rd (E of Kenilworth Ave)	100	101	107	100	105	98	101	104	100	100	101	104	105	103	99	77	85	89	
Blackness Rd (W of Marchfield)	100	102	98	94	93	90	90	89	78	84	86	99	89	88	84	63	67	74	
Broughty Ferry Rd (E of Dalgleish Rd)	100	100	99	94	86	87	85	77	92	95	84	88	91	93					
Dens Rd (S of Hillbank Rd)	100	98	98	102	100	93	93	94	90	89	95	95	99	96	92	73	80	82	
Forfar Rd (N of Janefield Pl)	100	104	106	89	99	99	96	98	95	98	99	96	97	100	98	74	80	78	
Hilltown (N of Stirling St)	100	95	98	95	96	94	90	91	93	71	96	97	91	76	73	75	77	85	
Lochee Rd (N of Rankine St)	100	102	100	99	99	96	94	86	84	88	88	87	92	96	97	74	67	87	
Perth Rd (E of Windsor St)	100	89	91	90	92	88	85	86	86	86	88	80	88	95	90	61	72	80	
Pitkerro Rd (S of Baxter Park)	100	94	99	98	97	93	85	85	87	88	90	90	95	86	87	72	78	83	
Rankine St (N of Lochee Rd)	100	90	100	98	94	88	88	85	89	86	88	87	87	92	90				
Riverside Dr (nr Airport)	100	101	100	101	95	94	90	84	86	84	84	92	93	84	92	68	79	86	
Rosebank St (N of Kinloch St)	100	101	98	96	94	95	92	93	96	95	97	96	87	83	84	69	75	81	
Tay Bridge	100	101	101	102	104	103	104	101	101	102	89	106	109	109	111	75	90	104	

Note: 1) Heights of the bars in the charts are relative to the range for that location.

2) The red and blue bars are the highest and lowest percentage growth, respectively, for that site.

Appendix F: List of industrial processes

Table F.1 List of Industrial Processes

Process Name/Address	Process Type	PPC Sector	New source since APR 2022?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
Rockwell Solutions, Wester Gourdie, Dundee	Chapter 6: Other Activities Surface treating with organic solvents - Also Chapter 7 SED	6.4.b	No	No	No	No	No	No	Variation in progress Granted. Changes on site mean it's likely there has been a reduction of solvent emissions
MVV Environmental (Baldovie) Ltd) Baldovie, Dundee	Chapter 5: Waste Management	Sector 5.1a and 5.1b under PPC 12	No	No	No	Yes, previously assessed	No	No	Granted Substantial Variation for replacement plant issued in February 2019. Planning Application submitted late 2019 to continue use of old incinerator alongside the new one.
Nynas UK AB, East Camperdown Street, Dundee DD1 3LG	Chapter 1: Energy Industries	Section 1.2 Part A Paragraph (f) (i)	No	No	No	Yes, previously assessed	No	No	Granted. Site is now effectively a Part B process, but a formal surrender of the Part A has not yet been submitted. Site is now solely burning natural gas, with a much-reduced inventory of bitumen and oil products.
Nationwide Crash Repair Centres Ltd, Liff Road, Dundee	Chapter 6: Other Activities vehicle respraying	6.4.b	No	No	No	No	No	No	No Change

Process Name/Address	Process Type	PPC Sector	New source since APR 2022?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
Hanson Aggregates Piper Street, Dundee	Chapter 3: Mineral Industries cement batchers	3.1.a.(ii)	No	No	No	No	No	No	Not operating.
Subsea Protection Systems	Chapter 3: Mineral Industries cement batching	3.1.b	No	No	No	Yes, previously assessed	No	No	Permit surrendered.
Discovery Filling Station	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Brochtay Filling Station	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Asda Stores Filling Station Kirkton	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Tesco Stores Ltd, Methven Street, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	Surrendered 2015
BP Kingsway West Filling Station	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Shell Caird Park	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Shell UK Ltd, East Kingsway Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	Closed 2015
Asda Stores Ltd, Milton of Craigie, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change

