

Annual Progress Report (APR)



2017 Air Quality Annual Progress Report (APR) for
Dundee City Council

In fulfilment of Part IV of the
Environment Act 1995

Local Air Quality Management

June 2017

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Executive Summary: Air Quality in Our Area

Air Quality in Dundee

Dundee City Council (DCC) has an Air Quality Management Area (AQMA) covering the whole city, as a result of exceedances of the Air Quality Objectives (AQOs) for nitrogen dioxide (NO₂)(annual mean and hourly mean) and particulate matter (PM₁₀)(annual mean). The main source contributing to these exceedances is road traffic, however the increasing popularity of wood burning stoves and other biomass sources has the potential to increase local background concentrations.

Dundee City Council currently monitor for NO₂ and PM₁₀, the latest results and trends are discussed in Chapter 3. The majority of monitoring locations are showing an improving trend in pollutant concentrations, though exceedances of the AQOs are still predicted at the following locations:

- the city centre bus corridor;
- the inner ring road;
- adjacent to the trunk road network; and
- main arterial routes.

Dundee City Council produced its Air Quality Action Plan in 2011 and has a Corporate Air Quality Steering Group which co-ordinates actions to improve air quality in the city. The group contains representatives from various council services including: corporate policy; fleet management; planning; transportation and environmental health. The group also includes representatives from other major employers, including Dundee University and NHS Tayside. The Scottish Environment Protection Agency consult with the council on new industrial process applications and provide an annual update on existing processes in the city. DCC intends to liaise with Transport Scotland as part of the NLEF process to discuss whether any additional actions are possible to reduce pollutant concentrations at relevant locations close to the trunk road network in Dundee.

Actions to Improve Air Quality

Dundee City Council has taken forward a number of measures during the current reporting year of 2016 in pursuit of improving local air quality. Key completed measures are:

- Dundee City continues to lead the way in the uptake of electric vehicles in the UK and are the only Scottish city named as a Go Ultra Low City by the Office for Low Emission Vehicles (OLEV). The funding that the city secured in 2016 is being used to build on the existing infrastructure and in developing a comprehensive and innovative charging network in the region that will encourage all groups to switch to electric vehicles.

The main element of the proposed infrastructure is to create three charging hubs across the city that will ensure that anybody in Dundee is only a short distance from a charging hub. These will be supplemented by taxi-only chargers on two of the sites following a successful bid into OLEV in 2017.

- The uptake of electric vehicles was also advanced through the offer of free parking to all electric vehicles within the city; changes to the taxi licensing rules to encourage uptake; and, taking advantage of funding streams available to purchase new vehicles. To date, between the council fleet (81 EVs) and taxi industry (currently 48 EVs) over 3 million pure electric miles have been driven in the city, with electric vehicles now becoming a well-recognised sight in the city.

- Continuation of both ECOSTARS Schemes for Heavy Duty Vehicles (HDV) and Taxis/Private Hire vehicles (PHV). DCC was delighted in reaching the milestone of recruiting the 100th member in the latter part of 2016. Local haulier Harry Lawson Ltd was presented with an award for achieving a four star rating in February 2017. There are now 105 members (4666 vehicles) in the HDV Scheme and 15 members (512 vehicles) in the Taxi/PHV Schemes
- The Dundee Cycling Strategy was adopted in June 2016 and gives a greater focus to all the cycling related work around the Council. The government had requested that all local authorities develop strategies around active travel. In late 2016, the Dundee Cycling Forum was established as a community body whose aims are the encouragement, promotion and support of cycling in the city.
- Continuation of delivery of air pollution and active/sustainable travel workshops to every Primary 5 class in Dundee and the “i-bike” officer initiative to raise awareness and encourage modal shift to gain air quality improvements.
- Active participation in the Cleaner Air for Scotland Governance Group and in the implementation/consideration of aims and objectives of CAFS across all relevant service/policy areas to contribute to the achievement of the necessary air quality improvements. An update on progress is detailed in **Section 2.3**.

“We are delighted to reach the milestone of being the 100th member in the Dundee area and achieve a four star rating. ECO Stars is a great opportunity for operators to gain access to free confidential advice and improve fleet efficiency. The impact our business has on the environment is something that we take very seriously, and by joining this scheme we will ensure air quality remains one of our top priorities.”

Quote from Michael Lawson, Managing Director for Harry Lawson Ltd (on left)



Local Priorities and Challenges

Dundee City Council expects the following measures to be completed over the course of the next reporting year:

- Review of bus movements in Crichton Street/Whitehall Street/Nethergate to investigate and identify measures to improve congestion and air quality. This project is now scheduled to be completed in early 2017/18.
- Continuation of detailed assessment of traffic and urban realm issues in the Seagate examined a range of traffic management options which could reduce pollution on the Seagate, a pollution hotspot. This work identified options to reroute a substantial proportion of the buses in the area to other streets. Further funding was provided in 2016/17 to investigate the viability of these proposed changes. The traffic modelling has shown that the proposed transport management options would be unacceptable on traffic congestion, access and air quality grounds. The area will therefore be re-examined as part of the CAFS (NMF & NLEF) assessment process detailed in **Section 2.3** of this report.
- Further expansion of the infrastructure to support uptake of ULEV by taxi trade;
- Continuation of the “i-bike” officer initiative to raise awareness and encourage modal shift to gain air quality improvements;
- 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 active participation in the Cleaner Air for Scotland (CAFS) Governance Group and in the implementation/consideration of aims and objectives of CAFS across all relevant service/policy areas to contribute to the achievement of the necessary air quality improvements. The actions that are to be taken forward 2017/18 are detailed in **Section 2.3**;
- Upgrade the council's urban air quality monitoring network to include PM_{2.5} monitoring in line with new statutory requirements;
- Contribute to the development of a city model of Dundee as part of the National Modelling Framework, being developed under the Cleaner Air for Scotland Strategy;
- Continue to liaise with Transport Scotland and the Scottish Environment Protection Agency (SEPA) in the development of the National Low Emission Framework (NLEF) being development under CAFS to help inform how this can be taken forward in Dundee;
- Take forward the other proposed Local Air Quality Management tasks highlighted in **Section 6.3**.

“Dr Bike is our mobile mechanical service delivered to your door. Dr Bike is a service aimed at organisations, schools, community groups and event organisers who require a mechanic to come to their workplace/community/school/event and carry out basic bicycle servicing.”

Quote from The Bike Station



How to Get Involved

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

This includes advice on how we can all help to improve air quality in Dundee, such as: using public transport; car-sharing & car clubs; no-idling; electric vehicles; cycling; walking; and not having a garden bonfire or burning wood.

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1. Local Air Quality Management

This report provides an overview of air quality in Dundee during 2016. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedance is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual 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		Date to be achieved by
	Concentration	Measured as	
Nitrogen dioxide (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	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
	18 µg/m ³	Annual mean	31.12.2010
Particulate Matter (PM _{2.5})	10 µg/m ³	Annual mean	31.12.2020
Sulphur dioxide (SO ₂)	350 µg/m ³ , not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	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
Lead	0.25 µg/m ³	Annual Mean	31.12.2008

2. Actions to Improve Air Quality

2.1 Air Quality Management Areas

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

A summary of AQMAs declared by Dundee City Council can be found in **Table 2.1**. 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	<ul style="list-style-type: none"> NO₂ annual mean PM₁₀ annual mean NO₂ 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	<p>Air Quality Action Plan for Nitrogen Dioxide (NO₂) and Fine Particulate Matter (PM₁₀)-January 2011</p> <p>https://www.dundeecc.gov.uk/sites/default/files/publications/Dundee%20CC%20FinalAQAP_Jan11.pdf</p>

2.2 Progress and Impact of Measures to address Air Quality in Dundee City Council

Dundee City Council has taken forward a number of measures during the current reporting year of 2016 in pursuit of improving local air quality. Details of all measures completed, in progress or planned are set out in **Table 2.2**. More detail on these measures can be found in the Air Quality Action Plan relating to the AQMA. Key completed measures are:

- Dundee City continues to lead the way in the uptake of electric vehicles in the UK and are the only Scottish city named as a Go Ultra Low City by the Office for Low Emission Vehicles (OLEV). The funding that the city secured in 2016 is being used to build on the existing infrastructure and in developing a comprehensive and innovative charging network in the region that will encourage all groups to switch to electric vehicles.

The main element of the proposed infrastructure is to create three charging hubs across the city that will ensure that anybody in Dundee is only a short distance from a charging hub. These will be supplemented by taxi-only chargers on two of the sites following a successful bid into OLEV in 2017.

- The uptake of electric vehicles was also advanced through the offer of free parking to all electric vehicles within the city; changes to the taxi licensing rules to encourage uptake; and, taking advantage of funding streams available to purchase new vehicles. To date, between the council fleet (81 EVs) and taxi industry (currently 48 EVs) over 3 million pure electric miles have been driven in the city, with electric vehicles now becoming a well-recognised sight in the city.
- Continuation of both ECOSTARS Schemes for Heavy Duty Vehicles (HDV) and Taxis/Private Hire vehicles (PHV). DCC was delighted in reaching the milestone of recruiting the 100th member in the latter part of 2016. Local haulier Harry Lawson Ltd was presented with an award for achieving a four star rating in February 2017. There are now 105 members (4666 vehicles) in the HDV Scheme and 15 members (512 vehicles) in the Taxi/PHV Schemes
- The Dundee Cycling Strategy was adopted in June 2016 and gives a greater focus to all the cycling related work around the Council. The government had requested that all local authorities develop strategies around active travel. In late 2016, the Dundee Cycling Forum was established as a community body whose aims are the encouragement, promotion and support of cycling in the city.
- Continuation of delivery of air pollution and active/sustainable travel workshops to every Primary 5 class in Dundee and the “i-bike” officer initiative to raise awareness and encourage modal shift to gain air quality improvements.
- Active participation in the Cleaner Air for Scotland Governance Group and in the implementation/consideration of aims and objectives of CAFS across all relevant service/policy areas to contribute to the achievement of the necessary air quality improvements. An update on progress is detailed in **Section 2.3**.

Progress has been slower than originally expected on the following measures:

- Dundee City Council commissioned consultants to undertake a review of bus movements in Crichton Street/Whitehall Street/Nethergate to investigate and identify measures to improve congestion and air quality. This project is now scheduled to be completed in early 2017/18; and,
- Continuation of detailed assessment of traffic and urban realm issues in the Seagate examined a range of traffic management options which could reduce pollution on the Seagate, a pollution hotspot. This work identified options to reroute a substantial proportion of the buses in the area to other streets. Further funding was provided in 2016/17 to investigate the viability of these proposed changes. The traffic modelling has shown that the proposed transport management options would be unacceptable on traffic congestion, access and air quality grounds. The area will therefore be re-examined as part of the CAFS (NMF & NLEF) assessment process detailed in 2.3 of this report.

Dundee City Council expects the following measures to be continued over the course of the next reporting year:

- further expansion of the infrastructure to support uptake of ULEV by taxi trade;
- the “i-bike officer” initiative to raise awareness and encourage modal shift to gain air quality improvements;
- 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;

- active participation in the Cleaner Air for Scotland (CAFS) Governance Group and in the implementation/consideration of aims and objectives of CAFS across all relevant service/policy areas to contribute to the achievement of the necessary air quality improvements. The actions that are to be taken forward 2017/18 are detailed in **Section 2.3**

Table 2.2 Progress on Measures to Improve Air Quality

KEY TO TABLE

Potential Air Quality Benefits

Small	0 - 0.5 µg/m ³
Medium	0.5 - 1.0 µg/m ³
High	greater than 1.0 µg/m ³
n/a	not applicable

Action Plan Measure Priority Level	
High	
Medium	
Low	

Timescale (Years from 2011)	
Short	1 - 2
Medium	3 - 5
Long	6 +

2016 Updates are shown in blue text

Dundee City Council

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
1	Measure M1: Existing Road Infrastructure Improvements	Transport planning and infrastructure	► City Centre Improvements - Union St	DCC City Development Department (Transportation Division)			Implementation of improvements	High	Union Street Road Infrastructure improvements completed December 2011. Two way traffic was maintained. Pavement widths were altered and the bus stops have been removed to reduce congestion and bus idling.	Union Street Road infrastructure improvements completed 2011	The levels of NO ₂ at Union St have shown a consistent improving downwards trend to well below the objective level since 2010. . PM ₁₀ concentrations increased in 2015 and were close to exceeding the annual mean objective. It is estimated that the new annual mean objective for PM _{2.5} will be exceeded at this location. NO ₂ concentrations at some of the monitoring locations in Nethergate and Whitehall Street have increased since the removal of bus stops from Union Street."
		Transport planning and infrastructure	► NW Arterial Route Improvement - Lochee Rd					Not estimated	Alterations carried out at Lochee Road/Rankine Street in February 2012 removed central reservation to free up road space and reduce congestion	Completed 2012	The automatic monitor in Lochee Road recorded annual mean NO ₂ concentrations above the AQO in 2016, but this was below that recorded in 2006 when the AQMA was first declared. The average long-term trend of annual mean NO ₂ at all monitoring locations in Lochee Road is slightly downwards. The long-term trend in NO ₂ concentrations in Rankine Street is slightly upwards. PM ₁₀ concentrations were above the annual mean objective in 2016, with a slight upward trend over the past 6 years. "

Dundee City Council

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
1 cont		Transport planning and infrastructure	► City Centre Improvements - Meadowside		1 year trial of closing of nearside lane to increase distance between traffic and receptors successful. Funding received in 2015/16 to make temporary surface permanent.	2013 +		Not estimated	Meadowside – in 2012 trial of lane closure at the north end of street to increase separation distance between traffic and receptors was put in place for two weeks from the 26/11/12. As the monitoring results were inconclusive , it was agreed to install a temporary paving surface which was completed in October 2013 to allow the impact on monitored concentrations to be studied for a 12month period. During the extended trial period nitrogen dioxide concentrations reduced by 19% and there was an 11% reduction in PM ₁₀ . Due to the significant improvement in pollutant concentrations permanent street infrastructure changes were completed in Feb/March 2016	Completed 2016	The greatest improvement in pollutant concentrations between 2013 and 2014 was seen at the Meadowside automatic monitor. Nitrogen dioxide concentrations, reduced by 19% and 11% for PM ₁₀ . The 2015 and 2016 monitoring results demonstrate that the air quality improvements attributable to this infrastructure change have been maintained. Slight increase in PM ₁₀ concentrations possible due to nearby roadworks.
1 cont		Transport planning and infrastructure	► Arterial Route Improvements - Stannergate		Traffic/Pollution Modelling Dundee East area (including Stannergate roundabout) to identify options for AQ improvement. Funding received in 2016/17 for source characterisation & identification	2013		Not estimated	Consultants engaged in 2013 to carry out traffic micro-simulation modelling and air dispersion modelling. Final draft of the AD Modelling received in April 2016, Summary of findings presented in APR 2016. Potential baseline exceedances identified at relevant receptors at the following locations: <ul style="list-style-type: none"> A92 (between Broughty Ferry Road and Greendykes Road(PM₁₀, & NO₂); Scott Fyfe roundabout (A92/A972/B961/B959/C223) (PM₁₀); Claypotts junction (A92/B978)(PM₁₀); Modelled scenarios focused on proposed developments in the port area and possible improvements to Stannergate roundabout. None of the options studied currently being pursued. Area will be re-examined as part of the NMF Funding carried forward and consultants will be commissioned to undertake work early 2017/18.	2016/17 2017/18	2016 NO ₂ monitoring on the A92 between Broughty Ferry Road and Greendykes Road were below the objective. 2016 NO ₂ concentrations were borderline at the closest receptor to the Stannergate roundabout. Exceedance of the annual mean an objective for PM ₁₀ were predicted in 2016 at the Stannergate Osiris. The daily mean objective was met in 2016. Sources other than transport are thought to contribute significantly to the PM ₁₀ concentrations at this location.
1 cont		Transport planning and infrastructure	► City Centre Upgrade 13 traffic signals with fibre optic connections		Funding contribution 2016/17	2017/18		Not estimated	A Fibre network is to be implemented to improve Traffic Signals communication (and revenue saving) with the Control Room in Dundee House. This network will improve reliability and efficiency of UTC. This project was originally scheduled to be undertaken in 2016/17 but it has been delayed until 17/18.	2017/18	

Dundee City Council

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
1 cont		Transport planning and infrastructure	► City Centre Improvements – Seagate / St. Andrews Street		Funding provided in Financial Year 14/15 to provide engineering design and air dispersion modelling of changes to bus stop locations Further Funds provided in 2016/17 to review and undertake traffic and AQ modelling of preferred options	2014/15		Not estimated	<p>In late 2014, JMP 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. Their commission included engagement with local bus operators given that buses account for around 60% of harmful emissions. 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. The "Air Dispersion modelling demonstrated that if all buses and HDVs were Euro VI then no exceedances of the NO₂ or PM₁₀ objectives would persist in the city centre</p> <p>Following receipt of the final report on Seagate' (produced by JMP), the Council agreed that further traffic and air dispersion modelling was required of the preferred options before any of the recommendations could be taken forward. The traffic modelling has shown that the proposed transport management options would be unacceptable on traffic congestion, access and air quality grounds.</p> <p>This area will be re-examined as part of the NMF</p>	2017/18	NO ₂ concentrations exceeded the annual mean objective in 2016. PM ₁₀ concentrations reduced in 2016 to below the annual mean objective.
1 cant		Transport planning and Infrastructure	City Centre Improvements – Crichton Street/ Whitehall Street /Nethergate		Funding provided in 2016/17 to undertake review of bus movements in Crichton Street/ Whitehall Street/ Nethergate	2016/17		Not estimated	Consultants were commissioned in March 2016 to undertake this work and it is ongoing..	2017/18	.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
2	Measure M2: DCC will enhance the Urban Traffic Management and Control (UTMC) system to reduce congestion	Traffic management	► Real-time traffic monitoring. ► Improved control regime to smooth out peak traffic.	DCC City Development Department (Transportation Division)	Implementat ion of UTMC improvements and carry out annual review to measure % reduction in congestion in line with target		► 10% reduction in congestion (journey times) in targeted areas during peak times before and after implementation of measure. ► Annual review of impact	Small	<p>Scheme designed to expand UTMC to two congested junctions in Lochee Rd AQ hotspots.</p> <p>Schemes now implemented and the traffic management improvements will be assessed in terms of AQ improvements by Environmental Protection Division. ► UTMC was implemented in March 2013 which will see further traffic management enhancements. ► Seagate / Commercial Street traffic light refurbishment to improve bus and traffic flows through this AQ hotspot on the main bus corridor completed Feb 2013. Coupled with increased enforcement of waiting restrictions to reduce congestion. ► Successful trial of Bluetooth journey time monitoring of western arterial route, possibility of expansion to include AQ hotspots.</p> <p>Schemes now implemented and the traffic management improvements will be assessed in terms of AQ improvements by Neighbourhood Service. UTC are monitoring the traffic although ongoing roadworks can impact of traffic flow through the junctions</p>	Completed 2013	<p>NO₂ concentrations in Seagate reduced between 2013 and 2016 but still show an increasing trend over the past 11 yrs. PM₁₀ concentrations were below the objective in 2016, with a decreasing trend over the past 6 years. .</p>