Process Name/Address	Process Type	PPC Sector	New source since APR 2022?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
Tesco Stores Ltd, Riverside Drive, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Tapedrive Ltd, Marketgait F/S, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Sainsburys Supermarket Ltd, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Jet Petrol Station, Forfar Road, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	Yes, previously assessed	No	No	No Change
Dens Metals Ltd, West Pitkerro, Dundee	Chapter 2: Production and Processing of Metals	2.2.a	No	No	No	Yes, previously assessed	No	No	Surrendered 2015
Mctavish Ramsay Ltd, Barlow Ave, West Pitkerro	Chapter 6: Other Activities Timber Activity	6.6.(i)	No	No	No	No	No	No	Company in administration. Not operating
Johnsons, Asda Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	Surrendered 2015
Breedon Aggregates Ltd, Longtown Street, Dundee	Chapter 3: Mineral Industries Cement Batching	3.1.a.(ii)	No	No	No	No, previously assessed	No	No	No Change
Aberdeen Valet Service Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	Site no longer operating.	Site no longer operating.	No	No	No	Surrendered 2015
Lochee Dry cleaning Centre Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	No Change

Process Name/Address	Process Type	PPC Sector	New source since APR 2022?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
Ferry Laundrette Broughty Ferry	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	Fire in 2016, now operational again.
Stay-Press Dry Cleaning Centre, Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	Surrendered 2015
Care Clean, Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	No Change
Dignity Ltd, Dundee Crematorium, Dundee	Chapter 5: Waste Management	5.1c	No	No	No	No	No	No	No change
Laundry On Line, Annfield Road, Dundee	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	permit surrendered March 2016
Wm Morrison Supermarkets Plc, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	No	No	No	No Change
Wm Morrison Supermarkets plc, I Afton Way	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	No Change
Tesco Filling Station, South Road, Dundee	Chapter 1: Energy Industries-Petrol Station	1.2.c.(ii)	No	No	No	No	No	No	No Change
Halley Stevensons (Dyers & Finishers) Limited, Baltic Works, Annfield Road, Dundee DD1 5JH	Chapter 6: Other Activities	Section 6.4 Part A Paragraph (a)	No	No	No	No	No	No	No Change

Process Name/Address	Process Type	PPC Sector	New source since APR 2022?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
Discovery Flexibles, Kemback St Dundee	Chapter 6: Other Activities surface treatment using organic solvents also Chapter 7 SED coating flexible packaging	6.4.b	No	No	No	No	No	No	Replacement of one of the process lines with updated equipment. May mean slight change to emissions but not likely to be significant. Variation in progress.
J T Inglis, Riverside Works, Dundee	Chapter 6: Other Activities Textile Treatment	6.4.d	No	No	No	No	No	No	Site Closed 2016, surrender application ongoing
Michelin Tyre Plant, Dundee	Chapter 6: Other Activities surface treatment of rubber with organic solvents also Chapter 7	6.4.b	No	No	No	Yes, previously assessed	No	No	Plant was still operating in 2019 but since has ceased operating
Michelin Tyre Plant, Dundee	Chapter 1: Energy Industries, Combustion	1.1.a	No	No	No	Yes, previously assessed	No	No	Plant was still operating in 2019 but since has ceased operating.
D C Thomson Printers, Dundee	Chapter 6: Other Activities printing process	6.4.b	No	No	No	No	No	No	Not operating but still permitted.
Day International Ltd, Balgray St, Dundee	Chapter 6: Other Activities surface treatment of rubber with organic solvents	6.4.b	No	No	No	Yes, previously assessed	No	No	Not operating at present.
RMC Readymix Ltd, Dundee	Chapter 3: Mineral Industries, Cement Batching	3.1.a.(ii)	No	No	No	No	No	No	No change