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
2 cont		Traffic management			TACTRAN Capital Grant funding for expanded automation of journey time monitoring to allow activation of traffic management systems to alleviate congestion.	2013		Not estimated	Funding provided in FY 14/15 to expand Bluetooth Traffic Speed Monitoring System to include the Lochee Road corridor a known air pollution hotspot was completed by 31 st March 2015 In 2016 the system was expanded along the eastern corridor on the A92 coming in from Arbroath and Broughty Ferry. Ongoing discussions re maintenance costs with Transport Scotland and IBI.	2016	n/a
		Traffic management			Improve traffic flow/management strategies in Lochee Rd- introduce MOTES	2013		Not estimated	MOTES now unlikely to be deployed as it appears to have limited effect. Expansion of Bluetooth traffic speed monitoring to include the Lochee Road corridor was completed by 31 st March 2015	2015	n/a
		Traffic management			Paramic/AIR E modelling of key junctions – Kingsway/Forfar Road & Lochee Road Corridor to test option improvements	2013		Not estimated	Consultants engaged in 2013 to carry out traffic micro-simulation modelling and air dispersion modelling. Final Modelling received in April 2016. Summary of options contained in Appendix C of APR2016. Kingsway / Forfar Road study identified potential baseline exceedances at relevant receptors at the following locations: <ul style="list-style-type: none"> A972T (Kingsway – Pitkerro Road roundabout) (NO₂); A90 (north of the Kingsway) (NO₂); and Forfar Road (A929) / Clepington Road (C244) junction (PM₁₀ & NO₂). Options studied included A90 Bypass and improvements to signal timings, the bypass being the most beneficial scenario. Neither option currently being pursued. Lochee Road Corridor options studied – closure of Cleghorn Street/Lochee Road junction and improvements to bus fleets. Study also found signal timings along the corridor to be optimised. Improvements to the bus fleets was the most beneficial of the options tested. Neither option currently being pursued. Both areas will be re-examined as part of the NMF	2016	NO ₂ diffusion tubes installed in 2016 at sites close to the identified exceedance locations in the Kingsway / Forfar Road study area were below the objective.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
3	Measure M3: DCC to identify partnership and funding to continue benefits of Smarter Choices/Smarter Places: Dundee Travel Active Programme	Promoting travel alternatives	<ul style="list-style-type: none"> ► Identify and implement wider partnership to continue programme. ► Identify funding. 	DCC City Development Department (Transportation Division)			<ul style="list-style-type: none"> ► Increase % of people who walk and cycle to work in Dundee. ► Identify funding for education 	Small	<p>► Social Marketing Campaign undertaken - focussing on the Lochee Road corridor (Reported in AQAP Progress Report 2012, Appendix 1). ► DCC initiated partnership with a local social enterprise to develop a Behavioural Change Centre of Excellence.</p> <p>► Designed a programme of in-class workshops to promote sustainable and active travel in 11 primary schools. ► Established a new Bike Boost programme to promote cycling to work and other journeys.</p> <p>► DCC is actively working to secure funds for future investment in Dundee Travel Active.</p> <p>2012 summary - Broughty Ferry targeted for Personalised Travel Planning delivered by Social Enterprise Positive Steps..</p> <p>► DCC staff travel policy now being implemented and this will further encourage modal shift to active modes.</p> <p>► Investigated a school based travel behaviour change programme for 2013. ► 19.7% of people estimated to be walking or cycling to work in Dundee. The data is published by the Scottish Government every two years. The 19.7% data is taken from the Scottish Household Surveys undertaken in 2009 and 2010. The target in the City Development Service Plan 2012-2017 is 25%.</p> <p>Summary 2013 ► Broughty Ferry has had Personalised Travel Planning delivered by Social Enterprise Positive Steps.</p> <p>41% of trips to work by Active Travel (walking and cycling) in 2012. This figure is taken from Scottish households survey (SHS) undertaken in 2012 and relates to a very small sample size (92 people).</p> <p>Summary 2014--Sustans Funding used to help deliver improved cycling and walking connectivity. A limited level of SCSP funding has been used to improve signage around the Green circular. Doctor Bike has visited Dundee City Square several times offering bike maintenance workshops.</p> <p>Summary 2015-Dr Bike has visited the City Square, Dundee University and Abertay University Campus several times offering bike maintenance workshops. I-bike initiative also commenced in July as detailed below.</p> <p>Summary 2016 - Cycling Scotland's annual monitoring report published in early 2016 showed significant growth in the number of people choosing to cycle in Dundee. Cycling was recorded as 'main mode of travel' by 4.2% of respondents.</p> <p>See also Measures 16,17 & 22</p>	2012+ on-going	A reduction in transport / unnecessary journeys is predicted however this may be difficult to measure.

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
		Promoting travel alternatives			Behavioural Change Primary School programme to promote sustainable travel options in all primary schools in Dundee. Funding provided in FY 2014/15 to extend programme to P5 pupils over two academic years Funding sought in FY for 2015/16.	2013+			Primary school focussed Personalised Travel Planning contract awarded and all P5 pupils in Dundee to be given classroom sessions on Air Quality, Sustainable Travel, Active Travel benefits March – October 2013. Summer term & Autumn Term 2014 Feedback from these sessions has been very positive. Summary 2015-It was the intention to undertake the Primary school focussed Personalised Travel Planning Sessions in-house but this was not feasible. The work was put out to tender and awarded to JMP Consultant in December 2015 with the intention of programming completion by the end of June 2016 for the 2015/16 intake of pupils. Summary 2016- Continued programme of behavioural change projects promoted with schools throughout 2016/17 with varying levels of engagement from school communities.	Ongoing	
3 cont.		Promoting travel alternatives			3 "Doctor Bike" Safety Events planned for the City Square Funding to provide match funding for I-bike initiative sought in FY for 2015/16 and again in 2016/17	2013/14 2015/16			Doctor Bike has visited Dundee City Square several times offering bike maintenance workshops i-bike officer in place from July 2015. Initially working with Grove and Menzieshill Secondary Schools and their respective feed-in primary schools encouraging cycling. i-bike officer in place throughout 2016 working first with Menzieshill and Grove and their cluster schools, before moving on to Harris and St Paul's (and cluster primary schools) from August 2016.	Ongoing	
4	Measure M4: DCC will introduce measures to improve bus services and reduce emissions	Transport planning and infrastructure	► Statutory Bus Quality Partnership. ► Voluntary Bus Quality Partnership	DCC City Development Department (Transportation Division)		2011+	► Identification of new corridors that directly benefit air quality.	Medium	Opportunities investigated as part of Air Quality Low Emission Charter Publication of Cleaner Air for Scotland Strategy(CAFS) (launched November 2015) DCC represented (along with other major city local authorities) on CAFS Governance Group and are working with the Scottish Government and partner organisations in development of the National Modelling Framework and National Low Emission Framework to bring forward options for further air quality improvements. Details of the progress to date is contained in section 2.3 of the main report.	Medium Term	
		Vehicle Fleet efficiency					► Average age fleet and Euro category, fuel type			2012+	

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
4 cont.	Measure M4, cont.	Vehicle Fleet efficiency	► Fleet Renewal – Emissions Improvements	DCC City Development Department (Transportation Division)		2011+	► Fleet age, Euro class, fuel type	Medium	<p>► National Express Dundee introduced 15 new Euro V buses during December 2011 for use on Services 22 (Ninewells Hospital - City Centre-Downfield-Craigowl View) and 28/29 (Douglas-Charleston-Douglas via City Centre). ► During 2010/11 Stagecoach invested in 20 new Euro V double-deckers on its major Service 73 corridor (Ninewells-City Centre-Broughty Ferry-Carnoustie-Arbroath) and Service 20 (Dundee-Forfar). ► 4 new Euro V coaches also have also been introduced in new route (Dundee-Arbroath-Montrose-Aberdeen)</p> <p>2012 summary - ► No bids submitted for Green Bus fund 3 ► DCC looking at Hydrogen Fuel cell opportunities for buses in a collaborative approach through the Scottish Cities Alliance. ► National Express Dundee applied to Scottish Government's Green Bus Fund 2 and invest in hybrid engine technology. ► Stagecoach invested in 6 new Euro V buses on their Dundee to Blairgowrie route (Service 57)</p> <p>2013 Summary - Through the Scottish Cities Alliance (SCA) investigations into potential for Hydrogen fuel alternatives are being developed with major EU funding opportunity hopefully being available 2014 - 2020. SCA and ten Cities are engaged with EU proposal in terms of Scotland's suitability for Hydrogen Fuel cell bus expansion. 2014 Summary - In Dundee, National Express has been operating Diesel Electric Hybrid buses since 2013 and these have been operationally very successful in terms of the 'green' message and attracting users. National Express are also looking to modernise the smaller midi bus sized vehicles in their fleet. Stagecoach will introduce 15 Diesel Electric buses in Spring 2015 to Service 73 corridor Electric Vehicle operation and charging infrastructure expansion has put Dundee to the forefront of this technology. Dundee alongside the Scottish Cities Alliance is exploring Hydrogen Fuel cells as alternative fuel technology for buses, through EU funded Hydrogen Fuel cell Joint Undertaking. Stagecoach have announced that approximately 18 new Diesel Electric buses will replace existing Euro 5 buses in Spring 2015 and new Euro 6 diesel vehicles will replace Euro 5 vehicles later this year also. These major bus industry investments will have a positive impact on air quality in Dundee.</p> <p>2015 Summary- The Council continues to work in informal partnership with the main bus operators in Dundee. Stagecoach introduced 18 Euro VI electric-hybrid buses on their Service 73 route in May 2015. Investment in new buses at Xplore Dundee has been limited with the arrival of just 5 new buses in 2015. Some "younger" buses from the wider National Express group have been redeployed to Dundee during 2015.</p> <p>2016 Summary - The Council continues to work in informal partnership with the main bus operators in Dundee. Investment in new vehicles (EURO VI) has been limited in 2016, with only one new vehicle being purchased this year.</p> <p>The government continues to review its BSOG payments and Dundee City Council officers have contributed to that discussion and debate</p>	2013+	

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
		Vehicle Fleet efficiency					►Lobby Scottish Government for fuel duty rebates for low carbon fleet		<p>Bus Service Operators Grant (BSOG) changes from April 2012 will reward use of cleaner fuels and incentivise the use of cleaner vehicles.</p> <p>2013 Summary-Current enhanced BSOG available for operation of Diesel Electric Hybrid buses. Further investigate enhanced BSOG where Hydrogen Fuel Cell vehicles are introduced.</p> <p>2014 –No Change</p> <p>2015 Summary - The government continues to review its BSOG payments and Dundee City Council officers have contributed to that discussion and debate.</p> <p>2016 Summary No Change</p>		
4 cont.		Vehicle Fleet efficiency			National Express Dundee will introduce nine Diesel Electric Hybrid buses into their fleet in April / May 2013 as per Green Bus Fund 2 bid success	2013			<p>In 2013 High profile launch event for the nine Hybrid Buses introduced by National Express Dundee – coupled with promotional work with local schools</p> <p>Completed</p>	2013	New cleaner emission vehicles are now successfully in operation
		Vehicle Fleet efficiency			ECO Stars Dundee Fleet Management Recognition Scheme being introduced	2013/14			See Measure 6 – National Express Dundee one of the 12 inaugural members and Stagecoach joined the scheme in 2014		
	Measure M4, cont.	<p>Traffic Management</p> <p>Vehicle Fleet Efficiency</p>	►Tackling Idling Bus Emissions	DCC City Development Department (Transportation Division)		2011+	<p>►Traffic Regulation Conditions within the city centre.</p> <p>►‘No-idling’ signage on bus routes.</p> <p>► Driver Training/Awareness Raising</p>	Small	<p>►Opportunities being investigated as part of Air Quality Low Emission Charter (Reported in AQAP 2012, Appendix 2).</p> <p>►National Express Dundee and Stagecoach have invested in in-vehicle monitoring systems and vehicles with auto-shutoff technology</p>	2012+	

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
4 cont.	Measure M4, cont.	Promoting low emission transport •	► Low Emission Zones (LEZ) for buses	DCC City Development Department (Transportation Division)		2013	► Investigate the Traffic Regulation Conditions for LEZ in City Centre. ► Route choice for clean buses see Park & Ride facilities	High	<p>Opportunities being investigated as part of Air Quality Low Emission Charter. (Reported in AQAP 2012, Appendix 2)</p> <p>see Measure 5 re Park and Ride Facilities)</p> <p>Publication of Cleaner Air for Scotland Strategy(CAFS) (launched November 2015)</p> <p>DCC are represented (along with other major city local authorities) on CAFS Governance Group and are working with the Scottish Government and partner organisations in the development of the National Modelling Framework and National Low Emission Framework to bring forward options for further air quality improvements. Details of the progress to date is contained in section 2.3 of the main report.</p>	Med Term, 2015-2016+	
		Promoting low emission transport			Bus Emission Modelling being undertaken to test likely improvements associated with various scenarios including possible LEZ for buses by 2017	2013/14			<p>Model of main City Centre Bus Corridor set up to model the impact of the following low emission Scenarios:</p> <p>S1 – 2017 All Buses Euro V S2 –2017 All Buses Euro VI S3 – 2017 All Buses & HGVs Euro V S4 – 2017 All Buses & HGVs Euro VI</p> <p>Modelling Report submitted July 2015, summary of findings available in Appendix C of DCC 2016 Air Quality Annual Progress Report (APR).</p>	2015	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
5	Measure M5: DCC will explore provision of Park and Ride facilities that do not have adverse impact on air quality	Alternatives to private vehicle use	► Provision of Park and Ride (P&R) facilities	DCC City Development Department (Transportation Division) & Tayside and Central Scotland Transport Partnership (TACTRAN)			► Report on identification and prioritisation of P&R facilities ► Implementation of scheme ► Passenger numbers	Medium	<p>Site at Wright Avenue selected as preferred location for P&R at Dundee West and at site on south side of Tay Road Bridge identified for Dundee South and confirmed by NE Local Plan reporter.</p> <p>► Both sites taken forward with detailed design. Dundee West underwent pre - planning application consultation and detailed planning consent applied for in mid-2013.</p> <p>Dundee West site at Wright Avenue rejected by Development Management Committee In October 2013. This will require TACTRAN and DCC to review Dundee area Park and Ride strategy.</p> <p>Summary 2014-TACTRAN and DCC to review Dundee area Park and Ride strategy. Also to engage with Transport Scotland as there are national transport policy implications in terms of Park and Ride around Scotland's cities. It is not anticipated that Dundee West Park and Ride option will be revisited in the timeframe of this monitoring framework. Wider strategy around city under review with TACTRAN, SESTRAN, Fife Council and Transport Scotland DCC, Fife Council, TACTRAN and SESTRAN actively investigating funding opportunities to secure land purchase at Dundee South (Tay Road Bridge) landfall.</p> <p>Summary 2015- TACTRAN and DCC to review Dundee area Park and Ride strategy. Also to engage with Transport Scotland as there are national transport policy implications in terms of Park and Ride around Scotland's cities. Wider strategy around city under review with TACTRAN, SESTRAN, Fife Council and Transport Scotland DCC, Fife Council, TACTRAN and SESTRAN actively investigating funding opportunities to secure land at Dundee South (Tay Road Bridge) landfall.</p> <p>Summary 2016 - Park and Ride around the city needs further development and funding. It has now been included in the Tay Cities Deal that has recently been agreed between the partner councils.</p>	+	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
6	Measure M6: DCC will introduce measures to reduce emissions from Heavy Goods Vehicles	Freight and delivery management	► Perth & Dundee Retail Freight Consolidation Centre	DCC City Development Department Transportation Division)& TACTRAN		2011+	► Implementation of scheme ► Vehicle fleet in the AQMA ► Study for the alternate system of retail freight	Small	<p>Opportunities being investigated as part of Air Quality Low Emission Charter (See AQAP2012 Appendix 2)</p> <p>Summary 2013-LaMILO (Last Mile Logistics) projects to deliver exploratory social enterprise model freight consolidation based on successful Dutch model. ENCLOSE project developed and looking at Sustainable Urban Logistics Plan for Dundee (SULP)</p> <p>Summary 2014- Dundee City Council is working with the Heavy Duty Vehicle operators to reduce environmental impact of these vehicles. An accreditation scheme - ECO STARS is operating that recognises green fleets. DCC are also partners in an EU funded project ENCLOSE that is looking to make City Logistics more efficient and environmentally friendly. The Dundee Sustainable Urban Logistics Plan was approved by the City Development Committee on 27.10.14</p> <p>Summary 2015-A number of new members joined ECO STARS Scheme for Heavy Duty Vehicles in 2015 with the membership increasing to 79 by the 31st December.</p> <p>Summary 2016 - A number of new members joined ECO STARS Scheme for Heavy Duty Vehicles in 2016 with the membership increasing to 105(4666 vehicles) by the 31st December.</p>	2012+	
6 cont.	Measure M6 cont.	Freight and delivery management	► Freight Quality Partnership (FQP)	DCC City Development Department Transportation Division)& TACTRAN			► Implementation of partnership ► Changes in hourly profile of HGVs in AQMA	Small	<p>Dundee is included as part of Tactran's Regional Freight Quality Partnership</p> <p>Summary 2015 - A Freight Consolidation business plan has been prepared and ongoing discussions with a potential operator to develop a small scale Freight consolidation centre in the city.</p> <p>Summary 2016 -- Ongoing discussions with an operator to develop a small scale Freight consolidation centre in the city. They are currently seeking funding to take this forward</p>	Long term	

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
6 cont.		Freight and delivery management			A freight routing planning tool will be launched by TACTRAN which should encourage HGVs to follow appropriate routes	Jan-13			The Tactran Freight Planning Tool was established in The 2013		
		Freight and delivery management			Dundee is participating in a pan European project (ENCLOSE) investigating city logistics with carbon and emission reduction as important factors under investigation	2013			The Dundee Sustainable Urban Logistics Plan (SULP) was developed to give legacy post ENCLOSE project in terms of energy efficient and 'green' city logistics. The Plan was approved by the City Development Committee on 27.10.14		
6 cont.		Vehicle Fleet Efficiency			ECO Stars Dundee Fleet Management Recognition Scheme being introduced in 2013 Funding to continue in 2015/16 & 2016/17 Seeking continuation of funding in 2017/18	2013			Dundee ECO Stars Fleet Recognition Scheme was successfully launched on the 13th December 2013 with 12 inaugural members. This is a fleet accreditation system that acknowledges greener fleets. The Corporate Air Quality Steering Group intends to seek funding for future years. Dundee ECO Stars Recognition Scheme for heavy duty vehicles fleets had 79 members by the 31 st December 2015 Dundee ECO Stars Recognition Scheme for heavy duty vehicles fleets continues to be successful reaching a membership of 105(4666 vehicles) by the 31st December 2016	Ongoing	A number of participating members are now demonstrating working towards operating cleaner /greener fleets.
		Promoting Low Emission Transport			Match funding for feasibility study for ULEV/ZEV deliveries in 2015/16 FY				A Freight Consolidation business plan has been prepared and ongoing discussions with a potential operator to develop a small scale Freight consolidation centre in the city. Summary 2016 - Ongoing discussions with an operator to develop a small scale Freight consolidation centre in the city. They are currently seeking funding to take this forward		