Process Name/Address	Process Type	PPC Sector	New source since APR 2022?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
Brown & Tawse Steelstock Ltd, Fowler RD West Pitkerro - Dundee	Chapter 6: Other Activities, paint spraying	6.4.a	No	No	No	No	No	No	No Change
Armitages Pet Products Ltd, Broughty Ferry Road- Dundee	Chapter 6: Other Activities, Pet Food Manufacture	6.8.a	No	No	No	No	No	No	Permit surrender received December 2017
Tesco Stores Ltd, Kingsway Retail Park Dundee	Chapter 1: Energy Industries, Petrol Station	1.2.c.(ii)	No	No	No	No	No	No	No Change
Joinery and Timber Creations (65) Ltd,	Chapter 6: Other Activities, Timber Process	6.6.(i)	No	No	No	No, previously assessed	No	No	Waste wood boiler- permitted but not operating.
Ethiebeaton Quarry	Chapter 3 Mineral Activities - cement batching process 3.1a(ii), roadstone coating 3.5e, crushing and grinding 3.5c	3.1a(ii), 3.5e, 3.5c	No	No	No	Yes, previously assessed	No	No	No change
Health Care Environmental Services, Nobel Road, Wester Gourdie Ind. Estate	Chapter 5 Waste Management Part A Treatment of Clinical waste	5.3a	No	No	No	No, previously assessed	No	No	Site still permitted but facility closed.
Petrol Filling Station, Asda, Myrekirk Road	Chapter 1: Energy Industries, Petrol Station	1.2.c.(ii)	No	No	No	Yes, but no relevant receptors	No	No	No change

Process Name/Address	Process Type	PPC Sector	New source since APR 2022?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
ASKA Energy, 3B Edison Place, Dundee	Chapter 4. Chemical Industry, Part A, Producing organic chemicals (biodiesel)	Section 4, Part A, sub-section b	No	No	No	No (Emissions aren't LAQM pollutants)	No	No	Permit surrender received December 2017. Permit surrendered
Sherburn Cement, Shed 1, Eastern Wharf, Port of Dundee, DD1 3LZ	Chapter 3, Part B, section 3.1 (a)(i) Bulk Storage of Cement	PG 3/01(12)	No	No	No	Yes (possible fugitive emissions of particulates)	No	No	Site permitted 2016 and operating PPC/B/1142921 No change
Crown Timber King George V Wharf Road, Dundee Harbour, Dundee, DD1 3LU	Section 6.6 Part A Wood Products Preservation with. Chemicals	Sector Guidance Note SG11 (draft status at issue)	No	No	No	No (No LAQM pollutants or fugitive emissions)	No	No	Existing process has come into the PPC regime (SEPA reference PPC/A/1132892) as part of the Industrial Emissions Directive. No change
Vericore Ltd, Kinnoull Road, Kingsway West, Dundee, DD2 3XR	Schedule 2 (PPC 2012) SED Part B Production of Veterinary Pharmaceuticals		No	No	No	Yes (possible fugitive emissions of particulates)	No	No	Site permitted 2016 and operating – PPC/B/1141206 No change

Process Name/Address	Process Type	PPC Sector	New source since APR 2022?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
Augean North Sea Services, Riverside Works, Princess Alexandra Wharf, Stannergate Road, Dundee, DD1 3LU	Chapter 5.3 Part A (b) (ii), (iii), (iv), (vi), (x)		No	No	No	Yes (possible fugitive emissions of particulates)	No	No	PPC/A/1151594 status "Granted" date May 2022 as "Full transfer". Site permitted 2017– started operating May 2018 PPC/A/1151594 substantial variation received Dec 2018 has since been withdrawn at request of applicant
Scotscreed Limited, Fishdock Road, Stannergate, Dundee, DD1 3LU	Chapter 3; Section 3.1 Part B (a) (ii)		No	No	No	Yes (possible fugitive emissions of particulates)	No	No	Site permitted 2017 and operating PPC/B/1155960 No change
Dover Fuelling Solutions, West Pitkerro Industrial Estate, 3, Baker Rd, Dundee DD5 3RT	Chapter 6; Section 6.4 Part B (a) coating and paint process		No	No	No	Yes (possible fugitive emissions of particulates)	No	No	Existing process has come into PPC regime due to threshold change. Emissions contained. PPC/B/1180866 (2)

Notes: ~ With reference to Annex 2 Appendix E TG.03
Part A - Processes shaded purple
(1) see Section 4.3 – New or Proposed installations for which an Air Quality Assessment has been carried out
(2) see Section 4.3 – New or Significantly changed installations with No previous Air Quality Assessment