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementati on Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
7	Measure M7: DCC will seek improvements in emissions standards, including NO ₂ and PM ₁₀ for the council fleet and public service vehicles	Promoting Low Emission Transport	<ul style="list-style-type: none"> ► Development of Green Procurement Strategy ► To set target for Euro category/fuel type 	<ul style="list-style-type: none"> ► DCC Corporate Fleet Manager ► DCC Environment Department 			<ul style="list-style-type: none"> ► Approval of Strategy (Asset Management Plan) ► Average age fleet and Euro category, fuel type 	Small	<ul style="list-style-type: none"> ► New Corporate Fleet Manager appointed December 2011 ► New Fleet Section to develop a reporting procedure to compare replacement vehicles in relation to emission improvements ► New Fleet Section will create a replacement plan for all vehicles to maintain fleet age profile ► 2011 makeup of the waste collection fleet - 12 x Euro 3, 17 x Euro 4 and 23 x Euro 5. Fleet is continually moving towards newest Euro Category ► The Fleet section replaced 60 vehicles 2012/13 all with improved emissions standards <p>Summary 2013 The Fleet Section has bought in over 50 new vehicles in 2013 replacing the oldest and most polluting vehicles where possible. And have also undertaken an exercise with hire company to replace over 30 of the oldest hire vehicles in the fleet. ► 2 new Euro 6 engine Refuse Collection vehicles have been ordered to join the fleet in 2014.</p> <p>There are also 39 electric vehicles in the Council Fleet contributing to lower emissions.</p> <p>DCC Transportation delivering in partnership with Developing Car Clubs in Scotland and Co-Wheels seven additional car club vehicles all of which are Electric Vehicles</p> <p>Summary 2014-Following the introduction of 7 Euro 6 refuse collection vehicles in 2014. The Fleet are looking to introduce another 5 in 2015. A further 7 electric cars have been added to the Fleet towards the end of 2014 with further cars and 1 van on order. The Fleet Section have also been offered a government grant to lease a number of vehicles, the leasing is currently out to tender but it is hoped to lease a further 7 vehicles.</p> <p>Summary 2015- The Fleet Section has spent approximately £1.8 million in 2015/16 replacing 31 vehicles and 45 items of plant.</p> <p>Summary 2016 - The fleet has now a total of 81 electric vehicles running across all operations. The ongoing replacement programme has seen the introduction of 16 Euro 6 RCV's to date, with another 2 on order. The Council Fleet covered over a "Million Electric Miles" achieving significant emission reductions.</p> <p>► See also Measure 14</p>	2014+	
		Promoting Low Emission Transport			The development of an Asset Management Plan which will incorporate environmental issues as part of the replacement criteria	2013/14			<p>An asset management plan has been created providing details of the ongoing replacement plan. Due to financial restrictions and vehicle variations the replacement programme will be done on a cost and condition basis. The emphasis of the plan will remain however the oldest and most polluting vehicles</p>		

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
		Promoting Low Emission Transport			Initial discussions for 2013/14 vehicle/plant replacement programme has identified improved emissions as a high priority	2013/14			Summary 2013/14-Replaced over 30 of the oldest hire vehicles in the fleet. . See Measure 7 above		An equivalent number of poorer quality emission vehicles have now been removed from service.
		Vehicle Fleet Efficiency			Participation in ECO Stars Dundee-Fleet Management Recognition Scheme	2013			DCC Fleet Achieved 4-Star Rating in ECO Stars Recognition Scheme as recognition for reducing the environmental impact of the Council's Fleet.	Ongoing	
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	Promoting low emission transport	<ul style="list-style-type: none"> ► Enforce No idling for taxis ► Increase cleaner taxis 	<ul style="list-style-type: none"> ► DCC Support Services ► DCC City Development Department ► Tayside Police 			<ul style="list-style-type: none"> ► Traffic Regulation Conditions for 'No Idling' of taxis ► Explore the potential of introducing Licensing Conditions for minimum taxi Euro category for certain classes of vehicles ► Provide 'No Idling' street signage ► Monitoring for idling in place 	Medium	<p>► Opportunities are being investigated as part of Air Quality Low Emission Charter (See AQAP 2012 Appendix 2). ► Education Transport contracts to be let with condition that all vehicles must be Euro 4 compliant.</p> <p>► Approximately 400 Taxi / PHC driver training sessions were made available in FY 2013/14 -limited uptake alternative training options being considered</p> <p>Summary 2014-As part of Air Quality Low Emission Charter, opportunities are being investigated for: Traffic Regulation Conditions for 'No Idling' of taxis; Explore the potential of introducing Licensing Conditions for minimum taxi Euro category for certain classes of vehicles; Provide 'No Idling' street signage; Monitoring for idling. Education Transport contracts were let with condition that all vehicles must be Euro 4 compliant. Engaging with taxi operators who are actively investigating electrification of taxi fleet - one operator has indicated desire to convert diesel fleet to all electric (100+ vehicles), currently DCC working with partners to support this major proposal.</p> <p>Summary 2015- ECO Stars fleet recognition scheme for Taxis was launched on the 11th March 2015. There were 11 members in the scheme by the 31st December 2015. DCC also looking at collaborative work with taxi operators in developing an Electric Vehicle trial for taxis in Dundee. Dundee was successful in the 1st stage of bidding to Office of Low Emission Vehicles Ultra Low Taxi Scheme. This awarded us a fully funded feasibility study to be carried out by Energy Savings Trust. This was undertaken in December 2015 and we are waiting on final report.</p> <p>Summary 2016 - The ECO Stars fleet recognition scheme for taxis/private hire vehicles increased its membership to 15 (512 vehicles) by the 31st December 2016.</p> <p>DCC submitted a bid into OLEV for £515,000 to help support the taxi industry to move to zero emission vehicles. This will require match funding of approximately £88,000 from DCC. This will result in a £603,000 project in the city to install infrastructure to support the industry in their switch to plug in vehicles. A decision is expected in March 2017.</p>	Ongoing+	Objective to remove poor emission vehicles from service

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
8		Transport Management			As part of Air Quality Low Emission Charter, continue to investigate opportunities for: Traffic Regulation Conditions for 'No Idling' of taxis;	2013/2014+			Ongoing		
8		Vehicle Fleet Efficiency			Explore the potential of introducing Licensing Conditions for minimum taxi Euro category for certain classes of vehicles;				<p>2013-Assuming successful implementation of the proposed ECOSTARS scheme for Taxi Operators, the Council will consider making achievement of a certain minimum star rating a pre-requisite for Council Contracted work.</p> <p>In 2015 DCC introduced a condition within the school transport contracts requiring any successful applicant to become a member of the ECOSTARS Scheme for Taxi Operators by July 2016</p> <p>In 2016 DCC introduced policies 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</p>		
		Traffic Management			Provide 'No Idling' street signage; Monitoring for idling.				<p>No progress as the funding that was provided in 2016/16 was allocated to cover the additional costs of installing permanent infrastructure in Meadowside.</p> <p>No progress in 2016/17 as not included in funding application.</p> <p>➤ See Measure 1</p>		
8 cont.		Promoting low emission transport			DCC also looking at collaborative work with taxi operators in developing an Electric Vehicle trial for taxis in Dundee				<p>2014-Looking at City Wide rapid charger network to support individuals use, where they can't easily home charge and this will support a taxi fleet of EVs (over and above their home / depot charging infrastructure). Up to seven rapid chargers would be located in neighbourhoods city wide</p> <p>2015- Dundee was successful in the 1st stage of bidding to Office of Low Emission Vehicles Ultra Low Taxi Scheme. This awarded us a fully funded feasibility study to be carried out by Energy Savings Trust. This was undertaken in December 2015 and we are waiting on final report.</p> <p>2016-Dundee City Council submitted a bid into OLEV for £515,000 to help support the taxi industry to move to zero emission vehicles. This will require match funding of approximately £88,000 from DCC. This will result in a £603,000 project in the city to install infrastructure to support the industry in their switch to plug in vehicles. A decision is expected in March 2017.</p>		
		Vehicle Fleet Efficiency			Expansion of ECOSTARS to include taxi / private hire operators	2014/15			<p>ECO Stars expanded to include taxi operators in 2014/15. Seeking funding in 2015/16 to continue scheme</p> <p>The scheme was launched on the 11th March 2015 and there were 11 members by the 31st December 2015.</p> <p>2016-There was 15 members(512 Vehicles) in our ECO Stars scheme by the 31st December 2016</p>		

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
9	Measure M9: DCC will investigate to initiate a Roadside Emission Testing (RET) scheme inside the AQMA and routes leading to AQMA	Traffic Management	► To investigate into the establishment of a programme of RET in the AQMA	► VOSA ► Tayside Police ► DCC Environment Department.			► Approval/no n-approval of RET scheme ► Traffic Regulation Conditions if necessary.	Small	Project on hold until funding identified	2013+	
		Traffic Management			To seek funding to undertake feasibility study of introduction of RET	2015/16+			Project on hold		
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	Policy Guidance And Development Control	► Provide AQ policy within Local Development Plan with commitment to improve air quality ► Produce air quality Supplementary Planning Guidance (SPG)	► DCC City Development (Planning Division) ► DCC Environment Department.			► Adoption of Local Development Plan ► Adoption of Air Quality SPG	Small	► Main Issues Report Consultation exercise completed 2/12/2011. Proposed Plan by late autumn 2012. ► Method of integrating AQ into SPG considered. ► Air Quality Policy incorporated into draft LDP. Air Quality Supplementary Planning Guidance approved as part of a package of SPGs for adoption of the Local Development Plan. Supplementary Guidance approved at Committee in February 2015. Implications of Cleaner Air for Scotland Strategy is being considered during the development of future LDPs.	2015 +	

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
11	Measure M11: DCC will ensure effective co-ordination between climate change and air quality strategies and action plan measures	Policy Guidance And Development Control	► Strategy to be developed to improve co-ordination between climate change and air quality strategies and action plan measures	► DCC Corporate Planning Department ► DCC City Development - (Property Division) ► DCC Environment Department.		2011+	► Implementation of co-ordination strategy ► Reciprocal attendance of air quality and climate change working groups/steering committees	Small	<p>Procedure implemented for exchange of information between the Climate Change Board & Corporate Air Quality Steering Group.</p> <p>All matters (e.g. Action Plan updates) that the Climate Change Board & Corporate Air Quality Steering Group require attention in general, will be dealt with by the Executive Director of Neighbourhood Services and / or the Strategic Management Team. In addition an update on Air Quality progress was presented to the Climate Change Board in December 2014 and the 2015 AQ Update Report included the implications of the Cleaner Air for Scotland Strategy (CAFS).</p> <p>2016- In addition to the above the Council sit on the 'Clean Air for Scotland - Climate Change Subgroup' to provide advice on potential synergies and challenges between climate change and air quality action in Scotland.</p>	2014+	
12	Measure M12: DCC will continue its active involvement and support of TACTRAN	Policy Guidance And Development Control	► Regularly attend meetings ► Provide feedback ► Provide necessary support	► DCC City Development Department. (Transport Division)			► Number of TACTRAN policies and proposals implemented	n/a	<p>DCC continue to support TACTRAN and focus on implementation of Regional Transport Strategy</p> <p>Ongoing.</p>	On-going	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
LEADING BY EXAMPLE MEASURES											
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	Promoting low emission transport	► Determine strategy/advise note and annually review content ► Install Electric Charging Facilities in Car Parks	DCC City Development Department (Transportation Division)			► List of any promotion campaigns planned / implemented ► Number / proportion of cleaner vehicles within fleets or clean fuels infrastructure in each financial year ► Number of electric charging points installed	Small	► See also Measures 7 and 14 ►► Electric vehicle charging station infrastructure for council vehicles has been implemented with Electric Charging points installed in underground car park (below City Square). ► Pool EVs now available for city centre DCC staff and expanded across several DCC Multi Storey Car Parks and out of city centre DCC offices. ► Also investigating alternative Low Carbon Vehicle technologies i.e. Hydrogen Fuel cells ► 8 Electric vehicle charging stations installed by DCC (double-headed) 2014-Electric vehicle charging station infrastructure for council vehicles has been implemented with Electric Charging points installed in underground car park (below City Square. Pool EVs now available for city centre DCC staff and further expansion now being implemented across several DCC Multi Storey Car Parks and out of city centre DCC offices. Also investigating alternative Low Carbon Vehicle technologies i.e. Hydrogen Fuel cells Looking at City Wide rapid charger network to support individuals use and taxi fleet of EVs 2015- DCC have submitted final bid to OLEV for their Go Ultra Low City Scheme and are waiting for the announcement which is due in early 2016. Dundee City Council have installed 2 x 22kw chargers within the city funded by Transport Scotland as well as a number of charge points in the city centre which will be shared with Car Clubs. Work is also underway on new car park at the rear of council headquarters which will accommodate 12 of the council's electric pool cars therefore freeing up the spaces in car parks for more use by the public. Four on-street public charging bays were created in Spring 2015. Trades Lane, Dock Street, South Tay Street and Nethergate. Co-wheels introduced 7 EVs into their Dundee fleet – available for hire by Co-wheels members 2016 DCC were awarded £1.86 million from OLEV to install a comprehensive charging infrastructure in the city and surrounding area. This plan commits to installing 15 public Rapid Chargers and 22 Fast chargers, 2016 also saw the opening of the new council only charging hub at the rear of Dundee House with 12 dedicated bays for electric vehicle charging infrastructure.	2012+ on-going	
					See also Measure 7-	2013/14+					

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
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	Vehicle Fleet Efficiency	► Development of Green Procurement Strategy	► DCC Corporate Fleet Manager		2011+	Number / proportion of new/improved vehicles within fleets in each financial year	Small	<p>► New Corporate Fleet Manager appointed December 2011. ► Procurement of vehicles through Scotland Excel Framework which gives consideration to Green Credentials. 2011 saw the introduction of 6 electric vehicles with a further 6 by end March 2012</p> <p>► The Fleet section has replaced 60 vehicles 2012/13 all with improved emissions standards</p> <p>2013-The oldest and some of the most polluting vehicles have been identified and will be replaced with the current Euro 5 engines in the 2013/14 replacement plan. ► 2 new Euro 6 engine refuse collection vehicles ordered and will add to the existing rolling programme of replacing older and more polluting vehicles. ► Over 80 vehicles were replaced in 2013</p> <p>2014-A draft asset management plan has been created providing details of the ongoing replacement plan. Due to financial restrictions and vehicle variations the replacement programme will be done on a cost and condition basis. The emphasis of the plan will remain however the oldest and most polluting vehicles.</p> <p>2015- An annual replacement programme has been introduced to replace older and more polluting vehicles. The Fleet Section has spent approximately £1.8 million in 2015/16 replacing 31 vehicles and 45 items of plant.</p> <p>The council spent £1.3 million in 2016 replacing older and more polluting vehicles, with a total of 30 vehicles being replaced. This included 4 new Euro 6 Refuse Collection Vehicles.</p> <p>► See also Measure 7</p>	2014+	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
15	Measure M15: DCC will improve the Council's vehicle fuel consumption efficiency by better management of fleet activities	Vehicle Fleet Efficiency	<ul style="list-style-type: none"> ► Develop fleet management plan to improve fuel efficiency. ► Investigate fleet activities in relation to pollution hotspots e.g. waste management fleet routes 	<ul style="list-style-type: none"> ► DCC Corporate Fleet Manager ► DCC Environment Department 		2011+	<ul style="list-style-type: none"> ► Implementation of smarter driver programme ► Preparation / Implementation of Fleet management plan ► 10% reduction by 2013 for staff business travel and Corporate Fleet 	Small	<ul style="list-style-type: none"> ► New Fleet Section created (2012) ► Environment Department LGV drivers have undertaken SAFED (Safe & Fuel Efficient Driving) as part of their decision driving training and there is a proposal to roll this out across all council drivers. ► New computerised Fleet Management Systems to be introduced will help monitor fuel use across the council. Fuel saving measures being trialled in vehicles including Throttle Intervention Systems and Gear Box Prognostics. Fleet Section are developing reports to help tackle idling issues, which will improve fuel efficiency. 25 of the new small vans are fitted with stop/start technology which will be monitored to ascertain benefits. ► 2013 Summary - Fleet Section are working with other departments and telematics company to develop reporting tools to monitor mileage and driving styles. ► Fleet section is beginning to develop action plan for rolling out Routesmart to plan routes for all council vehicles to assist with reducing mileage. ► Fuel cards have been introduced to reduce mileage for RCV's in the east of the city. ► 2014 Summary-The Routesmart officers introduced the 1st new route in January 2014 and have an extensive programme to look at all refuse collection routes. ► 2015 Summary – A recent trial of rev technology failed to produce any noticeable impact. A recent crackdown on speeding events across the council fleet will hopefully help improve fuel consumption. No further developments in the use of the Routesmart technology that would help with AQ improvement. ► 2016 Summary - The fleet section continues to look at new technology to try and improve fuel consumption. Waste and Grounds maintenance section will shortly be introducing routes designed by routesmart which will hopefully reduce the overall mileage travelled by council fleet. <p>See Also Measures 7,13,14</p>	2014+	
		Vehicle Fleet Efficiency			Analysis of the information provided by the telematics system in relation to idling time etc.	2014+			A monthly review is undertaken of the telematics data that includes total mileage, idling time and drivers' behaviour. This data is used to identify any trends and help departments manage their fuel usage		

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
16	Measure M16: DCC will promote options for better travel planning amongst Dundee City Council employees	Promoting Travel Alternatives	<ul style="list-style-type: none"> ► Review DCC Travel Plan ► DCC to investigate use of annual survey on how/what modes of transport employees use to travel to work 	DCC City Development (Transportation Division)	Funding being sought in 2017/18 to review Corporate Travel Plan and update it in line with CAFS actions	2011+	<ul style="list-style-type: none"> ► Implementation of DCC Travel Plan & review of progress with targets ► 10% reduction by 2013 in staff business travel ► % DCC employees walking/cycling to work 	Small	<p>► Staff Travel Policy adopted Autumn 2011. This includes CO2 usages for lease vehicles ► DCC senior managers monitor effectiveness of staff travel policy</p> <p>The staff travel policy is encouraging innovation in terms of pool fleet, public and active travel by DCC officers / management to support staff travel. (2012).</p> <p>2015 - Office bikes made available at Dundee House from October 2015. Increased engagement with cyclists to be achieved through the development of a Cycling Strategy for Dundee.</p> <p>2016 -- The Dundee Cycling Strategy was adopted in June 2016 and gives a greater focus to all the cycling related work around the Council. The government had requested that all local authorities develop strategies around active travel. In late 2016, the Dundee Cycling Forum was established as a community body whose aims are the encouragement, promotion and support of cycling in the city</p> <p>Subject to the availability of funding the Corporate Travel Plan and reviewed and update in line with CAFS actions in 2017/18</p> <p>See also Measure 3, 17 & 22</p>	2015+	
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	Promoting Travel Alternatives	<ul style="list-style-type: none"> ► 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 	DCC City Development (Transportation Division)		2011+	<ul style="list-style-type: none"> ► % DCC employees walking/cycling to work ► Incorporate cycling measures within DCC Travel Plan in line with the new DCC Cycling Strategy to be developed 	Small	<p>► Get Cycling engaged to deliver cycling initiatives at DCC and other major employers in Dundee.</p> <p>► Improved cycling facilities provided at Dundee House (Dundee City Council Headquarters) and other Council properties.</p> <p>► Bike Boost and Cycle to Work initiatives delivered over the summer of 2012 to encourage staff to consider cycling.</p> <p>► 2014 - Staff Travel Policy now fully implemented and walking and cycling modes are encouraged for shorter distances.</p> <p>► 2015- Staff Travel Policy now fully implemented and walking and cycling modes are encouraged for shorter distances. No data being collected</p> <p>► 2016. Increased engagement with cyclists through</p> <ul style="list-style-type: none"> • adoption of a Cycling Strategy for Dundee June 2016 • provision of Tax Free Bikes in partnership with Cyclescheme Ltd promoting cycling to work via monthly Cycling Breakfast • the Dundee Cycle Forum established as a community body <p>See also Measures 3, 16 & 22</p>	2014+	

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
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 .	Policy Guidance And Development Control	► DCC to implement annual energy reduction action plan	DCC City Development (Property Division)			► 10% reduction by 2013	Small	<p>The Climate Change Board continues to implement the Council's Carbon Management Plan and current energy management projects. However, while there are a number of initiatives that when fully implemented should realise reductions in our CO₂ emission, the current performance is not consistently improving. The agreed procedural arrangements to enable the Council to comply with the new mandatory UK-wide Carbon Reduction Commitment - Energy Efficiency Scheme have been implemented.</p> <p>The Council's recorded Total Footprint Emissions for property in</p> <p>2011/12 - 36,506 tonnes of CO₂ 2012/13 - 39,570 tonnes of CO₂ 2013/14 - 34,645 tonnes of CO₂ 2014/15 - 34,001 tonnes of CO₂ 2015/16 - 31,976 tonnes of CO₂ 2016/17 data not available until July 2017</p> <p>Fleet transport baseline figure of 5,976 tonnes (i.e. reported 2007 estimate) has reduced to</p> <p>4,164 in 2013/14 3,965 in 2014/15 3776 in 2015/16 3708 in 2016/17</p>	On-going	
					New annual aspirational reduction target of 5% until 2020	2013+					

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
19	Measure M19: DCC to promote and support localised energy generation that doesn't compromise Air Quality in private households	Promoting Low Emission Plant	► Determine strategy/advise note and annually review content	► DCC Housing Department ► Solar Cities		2011+	► List of any promotion campaigns planned/implemented	Small	<p>► In 2012 Solar PV – Annual 25,055kg CO₂ (nominated installers calculated figures)</p> <p>► Solar thermal – Annual 197 kg CO₂ (nominated installers calculated figures) The above figures are all annual savings as not all installation dates have been collected yet to allow calculation of the actual amount saved within the project period.</p> <p>► Participant in Maryfield and Coldside areas CO₂ reduction</p> <p>► Groups pending start date = 59</p> <p>► Groups working with = 23</p> <p>► Groups Complete = 2</p> <p>► Total number of people engaged = 853</p> <p>Summary 2013 City-wide Solar PV review carried out following the Westminster Government's resolution of the Feed In tariff (FIT). 25 DCC locations are FIT compliant. A further 18 additional locations being considered based on energy generation and pay back periods. Financial assessment complete. Report to be brought forward recommending approval to proceed.</p> <p>Summary 2014-PV Scheme business plan is being prepared for 28 Feb 2015</p> <p>Summary 2015-Further review of PV Scheme being undertaken due to further reductions in FIT payments.</p> <p>Summary 2016 - The Capital Plan of November 2016 makes allowances of £1.4M against a range of energy conservation measures including PV production.</p> <p>DCC are now also advancing 2 District Energy Generation Centres as part of the overall city-wide district heating and energy strategy.</p> <p>Progress is also continuing with the drafting of the City's SEAP</p>	2012+	

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
20	Measure M20: DCC will provide the public with relevant air quality information.	Public Information	<ul style="list-style-type: none"> ► Investigating the potential for uptake of an air pollution information system, such as Air Alert ► Improvements to AQ website information ► Make up to date air quality information available to the public through Council's digital website 	<ul style="list-style-type: none"> ► DCC Environment Department ► DCC City Development (Transportation Division) 			<ul style="list-style-type: none"> ► Investigate funding sources ► Implement Air Alert or similar service ► Improved rating of website in peer review ► Make AQ information available through Council's website ► Real Time Travel Information 	Small	<p>► Funding to improve air quality pages on the Council Website identified. The Scottish Government took forward their "Know & Respond" service linked to the new air quality index in 2012. This allows people with respiratory conditions to be alerted when moderate and high pollution levels are forecast. The Council have provided a link and information about this service on the web-site.► The existing website achieved a higher rating in the 2012 peer review than the previous year.► Real-time pollutant monitoring concentrations are available from the Scottish Air Quality Website (www.scottishairquality.co.uk). The Council have provided a link on the web-site to this service.► No progress on provision of real-time information on pollution levels to assist traffic management through pollution hotspots.</p> <p>In 2013 -the new air quality webpages completed apart from section on Air Quality Planning due to Supplementary Planning Guidance not yet being finalised. Historical data for all monitoring points for 2006 to 2012 available via interactive map while address search function for smoke control areas also available. LAQM reports available for download including 2013 Progress report. Previous air quality pages have been removed. Air quality information was included on new bus route map that was delivered to 75000 residences in Dundee at end of June to start of July 2013. Workshops held at four primary schools in Broughty Ferry in April / May which included discussions on air quality.</p> <p>In 2014-The air quality webpages on the DCC website have been updated however the section on Air Quality and Planning is still to be finalised as the Supplementary Planning Guidance is awaiting Committee approval. The DCC AQ pages were ranked at number 7 in the UK for local authority AQ webpages in the 2014 peer review, with top marks of 5 stars awarded for the AQ content available on the DCC website.</p> <p>Summary 2015-The Air Quality pages of the DCC website have been upgraded with features available to enable the public to view historical data for the 2006 - 2013 period for all monitoring stations via an interactive map. This page also creates a graph for the monitoring results for those years to provide trend at monitoring location. A link to the Scottish Air Quality website is also present to allow real-time data to be viewed. All LAQM reports are summarised with some available for downloading, with most recent addition being the 2015 USA report.</p> <p>ECO Stars pages updated to ensure that lists of members up to date. The peer review for local authority air quality websites not conducted in 2015. Data base for air quality monitoring data still to be completed so historical monitoring information for 2014 still to be uploaded.</p> <p>Summary 2016- Information on website updated as necessary to ensure that links to external websites remain correct. ECO Stars pages updated regularly to ensure that lists of members up to date. The peer review for local authority air quality websites not conducted in 2016.</p>	2012+	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
20		Public Information			► Complete improvements to AQ website	2013/15			Almost completed (see below)		
		Public Information			► Develop Database to enable DCC staff to better manage large volume of AQ data and make it more readily available to stakeholders	2013/15			<p>Initial discussions held with IT Department in regards to development of a database for the handling and retrieval of air quality monitoring data.</p> <p>2014 Summary -Development of the AQ database has progressed with the DCC IT Department building a specification for the database for AQ monitoring data, However the proposed period for development of the database in November to December 2014 delayed due to be undertaken in early 2015.</p> <p>2015 Summary- Information on website updated as necessary to ensure that links to external websites correct. ECO Stars pages updated to ensure that lists of members up to date. The peer review for local authority air quality websites not conducted in 2015. Data base for air quality monitoring data still to be completed so historical monitoring information for 2014 still to be uploaded.</p> <p>2016 Summary- The data base framework for air quality monitoring data is completed with trial period running until end of 2016 to enable use of system from start of 2017. Historical monitoring information for 2016 has been uploaded for display on website. In addition the Air Quality pages of the DCC website have been upgraded with features available to enable the public to view historical data for the 2006 - 2015 period for all monitoring stations via an interactive map. This page also creates a graph for the monitoring results for those years to provide trend at monitoring location. A link to the Scottish Air Quality website is also present to allow real-time data to be viewed. All LAQM reports are summarised with some available for downloading, with most recent addition being the 2016 Progress report</p>		

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
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	Promoting Travel Alternatives	<ul style="list-style-type: none"> ► DCC to ensure all relevant commercial planning applications have travel plan conditions applied in accordance with current best practice. ► DCC to produce Travel Plan Strategy which: <ul style="list-style-type: none"> ► Details procedure for tracking & possible requirement for enforcement of planning conditions requiring travel plans. ► Details procedure for Travel Plan Information storage at DCC 	<ul style="list-style-type: none"> ► DCC City Development Department, (Planning Division, Transportation Division) ► DCC Education Department 			<ul style="list-style-type: none"> ► Develop Business Case for Travel Co-ordinator & identify potential funding streams. ► Number of new travel plans (need to show in terms of walking cycling - % of journeys saved). ► Identify & report on any Air Quality related Travel Plan targets from travel plan strategy and any relevant Travel Planning Team targets. ► Promotion of Travel Plan initiatives e.g. Sustrans' Travel Smart ► Implement & regularly review Travel Plan Strategy 	Small	<ul style="list-style-type: none"> ► Work in 2011 focussed on reducing the impacts of school traffic on the Lochee Road hotspots. (See AQAP 2012 Appendix 1) ► Further work to promote sustainable travel in primary schools across Dundee scheduled for 2012. ► Planning applications for significant developments are required to submit travel plans. The submission of travel plans is actively pursued and approved, if appropriate. ► In 2012 investigated development of city wide programme of pupil involvement (P5 - 7) in travel behaviour change. Education Department also encouraged to refresh all school travel plans <p>In 2013 Funding secured to commence a city wide programme of pupil involvement (P5 - 7) in travel behaviour change. Education Department agreed that all school travel plans would be reviewed over 13/14. Tender issued 22 November 2013. Contract Awarded and in class sessions commenced March through to September 2014, all P5 pupils in Dundee reached through in class sessions.</p> <p>Travel Behaviour Change Programme for (P5-P7) now being delivered annually the current contract runs to 2016/17</p> <p>All primary schools were given support during 2015 in updating their school travel plans. A number of primary schools have engaged in active travel initiatives but many have not engaged positively.</p> <p>In 2016 Travel Behaviour Change Programme successfully run in majority of (P5-P7) across the city. Travel Plan Condition placed on some applications but implementation not monitored</p>	2014+	

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
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	Promoting Travel Alternatives	<ul style="list-style-type: none"> ► Identify walking & cycling schemes (such as Park & Cycle). ► Identify walking & cycling promotional opportunities around Dundee City 	DCC City Development (Transportation Division)		2011+	<ul style="list-style-type: none"> ► Number of walking and/or cycling initiatives in operation. ► Establish the use of cycle monitoring counts at key points on cycle routes 	Small	<ul style="list-style-type: none"> ► Get Cycling engaged to undertake promotion of cycling and delivered Bike Boost. ► Positive Steps implemented Dundee Travel Active Personal Travel Plans in Broughty Ferry ► Cycle to Work Scheme promoted during August 2012 ► City Engineer currently implementing major cycling scheme at Douglas Terrace <p>2013 Summary - Transportation Division have secured further funding from Sustrans for FY13/14, which will deliver several off and on road cycle schemes,.</p> <p>2014-Working with City Engineers at Riverside Drive / Seabraes Pedestrian Bridge, including pedestrian crossing improvements on Riverside Drive Sustrans officer embedded in TACTRAN will encourage more focus on Community Based active travel initiatives</p> <p>Works all underway and additional 'Safer Routes to School' funds bid for to implement minor improvements to support active travel to and from school</p> <p>2015 - Key developments in 2015 included the new Seabraes Bridge, improvements on Coupar Angus Road near Camperdown Park, Lower Broughty Ferry Road (west end of Grassy Beach) and Riverside Avenue to Perth Road.</p> <p>2016- Dundee's Cycling Strategy was approved by councillors in June 2016 and a number of actions are being implemented.</p> <p>See also Measures 3,16 & 17</p>	2014+	
					Preliminary Works to achieve off-road cycle route around the Port of Dundee	2013/14			<p>Permission to commence on Nynas land to undertake preliminary works to achieve off-road route around Port of Dundee</p> <p>On hold until resolution of land ownership</p>		
					Provide Pedestrian Bridge over the railway at Riverside Drive / Seabraes	2013/14			<p>Transportation Division & City Engineers completed works at Riverside Drive / Seabraes Pedestrian Bridge, including pedestrian crossing improvements on Riverside Drive</p> <p>As above</p>		

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
23	Measure M23: DCC will continue to work with transport providers to support and promote increased uptake of public transport modes	Transport planning and infrastructure	<ul style="list-style-type: none"> ► Promote schemes such as the SQUID card including Dundee and surrounding towns. ► Introduce smart and integrated ticketing 	<ul style="list-style-type: none"> ► DCC City Development (Transportation Division) 		2011+	<ul style="list-style-type: none"> ► % uptake schemes ► Passenger numbers 	Small	<p>The development of Smart Card based integrated ticketing (National Entitlement Card) is being undertaken by DCC, National Express and Transport Scotland. .</p> <p>2013 Summary -This matter has the support of the Scottish Cities Alliance with a view to proof of concept for a Scottish roll out. Initial smart ticketing has been successfully deployed by National Express Dundee and Dundee College. DCC commenced discussion with other transport operators in support of the Scottish Cities Alliance priority for smart ticketing - Delivery action Group hosted by DCC 06 December 2013. .</p> <p>2014 Summary-Projects now being implemented nationwide, the new Green Buses and the EcoMobility SHIFT assessment, potential Bus Innovation Fund bid with Angus Council, Tactran and NHS Tayside and additional off peak bus services (funded by DCC) will raise profile and attractiveness of travelling by bus in Dundee. Scottish government review of Dundee rail fares will also attract new and retain existing passengers by making rail travel an attractive and more affordable option</p> <p>2015 Summary - DCC continues to promote public transport as an attractive and affordable alternative to private car. Significant work and investment is invested in infrastructure and promotion</p> <p>2016 Summary – as above</p>	2012+	

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
		Transport planning and infrastructure			NEC SMART Ticketing to Go Live 2014	2014			Completed	July 2014	
24	Measure M24: DCC will continue to work in partnership with other organisations to promote and implement energy efficiency measures in Dundee	Policy Guidance and Development Control	► To implement an Annual Action Plan of energy efficiency measures.	► DCC City Development (Property Division)			► Implementation of Annual Energy Efficiency Action Plan. ► Report reductions in energy use	Small	<p>The Climate Change Board re-introduced the Carbon Management Action Plan in 2013</p> <p>Examples of partnership initiatives undertaken by DCC can be viewed in the Council's annual 'Scotland's Climate Change Declaration' Report: http://www.keepsotlandbeautiful.org/sustainability-climate-change/sustainable-scotland-network/climate-change/scotlands-climate-change-declaration/</p> <p>Examples include: Dundee Energy Advice Project; European ENCLOSE project (Energy Efficiency in City Logistics Services).</p> <p>2015- The Climate Change Board's continuous review of the Carbon Management Action Plan has identified a number of revisions required to support the climate change aspirations and to improve work in partnership with other organisations to promote and implement energy efficiency measures.</p> <p>2016 - Full energy management progress reports are presented to the Council's Climate Change Board (CCB) in Feb and Aug each year for consideration. In addition, actions and initiatives relating to reducing the Council's energy use, carbon emissions and improving energy efficiency of the Council estate are discussed in detail at each CCB meeting as required</p>	2012+	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
MEASURES SECURING AIR QUALITY BENEFITS THROUGH STATUTORY FUNCTIONS											
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	► The Environment Department (Environmental Protection Division) will continue to work with City Development (Planning Division) as Statutory Consultees	► DCC City Development Department (Planning Division) ► DCC Environment Department			► Total number of planning applications consultations responded to in each calendar year (changed from financial year) ► Percentage of the total planning applications responded to with air quality conditions/ assessments	Small	Environment Department Officers check weekly planning lists and comment on all applications which may adversely impact on local air quality. ► In 2011 19 planning applications responded to. ► 16% had air quality conditions/ assessments (this included smoke control area informatives) ► 19 planning applications in 2012. ► 38% of the planning applications determined in the calendar year had air quality conditions. ► 31 planning applications were responded to in 2013. ► 30 planning applications were responded to in 2014. ► 37 planning applications were responded to in 2015. ► 53 planning applications were responded to in 2016.	n/a	<i>Suggestions on best practice and mitigation measures advised accordingly.</i>
					see Measure 10 regarding the introduction of Supplementary Planning Guidance						