Glossary of Terms

Abbreviation	Description
AADT	Annual Average Daily Traffic flow
ADMS	An atmospheric air pollution dispersion model
AEA	AEA Energy & Environment
Annualise	the means of estimating an annual mean from a shorter study period mean by comparison with full datasets from background AURN sites
AQ Archive	UK Air Quality Archive
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the LA 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
APR	Air quality Annual Progress Report
AQO	Air Quality Objective
AQS	Air Quality Strategy
ATC	Automatic Traffic Count
AURN	Automatic Urban and Rural Network (UK air quality monitoring network)
Borderline	A concentration that is a potential exceedance (e.g. sites above 36µg/m^3 for NO_2 or 16.2µg/m^3 for PM_{10} annual mean)
CAFS	'Cleaner Air for Scotland - The Road to a Healthier Future', was Scotland's first air quality strategy, published in 2015
CAFS2	'Cleaner Air for Scotland 2 - Towards a Better Place for Everyone', is Scotland's second air quality strategy, published in 2021
CHP	Combined Heat and Power
CO	Carbon Monoxide
DCC	Dundee City Council
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EC	European Community
EPA	The Environmental Protection Act 1990
EPAQS	Expert Panel on Air Quality Standards
EU	European Union
FDMS	Filter Dynamics Measurement System
GF	Ground floor

GIS	Geographical Information System
HDV	Heavy goods vehicles and buses
HFO	Heavy Fuel Oil
HGV	Heavy Goods Vehicle
HSL	Health & Safety Laboratory
IPC	Integrated Pollution Control
kerbside	0 to 1 metre from the kerb
LAQM	Local Air Quality Management
LAQM	Local Air Quality Management
LAQM.TG(03)	Local Air Quality Management: Technical Guidance (2003)
LAQM.TG(09)	Local Air Quality Management: Technical Guidance (2009)
LAQM.TG(16)	Local Air Quality Management: Technical Guidance (2016) updated February 2018
LAQM.TG(22)	Local Air Quality Management: Technical Guidance (2022) updated August 2022
LDP	Local Development Plan
LEZ	Low Emission Zone
Limit Value	An EU definition for a mandatory air quality standard of a pollutant listed in the air quality directives
MW	Mega Watts
mg/kg	Milligrams per Kilogram
mg/m^3	Milligrams per cubic metre
NAEI	National Atmospheric Emission Inventory
NAQS	National Air Quality Standard
NLEF	National Low Emission Framework (part of CAFS)
NMF	National Modelling Framework (part of CAFS)
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
ng/m^3	Nanograms per cubic metre
NPL	National Physical Laboratory
NRS	National Registers of Scotland
NRTF	National Road Traffic Forecast
OLEV	Office of Low Emission Vehicles
OSIRIS	the brand name given by Turnkey Instruments Ltd. to their particle measuring nephelometer
PDT	Passive Diffusion Tube
PHV	Private Hire Vehicles
PPC	Pollution Prevention and Control Regulations

P&T	Planning and Transportation
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
Pb	Lead
percentile	The percentage of results below a given value
ppb	Parts per billion
ppm	Parts per million
QA/QC	Quality Assurance and Quality Control
REAE	Ricardo Energy and Environment
receptor	In this study, the relevant location where air quality is assessed or predicted (for example, houses, hospitals and schools)
roadside	1 to 5 m from the kerb
SCA	Smoke Control Area
SED	Solvent Emissions Directive
SEPA	Scottish Environment Protection Agency
SO_2	Sulphur Dioxide
SPG	Supplementary Planning Guidance
Street Canyon	A relatively narrow street with buildings on both sides, where the height of the buildings is generally greater than the width of the road
SULP	Sustainable Urban Logistics Plan
TACTRAN	Tayside and Central Scotland Transport Partnership
TEA	Triethanolamine
TEOM	Tapered Element Oscillating Microbalance
UKAS	United Kingdom Accreditation Service
ULEV	Ultra-Low Emission Vehicle
USA	Updating and Screening Assessment
$\mu g/m^3$	Micrograms per cubic metre
VCM	Volatile Correction Method
VOC	Volatile Organic Compound
vpd	Vehicles per day
WASP	Workplace Analysis Scheme for Proficiency

References

This report includes references where appropriate throughout the text as footnotes.