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No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
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	N/A	► DCC will continue to monitor and enforce statutory legislation in this area	► DCC Environment Department.			► Number of relevant complaints in each financial year. ► % resolved	Small	<p>► For period in 2010-11 financial year (01/01/11-31/03/11) a total of 15 relevant complaints were investigated of which 93% were resolved.</p> <p>► For period in 2011-12 financial year (01/04/11 - 31/12/11), a total of 26 relevant complaints were investigated of which 69% had been resolved by 31/12/2011.</p> <p>In 2012, officers investigated 21 relevant complaints, of which 90% were resolved</p> <p>In 2013, officers investigated a total of 10 relevant complaints were investigated of which 90% have been resolved and one complaint is still being investigated.</p> <p>In 2014, officers investigated a total of 22 relevant complaints of which 90.9% have been resolved and two complaints are still being investigated.</p> <p>In 2015, officers investigated a total of 17 relevant complaints of which 94% have been resolved and one complaint is still being investigated.</p> <p><i>In 2016 , officers investigated a total of 17 relevant complaints of which 77% have been resolved and four complaints are still being investigated</i></p>	n/a	
27	Measure M27: DCC will enforce relevant legislation to reduce the burning of commercial and domestic waste	N/A	► DCC will continue to monitor and enforce legislation in this area	► DCC Environment Department			► Number of relevant complaints ► % resolved	Small	<p>► In 2011 - 1 complaint of the burning of commercial waste was investigated under the Environmental Protection Act 1990 (EPA) Section 33 requirements which was resolved. ► 7 complaints of smoke from commercial bonfires were investigated under EPA Section 79 and Clean Air Act legislation. ► 11 complaints of smoke from the burning of domestic waste (domestic bonfires) were investigated under EPA Section 79 and Clean Air Act legislation in 2011 of which 94% of these complaints had been resolved by 31/12/2011</p> <p>In 2012 Officers dealt with 9 complaints of smoke from commercial bonfires and 17 complaints of smoke from the burning of domestic waste. 92% of these complaints were resolved.</p> <p>In 2013, officers investigated 11 complaints of smoke from commercial bonfires under Environmental Protection and Clean Air legislation. 12 complaints of smoke from the burning of domestic waste (domestic bonfires) were investigated under the same legislation. 96% of these complaints were resolved.</p> <p>During 2014 officers investigated 9 complaints of smoke from commercial bonfires under Environmental Protection and Clean Air legislation. 13 complaints of smoke from the burning of domestic waste (domestic bonfires) were investigated under the same legislation. 100% of these complaints have been resolved.</p> <p>During 2015 officers investigated 10 complaints of smoke from commercial bonfires under Environmental Protection and Clean Air legislation. 25 complaints of smoke from the burning of domestic waste (domestic bonfires) were investigated under the same legislation. 100% of these complaints have been resolved.</p> <p><i>During 2016 officers investigated 10 complaints of smoke from commercial bonfires under Environmental Protection and Clean Air legislation. 20 complaints of smoke from the burning of domestic waste (domestic bonfires) were investigated under the same legislation. 100% of these complaints have been resolved.</i></p>	n/a	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
28	Measure M28: DCC will promote composting in a bid to reduce pollution from domestic bonfires	Policy Guidance and Development Control	► Reintroduce discount/promotion campaign for compost bins	► DCC Environment Department		2011+	► % uptake composting bins	Small	<p>► The Waste Resources Action Programme (WRAP) subsidised discount compost bins ended due to funding cuts in March 2011 with a total of 5243 discounted bins being sold in the DCC area in the period between 2006 and end 2010 representing 2% of the total discounted bins for Scotland. The promotion of home composting continues under the Zero Waste Scotland campaign banner with a Recycling Projects Officer employed in the Environment Department. ► Composting is undertaken at the Environment Department's green waste processing facility at Riverside Drive. 37,526 brown bins for garden waste have been issued.</p> <p>In 2013 - The area Zero Waste Scotland Volunteer Co-Ordinator helped to promote the home composting message across Dundee. DCC staff continued to utilise educational talks etc. to reaffirm the message.</p> <p>A total of 48 composting bins (and associated accessories) were purchased through the home composting framework scheme during 2013</p> <p>In 2014 the Council continued to participate in the national home composting framework scheme - an online retail network of subsidised composting bins & accessories to help encourage self-management of organic waste - as well as providing a fortnightly kerbside collection service for garden waste across the city with seasonal additional uplifts for real Christmas trees which may otherwise end up in domestic bonfires. A total of 28 composting bins were purchased through the home composting framework scheme between January - Dec 2014</p> <p>In 2015 -Promotion of the separate collection of garden waste for central composting by Dundee City Council continues throughout the city, with a total of 1821 brown bins being requested between June and December 2015. In addition, we continued to participate in the national home composting framework which allows residents who are keen to compost their own garden waste rather than have this collected by the council, to purchase discounted composting containers and accessories through an online retail network. From June to November 2015 a total of 13 units were purchased by Dundee residents. Both the home composting purchases & garden waste bin requests reflect the work ongoing within the Projects team to promote the composting process as an alternative to burning domestic garden waste.</p> <p>In 2016 - Promotion of the separate collection of garden waste for central composting by Dundee City Council continues throughout the city, with a total of 1957 brown bins being requested between February 2016 and February 2017. The reason for the increase in numbers is due to the creation of additional routes as the service is expanded across the city.</p>	On-going	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
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	Public Information	► Continued support for Dundee Air Quality Monitoring Network	► DCC Environment Department.			► Number of monitoring sites ► Identification of sites in new hotspots ► Monitoring data via DCC website	n/a	<p>► DCC operate a network of real-time monitoring sites. Most monitors are at roadside sites: Logie St (PM₁₀), Lochee Rd (NO₂ & PM₁₀(installed 2011)), Seagate(NO₂ & PM₁₀(installed 2011)), Union Street(NO₂ & PM₁₀), Whitehall St (NO₂), Meadowside(NO₂ & PM₁₀) introduced in 2011, and since Sept. 2012 Albert Street/Arbroath Road (PM₁₀), Myrekirk Terr (PM₁₀), and Stannergate(PM₁₀). There is also a background site at Mains Loan (PM₁₀ & NO₂(installed 2011)) and an urban industrial location at Broughty Ferry Rd (with collocated PM₁₀ monitors). In 2014 SO₂ monitoring ceased at Broughty Ferry Rd as monitored concentrations were consistently below the AQOs.</p> <p>The real time monitor in Union Street was decommissioned in January 2016 as nitrogen dioxide concentrations have been below the annual mean objective since 2011.</p> <p>► DCC deploy 97 NO₂ diffusion tubes (PDTs) across a network of 82 sites around the city, located at busy roads and junctions and a number of background locations. Three PDTs are collocated with each of the 5 roadside automatic NO₂ for data accuracy. Locations are reviewed and any necessary changes to the network are reported annually.</p> <p>2016- The details of diffusion tube changes undertaken in 2016 are detailed in Section 3 of the main report.</p> <p>► The location of new relevant exposure next to pollution sources (e.g. busy roads) and dispersion modelling results inform the need for new monitoring locations and hence the potential identification of new hotspots.</p> <p>Potential new annual mean NO₂ exceedance areas identified at South Road (Denbank) in 2012 and Strathmore Ave in 2009 were below the NAQS in 2015 and 2016 when predicted to façade. NO₂ concentrations exceeded the AQO at West Marketgait / Guthrie St. (PDT installed 2013) and the new tube installed at West Marketgait / Old Mill in 2015. The potential hotspot at West Marketgait is now confirmed.</p> <p>► See also Measure 20 re' monitoring data on the website</p>	n/a	Annual mean concentrations of NO ₂ at Strathmore Avenue and South Road (Denbank) were below the NAQS in 2016 when predicted to façade. West Marketgait / Guthrie Street and Old Mill were above the NAQS in 2016.

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
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	Public Information	<ul style="list-style-type: none"> ► 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 NO₂ diffusion tubes regularly deployed around the City Council area. 	<ul style="list-style-type: none"> ► DCC Environment Department/ Tayside Scientific Services 			<ul style="list-style-type: none"> ► QA/QC measures adopted ► Auditing reports 	n/a	<ul style="list-style-type: none"> ► External consultant undertakes calibrations and filter changing of the continuous monitoring equipment in the air quality monitoring stations. ► Osiris meters - indicative PM₁₀ meters - filter change undertaken on quarterly basis and annual calibration. ► Audits of continuous monitoring stations' equipment undertaken by external consultants and auditing reports received. ► Public Analyst participates in AIR PT Scheme and field inter-comparison study. <p>Ongoing, -AIR is an independent analytical proficiency-testing (PT) scheme, operated by LGC Standards and supported by the Health and Safety Laboratory (HSL). AIR PT is a new scheme, started in April 2014, which combines two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme. AIR NO₂ PT forms an integral part of the UK NO₂ 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) (Is this still correct)</p>	n/a	
					Develop Database to enable DCC staff to better manage large volume of AQ data and make it more readily available to stakeholders	2013/15			Initial discussions held with IT Department in regards to development of a database for the handling and retrieval of air quality monitoring data. The DCC IT Department are in the process of development of a database for the handling and retrieval of air quality monitoring data. Specifications of database have been built by the IT Department which were discussed during a meeting held in August 2014. The development of the database was planned to be carried out in November - December 2014 however this has been delayed and is now planned to be carried out in early 2015 The database framework has been completed and trialling commenced in 2016.	2015	

No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments relating to emission reductions
31	Measure M31: DCC will establish additional monitoring sites across the City in locations where poor air quality is suspected	N/A	► DCC will continue to carry out and report on their statutory duties under the Review & Assessment process for LAQM	► DCC Environment Department			► Poor air quality sites identified monitored and dealt with through the process of Review & Assessment. ► Additional monitoring sites established as and when required	n/a	► See Measure 29 ► The potential new hotspot identified for NO ₂ in Strathmore was assessed and it was determined that monitoring with the additional tubes in the area could cease. ► See Measure 29 ► A review of the diffusion tube locations was undertaken in 2012 and 21 new sites identified as requiring monitoring during 2013 See also Measure 29	n/a	
32	Measure M32: DCC will implement road traffic counts to inform the review and assessment process.	Traffic Management	► Undertake classified traffic counts	► DCC Environment Department			► Classified traffic counts undertaken	n/a	Classified Traffic Counts Undertaken at 18 junctions in 2011 ► Classified Traffic Counts undertaken at 18 junctions in Sept 2012. Classified Traffic Counts were undertaken at 9 junctions in 2013. There were no traffic counts undertaken for air quality purposes in 2014 or in 2015 In 2016 - New traffic counts were undertaken in the Seagate, Coupar Angus Road, Harefield Rd, Dalkeith Rd/Arbroath Rd, Drumgeith Rd/Whitfield Dve, and the junction of Gray St/Queen Street.	On-going	

2.3 Cleaner Air for Scotland

Cleaner Air for Scotland – The Road to a Healthier Future (CAFS) is a national cross-government strategy that sets out how the Scottish Government and its partner organisations propose to reduce air pollution further to protect human health and fulfil Scotland's legal responsibilities as soon as possible. A series of actions across a range of policy areas are outlined, a summary of which is available at <http://www.gov.scot/Publications/2015/11/5671/17>. Progress by Dundee City Council against relevant actions within this strategy is demonstrated below.

2.3.1 Transport Action – “Avoiding travel – T1”

All local authorities should ensure that they have a corporate travel plan (perhaps within a carbon management plan) which is consistent with any local air quality action plan. Dundee City Council has a Council Travel Plan (CTP) to reduce the number of single occupancy car journeys made while on Council business and when commuting to work and to incentivise the use of public transport and walking and cycling and car sharing. However, this needs to be revised to bring it in line with DCC's Air Quality Action Plan, the revised corporate policy covering business travel and CAFS deliverables. Subject to the availability of funding the CTP will be reviewed and updated in 2017/18.

2.3.2 Climate Change Action – “Effective co-ordination of climate change and air quality policies to deliver co-benefits – CC2”

Scottish Government expects any Scottish local authority which has or is currently developing a Sustainable Energy Action Plan to ensure that air quality considerations are covered. Dundee City Council has committed to becoming a signatory to the EU Covenant of Mayors (CoM) and through the Dundee Partnership to develop a 'Sustainable Energy and Climate Action Plan' (SECAP) for Dundee that would aim to reduce area wide emissions and deliver multiple social, economic and environmental benefits. An “Invitation to Quote” (ITQ) is being prepared for this work and will be discussed internally before being issued on Public Contract Scotland. Air quality funding has been requested for the BEI/MEI element of SECAP development but funding for the main body of work is still to be sourced.

The collation of a Baseline Emission Inventory (BEI) is a prerequisite to SECAP elaboration as it identifies and quantifies the principal sources of CO₂ and GHG emissions and their respective reduction potentials from transport, municipal, tertiary and residential sectors. Subject to the availability of funding the following will be undertaken in 2017/18:

- a) a BEI for 2005 in required CoM format;
- b) a Monitoring Emissions Inventory (MEI) in required CoM format;
- c) an estimate of the projected 'business as usual' emissions through to 2030

2.3.3 Commentary on further actions

In parallel to continuing with the implementation of the AQAP measures, Dundee City Council along with the other three major city authorities, is represented on the CAFS Governance Group. DCC is committed to working with the Scottish Government and its partner organisations to deliver CAFS' aim of improving Scotland's air quality to be the best in Europe.

Two critical elements for the delivery of CAFS is the development of a National Modelling Framework (NMF) and National Low Emission Framework (NLEF). SEPA is leading on the

development of a standardised two level NMF, for regional and local scales, designed to inform decisions on potential transport and planning solutions to local air quality issues. While Transport Scotland are leading on the development NLEF appraisal process.

Detailed modelling of the four major cities is being progressed. The timeline for this work is being phased, with Glasgow and Edinburgh being progressed first and then Aberdeen followed by Dundee. The development of the Dundee City Model has been postponed until September 2017 so that the necessary baseline traffic data can be collected after the completion of major roadworks. The outputs from the modelling exercise will be used in the transport focussed NLEF appraisal process to consider a range of transport related vehicle access interventions, including Low Emission Zones, which will bring further improvements to air quality in the city. The package of interventions to be implemented will not be known until the NMF/NLEF processes are complete.

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 2016. **Table A.1** in **Appendix A** shows the details of the sites. There are three different PM₁₀ monitors (CM3, CM13, CM16) co-located at the Broughty Ferry Road site to help improve data accuracy. The analysers from the closed monitoring site in Union Street (end of 2015) were redeployed within the urban air quality monitoring network in 2016 at the following locations:

- NO_x analyser relocated to the urban industrial site at Broughty Ferry Road;
- PM₁₀ (BAM) analyser relocated to the roadside site in Whitehall Street opposite a main bus interchange.

Neither analyser recorded any exceedances of the relevant AQO's at their new locations.

National monitoring results are available at <http://www.scottishairquality.co.uk/>.

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.1**.

3.1.2 Non-Automatic Monitoring Sites

Dundee City Council undertook non- automatic (passive) monitoring of NO₂ at 87 sites during 2016. **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 how the monitors are calibrated and how the data has been adjusted are included in **Appendix C.1**. Eleven (11) new diffusion tube sites were added to the network at the start of 2016 at the following locations where new residential properties had been introduced or identified close to busy roads:

- Arbroath Rd (89) (DT 212);
- Claypotts / Arbroath Rd (502) (DT 171);
- Cleghorn Street (57) (DT 210);
- Drumgeith Road (2) (DT 206);
- East Dock St (26) (DT 214);
- Forfar Rd (83a) (DT 211);
- Hawkhill (251) (DT 209);
- King Street (3) (DT 216);
- Nethergate (64) (DT 213);
- Pitkerro Road (42) (DT 207); and,
- St Ann Street (2) (DT 208).

None of the new diffusion tubes deployed in 2016 identified a new area of exceedance, though the NO₂ annual mean concentration predicted at the nearest receptor to Nethergate (64) was borderline. The diffusion tube results for the entire network were reviewed in December 2016 (when 10 months data was available) in order to identify those monitoring locations where: concentrations were well below the AQO; no longer needed for model

verification; or, were unnecessary for long term trend analysis. The following 6 tube locations were discontinued at the end of 2016:

- Arbroath Rd (89) (DT 212);
- Cleghorn Street (57) (DT 210);
- Forfar Rd (83a) (DT 211);
- Hawkhill (251) (DT 209);
- High St Lochee (22-24) (DT 202); and
- St Ann Street (2) (DT 208).

The above six diffusion tubes were redeployed at the beginning of 2017 in areas where new residential developments are planned close to busy roads and junctions in Dundee.

- Muirton Road (2) (DT 222);
- Harcourt Street (CCTV) (DT 221);
- Seagate (99) (DT 217);
- South Marketgait (Lampost 18) (DT 218);
- Strathmartine Road (15) (DT 220); and
- Thomson Avenue (street sign) (DT 219).

The results of the new diffusion tubes deployed in 2017 will be reported in the Annual Progress Report 2018.

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 (NO₂)

Table A.3 in **Appendix A** compares the ratified and adjusted monitored NO₂ annual mean concentrations for the past 5 years with the air quality objective of 40µg/m³.

For diffusion tubes, the full 2016 dataset of monthly mean values is provided in **Appendix B**. Locations marked in green were new in 2016.

The procedure specified in paragraphs 7.77 to 7.79 of LAQM.TG(16) was used to estimate the concentrations at the nearest receptor. The annual mean background concentration used in the calculation was 21.2 µg/m³ (from DT 185) for city centre sites, and 17.0 µg/m³, (the average of concentrations from five urban background locations (DT 7, DT 164, DT 155, DT 185, and DT 82)) for the remainder. Potential exceedances (> 36 µg/m³) of the NO₂ annual mean that were identified at relevant locations near the monitoring locations are shown in **Table 3.1**.

Table 3.1 Locations of Potential Exceedances of the NO₂ annual mean AQO in 2016

Site ID	Location	2016 Bias Adjusted NO ₂ Annual Mean (µg/m ³)	2016 Predicted annual mean NO ₂ concentration at Receptor (µg/m ³)
DT 31	Lochee Rd (140) Traffic Lts	53.0	52.1
DT 37	Logie St (114)	53.8	51.5
DT 205	West Marketgait/Old Mill (23)	51.6	51.5
DT 70	Victoria Rd/Hilltown	50.8	44.6
DT 156	Dock St (57)	49.3	43.5
DT 190	Seagate (97)	41.8	41.8
CM 5	Seagate Romon	47.0	41.5
DT 183	West Marketgait / Guthrie St	46.1	40.9
DT 149	Meadowside (Romon) Average	41.0	40.3
DT 30	Lochee Rd (138)	48.9	39.3
DT 158	Lochee Rd (Romon) Average	43.8	38.5
CM 4	Lochee Rd Romon	44.6	38.4
DT 50	Seagate (101)	38.7	38.3
DT 159	Seagate(Romon) Average	41.3	37.5
DT 39	Loons Rd (1)	38.6	37.5
DT 85	Dock St (21)	37.6	37.3
DT 75	Whitehall St (5)	40.1	36.3
DT 213	Nethergate (64)	38.4	36.2

The highest NO₂ annual mean concentrations predicted at relevant receptors were on the North West arterial route (Lochee Road Corridor); the West Marketgait, which is part of the inner ring road; the main bus corridor; and, part of the trunk road network close to the city

centre (i.e. Dock Street 57). There are no specific measures within the AQAP currently targeting the inner ring road or trunk roads. All of these locations are within the AQMA.

Trends in NO₂ concentrations at automatic monitors with at least 5 years data capture are shown in **Figure A.3a**, all show an improving trend except for the roadside site in Seagate and the urban background site at Mains Loan. An analysis of apparent trends in the 64 monitoring locations with at least 5 years data is shown in **Figure A.3b**. Concentrations at the majority of sites (52) show an improving trend or have remained stable. The greatest improvements have been in Meadowside where action plan measures have been successful in reducing concentrations. Small worsening trends are evident on Dock Street close to the trunk road network; on or near the north-west arterial route (at Logie Street & Rankine Street respectively); and, on the main bus corridor (at Nethergate, Whitehall Crescent, Whitehall Street and Seagate).

An overview of how NO₂ annual mean concentrations are improving in different areas across the city can be seen in maps and graphs shown in **Appendix C.2**.

Table A.4 in **Appendix A** compares the ratified continuous monitored NO₂ hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m³, not to be exceeded more than 18 times per year. No exceedances of the hourly mean objective were identified by automatic monitors or indicated by diffusion tubes in 2016. Lochee Road had four occasions when the concentration was over 200µg/m³ . Analysis showed these were all in the winter months, on week days at either morning or evening traffic peak times. The pattern of these occurrences are similar to those in previous years.

Previously the hourly mean objective has only been exceeded at the Lochee Road automatic monitor, though there have been no exceedances for the past 3 years. **Figure A.4** shows the long-term trend in the 99.8th percentile concentration of hourly means at Lochee Road is still upward. The trend line has been drawn using an Excel simple regression statistical program. Diffusion tube monitoring and dispersion modelling show that the automatic monitor is not sited in the most polluted location. Until there is an established downward trend the AQMA for the hourly mean objective should remain.

3.2.2 Particulate Matter (PM₁₀)

Table A.5 in **Appendix A** compares the ratified and adjusted monitored PM₁₀ annual mean concentrations for the past 5 years with the air quality objective of 18µg/m³.

Table A.6 in **Appendix A** compares the ratified continuous monitored PM₁₀ daily mean concentrations for the past 5 years with the air quality objective of 50µg/m³, not to be exceeded more than 7 times per year.

Exceedances of the PM₁₀ annual mean objective (18µg/m³) were predicted at the following locations, within the AQMA:

- Lochee Road (BAM) and;
- Stannergate (Osiris).

The annual mean recorded at the Meadowside BAM was borderline. However this may have been influenced by the nearby roadworks at the beginning of 2016 that were associated with Action Plan measures to increase the separation distance between receptors and road traffic.

Annual mean PM₁₀ concentrations at monitoring sites with at least five years data are shown in **Figure A.5a** and **Figure A.5b**, with an analysis of the trends is shown in **Figure A.5c**. An improving trend is evident at the majority of current monitoring locations apart from Lochee Road (BAM), Myrekirk Terrace (Osiris) and Stannergate (Osiris). The largest decrease has been in Meadowside where action plan measures have contributed to the decrease in concentrations. The largest worsening trend is evident at Stannergate (Osiris). Traffic is not the only source of PM₁₀ in the Stannergate area, and source characterisation and identification work is proposed during 2017/18.

The PM₁₀ daily mean objective was met at all monitoring locations in 2016. The three daily exceedances reported by the Meadowside analyser in February were a result of the street works to widen the pavement as part of the action plan traffic infrastructure measure. A transboundary event raised PM₁₀ concentrations across the city and resulted in a daily exceedance at Lochee Road on 4th June.

Figure A.6a shows the frequency of the daily mean PM₁₀ concentrations greater than 50µg/m³ recorded at the real-time monitors. Where the measured data capture is less than 85%, LAQM TG(16) advises that, it is more appropriate to express short-term concentrations as percentile values for comparison with the objective. Expressing short-term concentrations as 98.08th percentile values provides easier inter-year comparison of data and examination of possible trends. **Figure A.6b** and **Figure A.6c** shows trends for those analysers with at least 5 years data capture. Trend lines have been drawn using an Excel simple regression statistical program.

The majority of automatic monitoring sites with at least 5 years data capture show an improving trend, apart from Myrekirk Terrace and Stannergate. The trend in concentrations at Mains Loan background site and the roadside site at Lochee Road remain relatively stable. However, it is hard to draw conclusions from analysis of trends in short-term PM₁₀ exceedances because apart from the influence of annual trans-boundary 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})

As of the 1st of April 2016, the Scottish Government has tightened the annual mean objective for PM_{2.5} to be in line with the World Health Organisation guidelines, and brought this pollutant within the LAQM regime, requiring local authorities to work towards achieving the objective of 10µg/m³ by 2020. Dundee City Council do not currently monitor for PM_{2.5}. Potential exceedances of the PM_{2.5} annual mean objective have been estimated from the PM₁₀ annual mean concentrations using the methodology described in LAQM.TG(16) (paragraph 7.109). Potential exceedances were identified at the following locations:

- Albert Street (Osiris);
- Lochee Road (BAM);
- Meadowside (BAM);
- Myrekirk Terrace (Osiris);
- Whitehall Street (BAM); and,
- Stannergate (Osiris).

There is currently no guidance available on how to predict forward PM_{2.5} monitoring concentrations to 2020 in LAQM.TG(16). Dundee City Council applied for funding from the Scottish Government to establish a PM_{2.5} monitoring network in Dundee. Funding has been awarded to establish two PM_{2.5} monitors in the city. It is intended that these will be located at the roadside site on Lochee Road and at the background site at Mains Loan during the 2017/18 financial year.

3.2.4 Sulphur Dioxide (SO₂)

Dundee City Council does not currently monitor SO₂.

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

As part of the Cleaner Air for Scotland Strategy (2015) discussed in **Section 2.3**, the Scottish Government, Scottish Environmental Protection Agency (SEPA) and Transport Scotland are developing a city model of Dundee as part of the National Modelling Framework (NMF). The NMF will include an air quality assessment tool, guidance documents, data requirements, best practice and 'web-based interactive data products' aimed at providing a standardised approach to modelling air quality at regional and local level. It is expected that the local NMF model will provide a significant proportion of the quantitative evidence required within the detailed options appraisal process for the National Low Emission Framework (NLEF). A comprehensive traffic data collection exercise is planned for September 2017 in Dundee as shown in **Figure C.30**, which will provide a new baseline for review and assessment.

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 last Annual Progress Report in 2016, there have been no new:

- Busy streets where people may spend one hour or more close to traffic;
- Roads with a high flow of buses and/or HGVs;
- Roads with significantly changed traffic flows; and
- Bus or coach stations.

Narrow congested streets with residential properties close to the kerb

New flats have been granted planning permission adjacent to Strathmartine Road in the Hilltown Area of Dundee¹. This development has the potential to create a street canyon where there wasn't one before. An air quality assessment was requested as part of the planning process. This predicted no exceedances of the air quality objectives for NO₂, PM₁₀ and PM_{2.5} at new or existing receptors in the area. Additional NO₂ diffusion tubes have been deployed in the area at the beginning of 2017 to help confirm the findings of the report.

Junctions (including busy roads and junctions in Scotland)

The APR 2016 reviewed new road count data from temporary count sites and identified three locations with greater than 10,000 vehicles per day (vpd) with relevant exposure within 10m which had not been previously assessed and were not part of ongoing modelling studies, these were:

- Arbroath Road (West of Ellengowan Drive)(2010), Count site No.00000332
- Hawkhill (Nr Blackness Primary School)(2010), Count site No.00000325
- Drumgeith Road (nr Summerfield Avenue) (2011), Count site No.00000364

¹ <http://idoxwam.dundeecc.gov.uk/idoxpa-web/simpleSearchResults.do?action=firstPage> 16/00806/FULM

New NO₂ diffusion tubes were deployed in these areas in 2016, the results at these diffusion tubes were well below the annual mean objective of 40µg/m³ (DT 212: 29.4µg/m³; DT 209: 21.4µg/m³; and, DT 206: 18.4µg/m³ respectively). Another three locations identified in the APR 2016 had been assessed previously for NO₂ using diffusion tubes but had not been assessed for PM₁₀, these were:

- Coupar Angus Road (South of Lansdowne Gardens) (2005), Count site No.00000158
- Coupar Angus Road (nr Dryburgh Gardens) (2010), Count site No.00000326
- Queen Street (East of Gray Street) (2010), Count site No.00000346

Classified traffic counts at roads and junctions in each of these areas except for the Hawkhill were carried out during 2016. Major roadworks throughout 2016, affecting traffic flows on the Hawkhill and nearby Sinderins junction meant it was not possible to carry out a representative traffic count. The Hawkhill forms part of the network of roads and junctions to be covered by the NMF for Dundee and will be considered as part of this process. The classified traffic counts carried out during 2016 allowed assessment of NO₂ and PM₁₀ at the nearest relevant receptors using the Design Manual for Roads and Bridges screening tool (DMRB). The DMRB methodology does not currently calculate PM_{2.5}. The results of the DMRB assessments and verification are shown in **Appendix C.11**. Location “A” is the closest relevant receptor to the Arbroath Road Count site; “B” to Drumgeith Road; “C” to the Coupar Angus Road count sites; and, “D” to the Queen Street count site. No exceedances of the NO₂ and PM₁₀ air quality objectives were predicted at the relevant receptors.

Data from the council's Road Traffic Reduction Act Sites from 2005-2016 are presented in **Table C.6**. **Table C.7** shows the percentage growth at each of the sites since 2005; none have experienced a significant increase (>10%) in traffic flows over this time.

The APR 2016 identified a new location where relevant exposure is proposed on Dock St close to the busy junction of the A92T and the A991. This location had not needed to be assessed previously as there were no relevant receptors. A new NO₂ diffusion tube was installed in this area (Jan 2016) which is close to the Central Waterfront Development. The diffusion tube result was below the annual quality objective of 40µg/m³ (DT 214: 34.7µg/m³). This area is within the boundary of the current AQMA, though there are no specific actions in the AQAP that target trunk road traffic in this area. To assess PM₁₀ it was proposed that this area would be included in the dispersion modelling of possible action plan measures for reducing pollutant concentrations in the Seagate. However the proposed traffic management plans tested were not deemed viable so no air dispersion modelling was undertaken. This area is also within the network of roads and junctions to be covered by the NMF for Dundee and will be considered as part of this process.

The APR 2016 reported the results of modelling studies which identified new exceedances of the annual mean objectives for NO₂ and/or PM₁₀ at relevant receptors at the following locations (the majority of which are part of the trunk road network):

- A92 (between Broughty Ferry Road and Greendykes Road (PM₁₀ & NO₂);
- Scott Fyfe roundabout (A92/A972/B961/B959/C223) (PM₁₀);
- Claypotts junction (A92/B978) (PM₁₀);
- A972T (Kingsway – Pitkerro Road roundabout) (NO₂);
- A90 (north of the Kingsway) (NO₂); and
- Forfar Road (A929) / Clepington Road (C244) junction (PM₁₀ & NO₂).

Consequently additional NO₂ diffusion tubes were added to the monitoring network in 2016 at three of the locations that did not already have diffusion tubes, i.e.: A90 (North of Kingsway); A972T (Kingsway / Pitkerro roundabout) and; Claypotts junction. The corresponding 2016 results were below the annual mean objective of 40µg/m³ (DT 211: 31.3µg/m³, DT 207:

32.6µg/m³, DT 171: 26.6µg/m³). Each of these areas are also within the network of roads and junctions to be covered by the NMF for Dundee and PM₁₀ will be considered as part of this process.

These areas are all within the boundary of the current AQMA. There are no specific AQAP actions, currently being pursued, that target trunk road traffic in these areas. The local authority intends to liaise with Transport Scotland as part of the NLEF process to discuss whether any additional actions are possible to reduce pollutant concentrations at relevant locations close to the trunk road network in Dundee.

New roads constructed or proposed

New junctions and roads have been constructed as part of the Central Waterfront Development Masterplan 2001 - 2031, described previously in the Progress Report 2005. The closest receptors to these changes are currently located on Dock Street, which is already an identified exceedance area. New residential developments and 'street canyons' are proposed within the Central Waterfront Area and the need for review and assessments of the new roads and junctions will be examined in subsequent reports as necessary.

4.2 Other Transport Sources

None of the following transport sources have been identified as new since the Annual Progress Report 2016:

- 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 addressed during previous

rounds of Review and Assessment and the focus is, therefore, on new installations and those with significantly changed emissions or new exposure.

The technical guidance (LAQM.TG(16)) states that industrial sources are unlikely to make a significant contribution to annual mean concentrations, but may contribute to elevated short-term concentrations, which may lead to exceedances of the short-term air quality objectives (e.g. 15-minute mean for SO₂, 1-hour mean for NO₂ or 24-hour mean for PM₁₀). The assessment should consider the potential impact of specific industrial processes or chemical storage for all of the regulated pollutants. Generally, industrial sources most likely to require further assessment work are those that emit NO₂, PM₁₀ and potentially SO₂.

A list of industrial processes in the city which are regulated by the Scottish Environmental Protection Agency (SEPA) is provided in **Appendix C.10**. This Appendix also includes a screening assessment of all the SEPA regulated processes and contains updated information provided by SEPA.

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

SEPA were consulted regarding any changes that meet the above criteria at SEPA regulated sites. The consultation responses are summarised in **Appendix C.10**, and no new or proposed installations that required to carry out an air quality assessment were identified.

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

SEPA were also consulted regarding any changes that meet the above criteria at SEPA regulated sites. The consultation responses are summarised in **Appendix C.10**, and no existing installations with substantially increased emissions or new relevant exposure were identified.

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

SEPA were consulted regarding any changes that meet the above criteria at SEPA regulated sites. The consultation responses are summarised in **Appendix C.10**, and no new or significantly changed installations with no previous air quality assessment were identified.

- **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 2000m³ 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 PM₁₀.

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:

- Biomass² 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 APR (2016), 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 enquiries/complaints to the Council about domestic solid fuel burning, and planning applications for the installation of wood/solid fuel burning stoves are on the increase.

The requirement to consider CHP Plant is a new requirement that local authorities have had to report since the APR (2016). The CHP screening tool has a threshold of 70kWe. Dundee City Council confirms that it has not identified any CHP plant exceeding this threshold which were installed during 2016.

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.

² 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.

Since the last APR (2016), Dundee City Council has not identified any new sources of fugitive or uncontrolled particulate matter, other than temporary demolition and construction activities. The DCC 2015 USA identified that annual mean PM_{10} concentrations at the Stannergate roundabout (located at the eastern entrance to the port) are higher than other similar roadside locations suggesting contributions from PM_{10} sources other than road traffic. There are a number of uncontrolled, transient and unpredictable sources of PM_{10} in the area which require further investigation to help inform potential action plan measures. Dundee City Council secured funding from the Scottish Government to engage consultants to carry out source identification and characterisation at this location. The work will be progressed during the 2017/18 and reported in next year's APR.

5. Planning Applications

Dundee City Council have been advised by the LAQM Helpdesk that this section is not mandatory.

6. Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring Data

Exceedances of the NO₂ annual mean objective (40µg/m³) were predicted at the following locations, within the AQMA:

- Dock Street;
- Lochee Road;
- Logie Street;
- Seagate;
- Victoria Road; and
- West Marketgait.

Borderline exceedances were also predicted at Whitehall Street and Nethergate.

An analysis of trends in NO₂ annual mean concentrations at monitoring locations with at least 5 years data indicates that the majority of sites show an improving trend with the greatest improvements taking place in Meadowside where action plan measures have been successful in reducing concentrations. Small worsening trends are evident on Dock Street close to the trunk road network; on or near the north-west arterial route (at Logie Street & Rankine Street respectively); and, on the main bus corridor (at Nethergate, Whitehall Crescent, Whitehall Street and Seagate).

No exceedances of the NO₂ hourly mean objective were identified by automatic monitors or indicated by diffusion tubes in 2016. Lochee Road is the only area of the city where the hourly AQO has been exceeded previously. No exceedances have been recorded here for the past 3 years but there is an worsening trend in the 99.8th percentile concentrations. Until there is an established downward trend the AQMA for the hourly AQO should remain.

Exceedances of the PM₁₀ annual mean objective (18µg/m³) were predicted at the following locations, within the AQMA:

- Lochee Road (BAM); and
- Stannergate (Osiris).

An improving trend is evident at all current monitoring locations apart from Lochee Road (BAM), Myrekirk Terrace (Osiris) and Stannergate (Osiris). The largest decrease has been in Meadowside where action plan measures are considered to have contributed to the decrease in concentrations. The largest worsening trend is evident at Stannergate (Osiris). Traffic is not the only source of PM₁₀ in the Stannergate area, and source characterisation and identification work in the area is proposed during 2017/18.

The PM₁₀ daily mean objective was met at all monitoring locations in 2016.

The majority of automatic monitoring sites with at least 5 years data capture show an improving trend, apart from Myrekirk Terrace and, Stannergate. The trend in concentrations at Mains Loan background site and the roadside site at Lochee Road remain relatively stable. However, it is hard to draw conclusions from analysis of trends in short-term PM₁₀ exceedances because apart from the influence of annual trans-boundary 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.

Dundee City Council do not currently monitor for PM_{2.5}, potential exceedances of the PM_{2.5} annual mean objective have been estimated from the PM₁₀ annual mean concentrations

using the methodology described in LAQM.TG(16). Potential exceedances were identified at the following locations:

- Albert Street (Osiris);
- Lochee Road (BAM);
- Meadowside (BAM);
- Myrekirk Terrace (Osiris);
- Whitehall Street (BAM); and,
- Stannergate (Osiris).

Dundee City Council were successful in obtaining funding from the Scottish Government to establish two PM_{2.5} monitors in the city. It is intended that these will be located at the roadside site on Lochee Road and at the background site at Mains Loan during the 2017/18 financial year.

6.2 Conclusions relating to New Local Developments

The work being undertaken as part of CAFS to set up a city model of Dundee road traffic sources as part of the NMF was highlighted in the review of road traffic sources. The comprehensive traffic data collected as part of this process will provide a new baseline for review and assessment.

A new potential street canyon on Strathmartine Road was identified and modelled with no new exceedances predicted. DMRB assessments of new relevant receptors exposed to traffic pollution identified in the 2016 APR were undertaken and no new exceedance areas were identified.

There were no new 'other transport', industrial, commercial or domestic sources that required assessment. No existing industrial sources had substantially increased emissions, been altered significantly or had new relevant exposure introduced nearby. Funding was secured from the Scottish Government to investigate the potential fugitive sources of elevated PM₁₀ concentrations measured at the Stannergate Osiris. This work will be progressed during 2017/18.

6.3 Proposed Actions

The 2016 monitoring data did not identify the need to declare an AQMA for any additional pollutants or objectives. Continuous monitoring in Union Street was discontinued in January 2016 as the NO₂ annual mean concentrations were well below the objective for a number of years. The equipment from the Union Street monitoring station was relocated, the NO₂ analyser to the Broughty Ferry Road monitoring station and the PM₁₀ analyser has been installed in Whitehall Street. Neither of these analysers recorded a breach of the relevant air quality objectives during 2016. None of the new diffusion tubes deployed in 2016 identified a new area of exceedance, though the estimated NO₂ concentration at the nearest receptor to Nethergate (64) (DT213) was borderline. The following actions are proposed following the review and assessment of monitoring data and new developments:

- Take forward the installation of new analysers capable of monitoring PM₁₀ and PM_{2.5} at Lochee Road and Mains Loan;
- Report on the source characterisation and identification of fugitive emission sources at the Stannergate roundabout;

- Report on any new or significantly changed SEPA prescribed process;
- Provide update on the progress of the NMF model for Dundee;
- Report on the new diffusion tubes installed in 2017. Six diffusion tubes were installed in areas where new residential developments are planned close to busy roads and junctions in Dundee;
 - Muirton Road (2) (DT 222)
 - Harcourt Street (CCTV) (DT 221)
 - Seagate (99) (DT 217)
 - South Marketgait (Lampost 18) (DT 218)
 - Strathmartine Road (15) (DT 220)
 - Thomson Avenue (street sign) (DT 219)
- Monitor planning applications for new pollution sources, relevant exposure and creation of 'street canyons';
- Liaise with Transport Scotland as part of the NLEF process to discuss whether any additional actions are possible to reduce pollutant concentrations at relevant locations close to the trunk road network in Dundee;
- Consider whether specific action plan measures are possible to target the recently identified exceedance areas on the West Marketgait (part of the inner ring road);
- Implement the action plan measures being taken forward in 2017/18;
- Submit the next Air Quality Progress Report in 2018.

Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

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 ^b		6.63	2.97
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	2.24	1.15	1.77
					PM ₁₀		Beta Attenuation (BAM)			2.06
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		TEOM			1.98
CM 5	Seagate Romon	Roadside	340487	730446	NO ₂	Y	Chemiluminescent ^b	2	1.10	1.70
					PM ₁₀		Beta Attenuation (BAM)			2.06
CM 2	Union Street Rollalong ⁽³⁾	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	Whitehall Street Romon	Roadside	340278	730156	NO ₂	Y	Chemiluminescent ^b	1.86	3.26	1.80
					PM ₁₀		Beta Attenuation (BAM) ^a	1.79	3.33	2.06
CM 14	Meadowside Romon	Roadside	340243	730653	NO ₂	Y	Chemiluminescent ^d	0.42	1.60	2.26
					PM ₁₀		Beta Attenuation (BAM)		1.63	2.17

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 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 is model Thermo 42i
 - ^d Equipment is model ML 2041
- (3) CM 2 Union Street – was discontinued in January 2016

Figure A.1 Automatic Monitoring Sites 2016

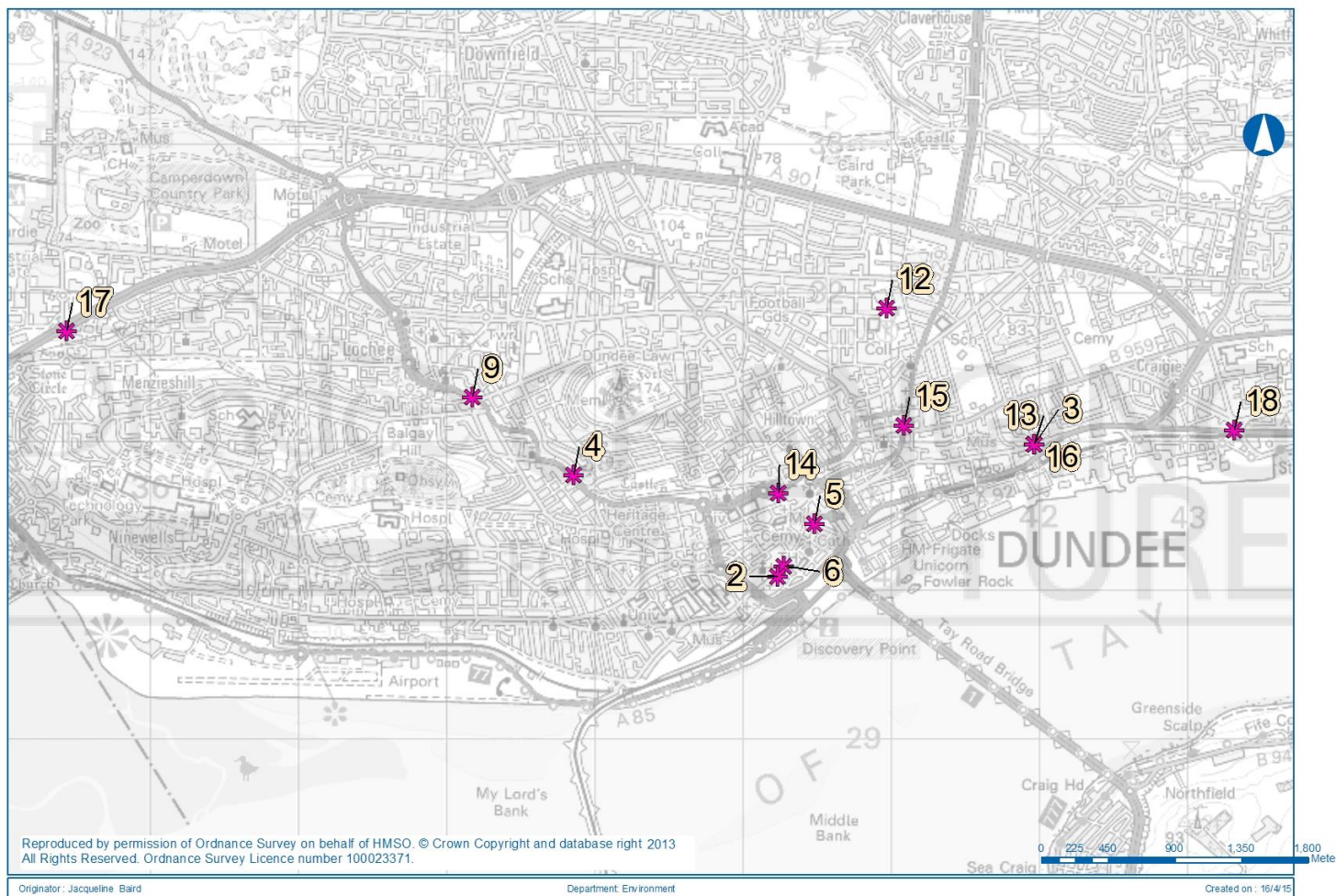


Table A.2 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type (1)	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ? (Y/N)	Monitoring Technique	Distance to Relevant Exposure ? (m) (2)	Distance to Kerb of Nearest Road (m) (3)	Tube collocated with a Continuous Analyser ?
DT 92	Abertay 2	R	340019	730612	NO ₂	Y	PDT	2.01	1.95	N
DT 179	Albert St (15) (Facade)	R	341092	731121	NO ₂	Y	PDT	0.25	2.04	N
DT 180	Albert St (15) (Rdside)	K	341091	731121	NO ₂	Y	PDT	1.75	0.54	N
DT 167	Albert St (191)	K	341161	731535	NO ₂	Y	PDT	2.70	0.62	N
DT 187	Albert St (81)	K	341113	731265	NO ₂	Y	PDT	2.95	0.47	N
DT 5	Arbroath Rd (13)	K	341111	731070	NO ₂	Y	PDT	2.52	0.73	N
DT 147	Arbroath Rd (38)	K	341202	731097	NO ₂	Y	PDT	2.97	0.50	N
DT 212	Arbroath Rd (89)	R	341440	731127	NO ₂	Y	PDT	0.32	1.78	N
DT 164	Broughty Ferry Rd - Lower	UB	343545	730942	NO ₂	Y	PDT	n/a	3.15	N
DT 204	Broughty Ferry Rd (129)	R	342244	731066	NO ₂	Y	PDT	3.57	2.27	N
DT 139	Broughty Ferry Rd (141 Downpipe)	R	343317	731072	NO ₂	Y	PDT	0.20	4.32	N
DT 145	Broughty Ferry Rd (Greendykes)	R	342662	731112	NO ₂	Y	PDT	7.72	4.10	N
DT 140	Broughty Ferry Rd (L/P 66)	R	343297	731096	NO ₂	Y	PDT	8.50	2.10	N
DT 7	Balgavies Place	UB	343082	731465	NO ₂	Y	PDT	n/a	n/a	N
DT 9	Birnam Place	UB	337531	730914	NO ₂	Y	PDT	n/a	n/a	N
DT 11	Broughty Ferry Rd (141)	R	343322	731073	NO ₂	Y	PDT	1.98	1.32	N
DT 155	Carolina Court LP6	UB	342353	731058	NO ₂	Y	PDT	n/a	n/a	N
DT 171	Claypotts / Arbroath Rd (502)	R	345347	732080	NO ₂	Y	PDT	5.3	11.2	N
DT 210	Cleghorn Street (57)	R	338860	730745	NO ₂	Y	PDT	0	4.37	N
DT 13	Cleington Rd/ Forfar Rd	K	341385	732121	NO ₂	Y	PDT	8.28	0.78	N
DT 188	Commercial St (9)	R	340544	730291	NO ₂	Y	PDT	2.44	2.57	N

Site ID	Site Name	Site Type (1)	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ? (Y/N)	Monitoring Technique	Distance to Relevant Exposure ? (m) (2)	Distance to Kerb of Nearest Road (m) (3)	Tube collocated with a Continuous Analyser ?
DT 84	Commercial St/Dock St (40)	R	340565	730263	NO ₂	Y	PDT	0.17	2.78	N
DT 192	Dock St (12)	R	340389	730079	NO ₂	Y	PDT	4.00	2.49	N
DT 85	Dock St (21)	R	340524	730216	NO ₂	Y	PDT	0.34	5.13	N
DT 156	Dock St (57)	R	340656	730343	NO ₂	Y	PDT	3.25	2.53	N
DT 206	Drumgeith Road (2)	R	343905	733027	NO ₂	Y	PDT	2.31	4.26	N
DT 20	Dura St (100)	K	341150	731576	NO ₂	Y	PDT	1.65	0.57	N
DT 214	East Dock Street (26)	R	340725	730417	NO ₂	Y	PDT	0.2	3.7	N
DT 22	Eastport Roundabout	R	340651	730623	NO ₂	Y	PDT	1.56	1.00	N
DT 211	Forfar Rd (83a)	R	341474	732519	NO ₂	Y	PDT	10.6	14.4	N
DT 83	Forfar Rd (104)	K	341437	732360	NO ₂	Y	PDT	7.68	0.67	N
DT 209	Hawkhill (251)	R	338917	729863	NO ₂	Y	PDT	0	3.66	N
DT 202	High St Lochee (22-24)	R	338062	731345	NO ₂	Y	PDT	0.05	2.29	N
DT 216	King Street (3)	K	340493	730659	NO ₂	Y	PDT	2.89	0.77	N
DT 26	Kingsway East Roundabout	R	343107	731740	NO ₂	Y	PDT	14.30	2.90	N
DT 27	Kingsway/ Mains Loan	R	341124	732468	NO ₂	Y	PDT	15.40	6.20	N
DT 177	Kingsway / Strathmartine Rd (279)	R	339179	732896	NO ₂	Y	PDT	3.63	3.14	N
DT 30	Lochee Rd (138)	K	338936	730680	NO ₂	Y	PDT	2.06	0.44	N
DT 31	Lochee Rd (140) Traffic Lts	R	338927	730685	NO ₂	Y	PDT	0.25	2.22	N
DT 32	Lochee Rd (184)	K	338767	730856	NO ₂	Y	PDT	3.19	0.73	N
DT 158	Lochee Rd (Romon) Average	R	338861	730773	NO ₂	Y	PDT	2.03	1.34	Y
DT 36	Lochee Rd/Polepark Rd	K	339016	730586	NO ₂	Y	PDT	9.21	0.95	N
DT 37	Logie St (114)	R	338184	731293	NO ₂	Y	PDT	0.53	1.73	N
DT 38	Logie St (98)	K	338252	731258	NO ₂	Y	PDT	n/a	0.84	N

Site ID	Site Name	Site Type (1)	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ? (Y/N)	Monitoring Technique	Distance to Relevant Exposure ? (m) (2)	Distance to Kerb of Nearest Road (m) (3)	Tube collocated with a Continuous Analyser ?
DT 39	Loons Rd (1)	R	338211	731293	NO ₂	Y	PDT	0.50	1.90	N
DT 182	Meadowside (28)	K	340298	730550	NO ₂	Y	PDT	2.95	0.80	N
DT 149	Meadowside (Romon) Average	R	340243	730653	NO ₂	Y	PDT	0.33	1.85	Y
DT 42	Muirton Rd (6)	R	338152	731293	NO ₂	Y	PDT	0.30	1.11	N
DT 185	Murraygate (46)	UB	340409	730484	NO ₂	Y	PDT	n/a	n/a	N
DT 189	Myrekirk Rd (29)	R	335420	731726	NO ₂	Y	PDT	5.17	2.00	N
DT 45	Nethergate (6)	R	340274	730171	NO ₂	Y	PDT	2.51	1.25	N
DT 47	Nethergate (40)	R	340230	730124	NO ₂	Y	PDT	2.72	1.26	N
DT 44	Nethergate (88)	K	340163	730061	NO ₂	Y	PDT	5.00	0.86	N
DT 213	Nethergate (64)	R	340196	730089	NO ₂	Y	PDT	2.4	4.15	N
DT 48	Nethergate(132) / Marketgait	R	340074	729984	NO ₂	Y	PDT	3.60	1.33	N
DT 46	Nethergate (95)	K	340033	729957	NO ₂	Y	PDT	1.84	0.86	N
DT 49	Rankine St (2)	R	338768	730900	NO ₂	Y	PDT	0.40	1.76	N
DT 207	Pitkerro Road (42)	R	341924	732235	NO ₂	Y	PDT	5.99	2.94	N
DT 50	Seagate (101)	R	340545	730532	NO ₂	Y	PDT	0.19	1.94	N
DT 54	Seagate (9)	R	340467	730388	NO ₂	Y	PDT	0.90	1.70	N
DT 190	Seagate (97)	R	340516	730499	NO ₂	Y	PDT	0	2.26	N
DT 159	Seagate(Romon) Average	R	340487	730446	NO ₂	Y	PDT	1.81	1.29	Y
DT 55	Soapwork Lane	R	340099	730650	NO ₂	Y	PDT	0	3.51	N
DT 151	South Rd (1 Denbank)	R	335188	731528	NO ₂	Y	PDT	0.28	1.79	N
DT 162	St Andrews St / Seagate (116)	R	340532	730548	NO ₂	Y	PDT	0.18	2.53	N
DT 56	St Andrews St (26)	K	340516	730584	NO ₂	Y	PDT	1.77	0.71	N
DT 208	St Ann Street (2)	R	337811	731462	NO ₂	Y	PDT	0	10.0	N

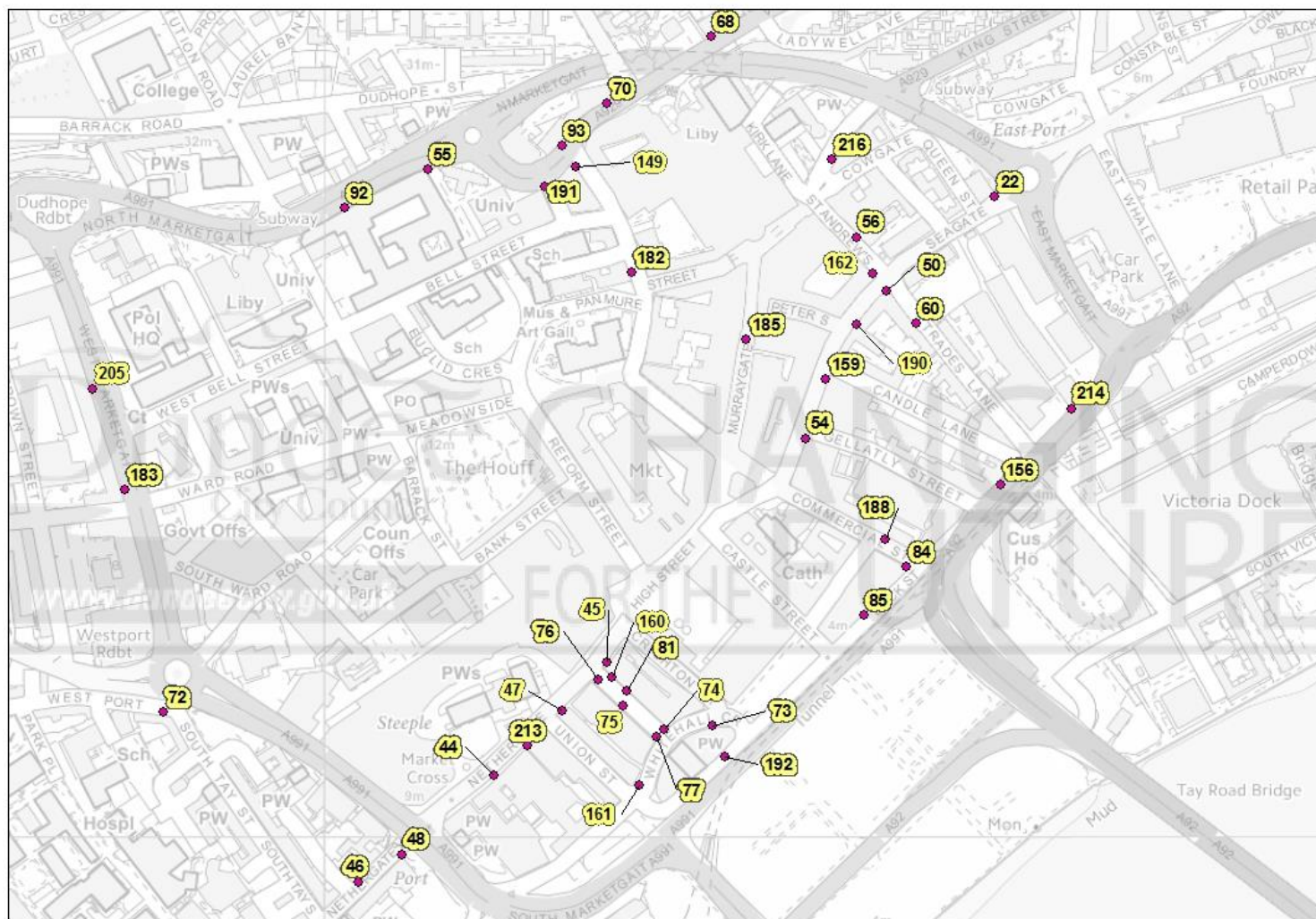
Site ID	Site Name	Site Type (1)	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA ? (Y/N)	Monitoring Technique	Distance to Relevant Exposure ? (m) (2)	Distance to Kerb of Nearest Road (m) (3)	Tube collocated with a Continuous Analyser ?
DT 59	Strathmore Avenue (353)	K	339609	731871	NO ₂	Y	PDT	1.45	0.67	N
DT 60	Trades Lane (31)	K	340575	730500	NO ₂	Y	PDT	1.82	0.44	N
DT 93	Victoria Rd (10b)	K	340230	730673	NO ₂	Y	PDT	2.70	0.30	N
DT 184	Victoria Rd (104) / William St	R	340697	730950	NO ₂	Y	PDT	1.50	1.36	N
DT 191	Victoria Rd (4) - India Buildings	R	340213	730633	NO ₂	Y	PDT	0	2.77	N
DT 68	Victoria Rd (60)	R	340375	730779	NO ₂	Y	PDT	0.56	2.18	N
DT 70	Victoria Rd/Hilltown	R	340274	730714	NO ₂	Y	PDT	2.01	1.15	N
DT 71	Victoria St/Albert St	K	341071	731072	NO ₂	Y	PDT	1.70	0.75	N
DT 205	West Marketgait/Old Mill (23)	R	339773	730436	NO ₂	Y	PDT	0.05	2.80	N
DT 183	West Marketgait / Guthrie St	R	339805	730338	NO ₂	Y	PDT	2.02	1.16	N
DT 72	Westport (2)	R	339842	730122	NO ₂	Y	PDT	2.50	0.46	N
DT 73	Whitehall Cr (4)	K	340376	730109	NO ₂	Y	PDT	3.00	0.88	N
DT 161	Whitehall Cr /Union St (50)	K	340305	730051	NO ₂	Y	PDT	4.78	0.64	N
DT 76	Whitehall St (1)	K	340265	730153	NO ₂	Y	PDT	5.57	0.88	N
DT 81	Whitehall St (12)	R	340293	730142	NO ₂	Y	PDT	2.67	3.00	N
DT 77	Whitehall St (15)	K	340322	730098	NO ₂	Y	PDT	4.55	0.75	N
DT 74	Whitehall St (40)	K	340330	730106	NO ₂	Y	PDT	3.57	0.78	N
DT 75	Whitehall St (5)	R	340289	730128	NO ₂	Y	PDT	3.17	2.51	N
DT 160	Whitehall St (Romon) Average	R	340278	730156	NO ₂	Y	PDT	1.66	3.49	Y
DT 82	Woodside Ave	UB	340776	732307	NO ₂	Y	PDT	n/a	0.55	N

Notes:

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

- (2) 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 representative of a residential area).
- (3) n/a if not applicable. 'Kerb' is taken as being the edge of the carriageway with flowing traffic

Figure A.2a NO₂ Diffusion Tube Locations (City Centre)



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Figure A.2b NO₂ Diffusion Tube Locations (East)

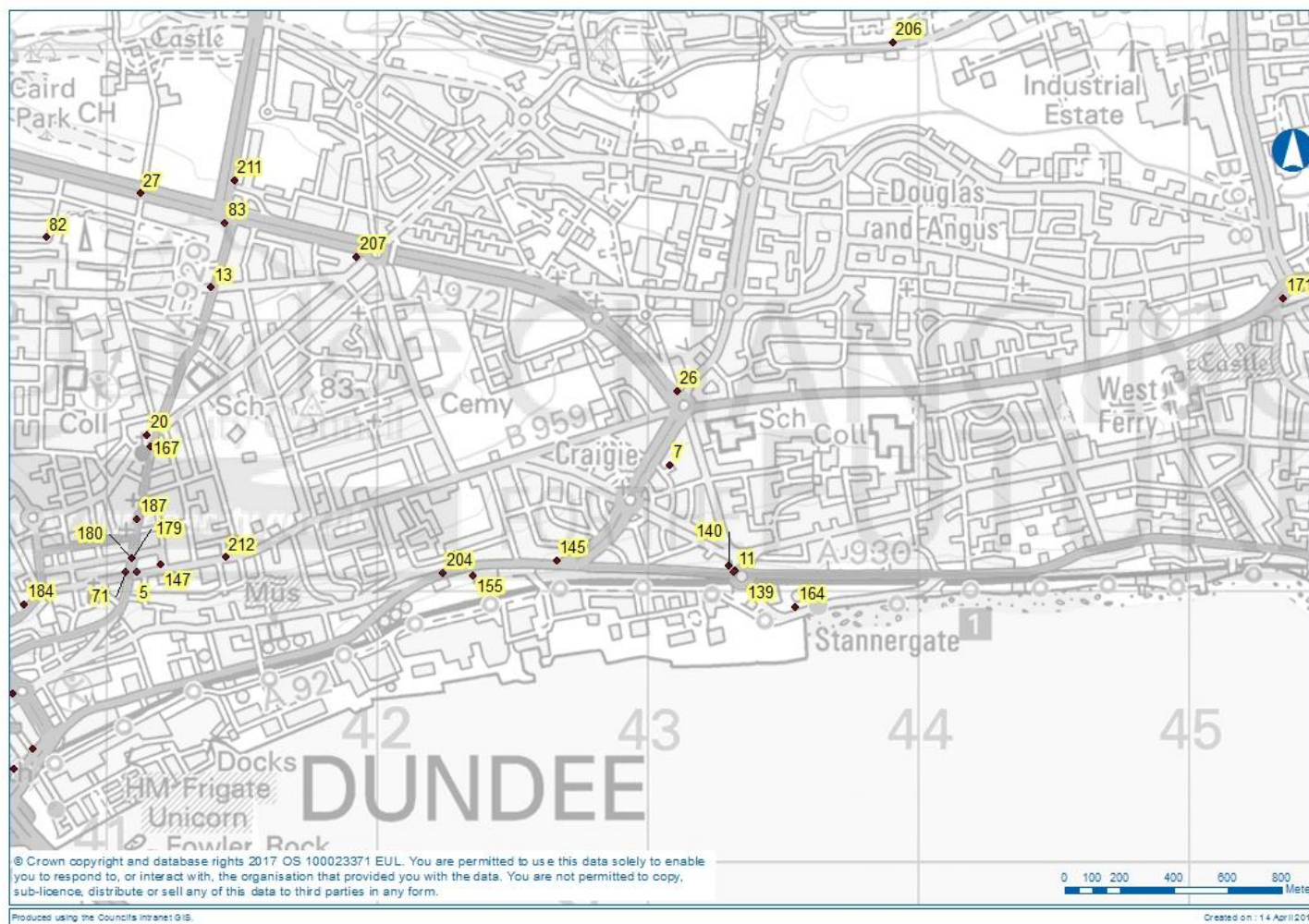


Figure A.2c NO₂ Diffusion Tube Locations (West)

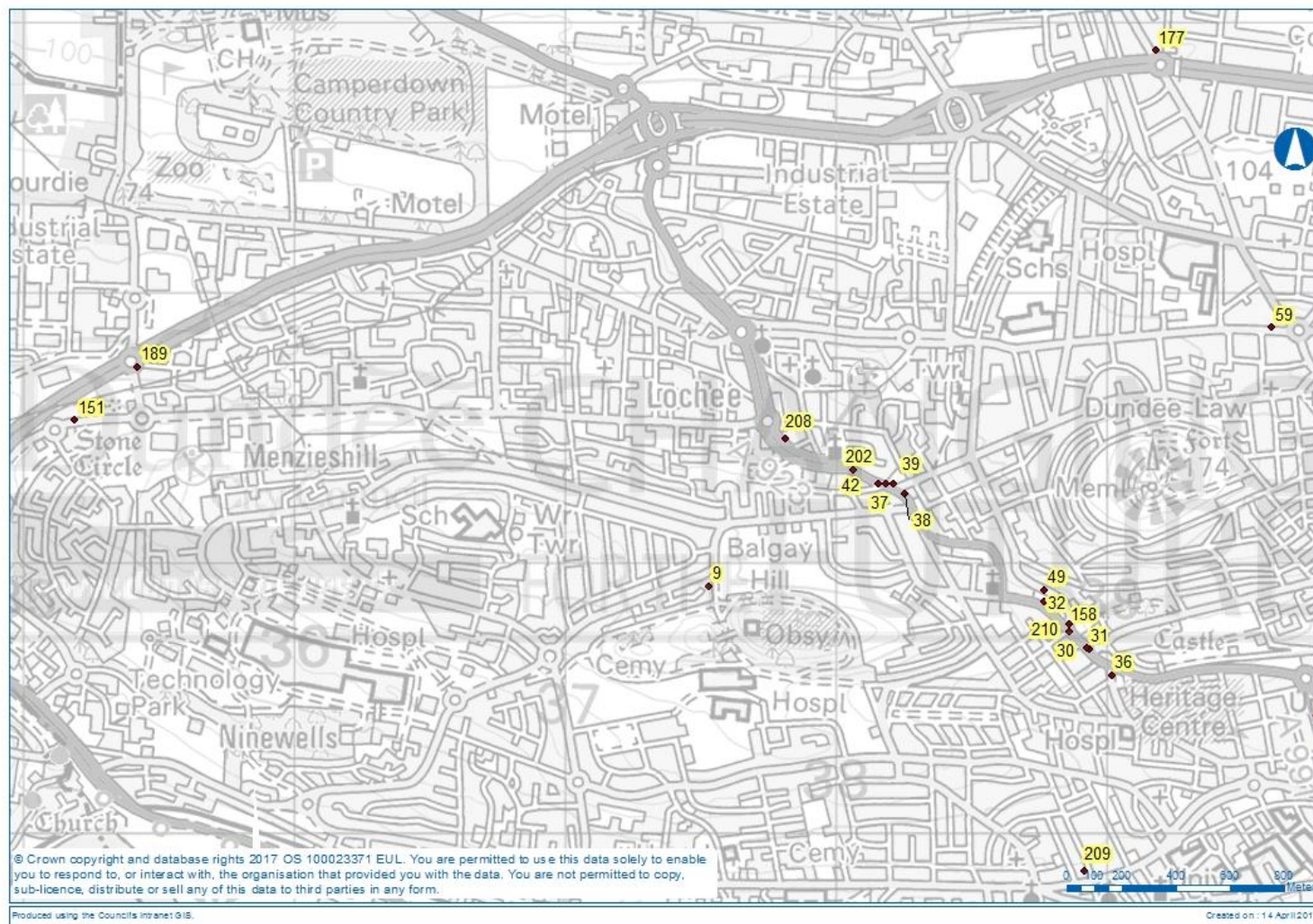


Table A.3 – Annual Mean NO₂ Monitoring Results

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
CM 3	Broughty Ferry Road	UI	Automatic	95.6					12.7
CM 4	Lochee Rd Romon	R	Automatic	98.0	52.9	51.6	45.8	47.8	44.6
CM 12	Mains Loan	UB	Automatic	65.3	9.8	11.5	12.4	10.3	11.4
CM 14	Meadowside Romon	R	Automatic	82.3	53.9	49.1	39.6	38.2	35.9
CM 5	Seagate	R	Automatic	99.2	47.6	55.0	54.5	49.9	47.0
CM 2	Union St Rollalong	R	Automatic		31.7	30.5	28.4	28.0	
CM 6	Whitehall St Romon	R	Automatic	96.1	44.4	41.2	42.5	36.3	37.2
DT 92	Abertay 2	R	PDT	100.0	41.5	40.2	39.7	36.3	38.5
DT 179	Albert St (15) (Facade)	R	PDT	100.0		36.5	36.5	33.4	33.7
DT 180	Albert St (15) (Rdside)	K	PDT	100.0		38.0	38.0	35.5	35.5
DT 167	Albert St (191)	K	PDT	100.0		36.5	35.0	31.2	33.5
DT 157	Albert St (71-73)	K	PDT		30.4				
DT 187	Albert St (81)	K	PDT	83.3		31.8	31.1	30.3	31.3
DT 2	Albert St (Fish)	K	PDT		31.7				
DT 3	Albert St (Shandon Place)	R	PDT		35.7				
DT 5	Arbroath Rd (13)	K	PDT	100.0	39.9	38.3	35.7	34.4	36.5
DT 168	Arbroath Rd (27)	R	PDT			34.1	32.4	29.5	
DT 147	Arbroath Rd (38)	K	PDT	91.7	39.4	37.6	34.3	33.7	35.0
DT 212	Arbroath Rd (89)	R	PDT	100.0					29.4
DT 6	Arthurstone Terrace (10)	K	PDT		22.3				
DT 7	Balgavies Place	UB	PDT	100.0	18.0	17.0	15.5	15.0	16.3
DT 8	Bank St/ Reform St	K	PDT		28.0				
DT 9	Birnam Place	UB	PDT	100.0	10.4	10.1	9.6	8.7	9.5
DT 140	Broughty Ferry Rd (L/P 66)	R	PDT	100.0	35.4	31.8	30.6	32.0	33.1

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
DT 164	Broughty Ferry Rd - Lower	UB	PDT	100.0	16.7	15.6	14.9	14.9	14.9
DT 204	Broughty Ferry Rd (129)	R	PDT	100.0				38.3	36.0
DT 139	Broughty Ferry Rd (141 Downpipe)	R	PDT	100.0	37.4	32.4	31.1	32.3	33.3
DT 11	Broughty Ferry Rd (141)	R	PDT	83.3	44.2	39.9	36.5	35.4	40.4
DT 142	Broughty Ferry Rd (141) (St.Sign)	R	PDT		32.2	30.4	29.5	27.6	
DT 145	Broughty Ferry Rd (Greendykes)	R	PDT	100.0	36.2	36.4	34.3	31.8	35.0
DT 166	Broughty Ferry Rd LP 59(2)	R	PDT		26.1	25.6	24.0	21.1	
DT 186	Carolina Court 30 mph sign	R	PDT			28.6	25.0		
DT 155	Carolina Court LP6	UB	PDT	100.0	22.5	21.6	19.4	18.6	19.1
DT 171	Claypotts / Arbroath Rd (502)	R	PDT	100.0		28.6			26.6
DT 12	Claypotts Junction	R	PDT		26.5				
DT 210	Cleghorn Street (57)	R	PDT	100.0					27.1
DT 174	Cleington Rd (172)	K	PDT			31.4			
DT 13	Cleington Rd/ Forfar Rd	K	PDT	100.0	38.0	36.4	33.6	36.5	31.8
DT 14	Commercial St	K	PDT		29.9				
DT 188	Commercial St (9)	R	PDT	91.7		43.1	39.4	35.6	37.4
DT 15	Commercial St (Waterstones)	R	PDT		39.5				
DT 84	Commercial St/Dock St (40)	R	PDT	100.0	41.2	40.1	35.9	36.4	34.8
DT 175	Coupar Angus Rd (38)	R	PDT			32.9	29.8		
DT 203	Coupar Angus Rd/Sinclair St	R	PDT					23.1	
DT 16	Crichton St	K	PDT		31.6				
DT 17	Dens Rd Crossing	R	PDT		32.8	32.1			
DT 148	Dock St - Tay Hotel	K	PDT		32.9				
DT 192	Dock St (12)	R	PDT	100.0			25.8	25.9	26.1
DT 18	Dock St (14)	K	PDT		33.1				

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
DT 85	Dock St (21)	R	PDT	91.7	40.8	42.6	38.2	37.4	37.6
DT 156	Dock St (57)	R	PDT	100.0	53.1	53.9	51.7	51.4	49.3
DT 206	Drumgeith Road (2)	R	PDT	100.0					18.4
DT 20	Dura St (100)	K	PDT	100.0	39.6	36.9	34.4	34.9	37.5
DT 169	Dura St (30)	R	PDT			29.6			
DT 21	Earl Grey Place (Park)	UB	PDT		22.8				
DT 214	East Dock Street (26)	R	PDT	100.0					34.7
DT 22	Eastport Roundabout	R	PDT	100.0	32.0	35.2	32.9	30.7	31.7
DT 211	Forfar Rd (83a)	R	PDT	91.7					31.3
DT 83	Forfar Rd (104)	K	PDT	100.0	50.2	45.9	44.8	45.1	46.3
DT 23	Harefield Rd (35)	K	PDT		29.8				
DT 209	Hawkhill (251)	R	PDT	100.0					21.4
DT 178	Hawkhill / Horsewater Wynd	K	PDT			29.6			
DT 154	High St Lochee (106)	R	PDT		23.2				
DT 202	High St Lochee (22-24)	R	PDT	100.0				31.6	30.2
DT 24	Hilltown (Suites)	R	PDT		32.4				
DT 193	Horsewater Wynd	K	PDT				21.9		
DT 216	King Street (3)	K	PDT	100.0					30.9
DT 25	King St (12 & 14)	K	PDT		27.2				
DT 177	Kingsway / Strathmartine Rd (279)	R	PDT	100.0		38.3	36.8	36.2	34.8
DT 26	Kingsway East Roundabout	R	PDT	100.0	40.3	39.5	38.8	36.1	37.2
DT 27	Kingsway/ Mains Loan	R	PDT	91.7	34.4	36.4	32.0	29.3	31.5
DT 29	Kingsway/ Strathmartine Rd (S)	K	PDT		45.9				
DT 30	Lochee Rd (138)	K	PDT	100.0	53.4	51.2	49.6	49.6	48.9
DT 31	Lochee Rd (140) Traffic Lts	R	PDT	100.0	54.8	52.8	51.1	50.3	53.0

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
DT 32	Lochee Rd (184)	K	PDT	100.0	37.6	36.1	34.4	36.2	35.1
DT 158	Lochee Rd (Romon) Average	K	PDT	100.0	48.7	44.4	43.1	44.8	43.8
DT 36	Lochee Rd/Polepark Rd	K	PDT	100.0	31.8	29.6	28.9	28.1	27.6
DT 37	Logie St (114)	R	PDT	100.0	54.6	54.8	51.7	51.0	53.8
DT 38	Logie St (98)	K	PDT	100.0	34.5	37.5	33.1	32.3	34.3
DT 176	Logie St / Grays Lane	R	PDT			24.1			
DT 39	Loons Rd (1)	R	PDT	100.0	42.0	40.3	39.1	35.6	38.6
DT 146	Mains Loan Average	UB	PDT		15.0				
DT 40	Marketgait	R	PDT		31.1				
DT 41	Meadowside	R	PDT		59.0				
DT 182	Meadowside (28)	K	PDT	91.7		38.4	34.7	37.1	35.9
DT 149	Meadowside (Romon) Average	R	PDT	100.0	56.9	49.9	43.7	41.2	41.0
DT 163	Meadowside / Bell St	K	PDT		49.1				
DT 170	Monifieth Rd (4)	R	PDT			25.2			
DT 42	Muirton Rd (6)	R	PDT	100.0	27.2	30.0	29.2	25.0	26.6
DT 185	Murraygate (46)	UB	PDT	75.0		25.9	23.9	21.4	21.2
DT 43	Myrekirk Rd	K	PDT		34.2				
DT 189	Myrekirk Rd (29)	R	PDT	91.7		34.8	31.7	32.2	33.7
DT 181	Myrekirk Terrace (8)	R	PDT			30.4	27.6		
DT 47	Nethergate (40)	R	PDT	100.0	42.5	45.0	42.8	37.4	35.4
DT 45	Nethergate (6)	R	PDT	100.0	42.3	41.7	40.4	38.2	36.8
DT 213	Nethergate (64)	R	PDT	100.0					38.4
DT 44	Nethergate (88)	K	PDT	91.7	50.2	48.4	50.9	42.7	41.9
DT 46	Nethergate (95)	K	PDT	91.7	35.9	34.3	32.2	31.0	30.5
DT 48	Nethergate(132) / Marketgait	R	PDT	100.0	33.5	32.5	29.3	28.6	29.9

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
DT 87	Nethergate/South Tay St	R	PDT		24.5				
DT 173	Old Glamis Rd(9) / Balgray St	K	PDT			24.3			
DT 91	Perth Rd (320)	K	PDT		36.3	37.1	35.1	34.0	
DT 172	Pitkerro Rd (3)	R	PDT			29.6			
DT 207	Pitkerro Road (42)	R	PDT	100.0					32.6
DT 88	Queen St B/F	R	PDT		27.7				
DT 49	Rankine St (2)	R	PDT	100.0	44.4	40.1	38.1	40.2	36.5
DT 50	Seagate (101)	R	PDT	91.7	39.4	41.9	40.8	39.6	38.7
DT 54	Seagate (9)	R	PDT	100.0	38.4	38.1	36.0	32.8	33.2
DT 150	Seagate (95-97)	R	PDT		51.4	40.7			
DT 190	Seagate (97)	R	PDT	91.7		59.4	46.5	44.6	41.8
DT 159	Seagate(Romon) Average	K	PDT	100.0	49.2	48.0	45.5	42.3	41.3
DT 55	Soapwork Lane	R	PDT	91.7	34.8	34.7	31.9	32.0	35.4
DT 151	South Rd (1 Denbank)	R	PDT	100.0	36.9	34.7	33.2	32.5	33.4
DT 162	St Andrews St / Seagate (116)	R	PDT	100.0	38.8	37.3	36.3	34.9	35.1
DT 56	St Andrews St (26)	K	PDT	100.0	36.2	36.4	35.3	28.9	30.9
DT 208	St Ann Street (2)	R	PDT	100.0					18.3
DT 153	Strathmore Ave - Ped X	R	PDT		29.4				
DT 152	Strathmore Avenue (337)	K	PDT		35.0				
DT 59	Strathmore Avenue (353)	K	PDT	100.0	38.8	38.0	38.8	35.9	39.4
DT 60	Trades Lane (31)	K	PDT	100.0	30.4	31.4	27.3	27.7	27.4
DT 61	Union St (Rollalong) Average	R	PDT		34.6	34.8	32.0	32.4	
DT 66	Victoria Rd	R	PDT		34.2				
DT 184	Victoria Rd (104) / William St	R	PDT	100.0		33.3	30.7	27.3	29.7
DT 93	Victoria Rd (10b)	K	PDT	100.0	36.2	34.0	30.6	29.3	31.7

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
DT 191	Victoria Rd (4) - India Buildings	R	PDT	100.0		32.7	31.8	29.7	30.2
DT 68	Victoria Rd (60)	R	PDT	100.0	42.2	39.8	37.5	34.9	34.7
DT 69	Victoria Rd / Cotton Rd	K	PDT		36.7				
DT 70	Victoria Rd/Hilltown	R	PDT	100.0	57.9	56.1	51.5	54.1	50.8
DT 71	Victoria St/Albert St	K	PDT	100.0	34.8	32.2	30.0	27.6	30.9
DT 90	Ward Rd	R	PDT		30.2	30.3			
DT 95	West Marketgait	K	PDT		37.2				
DT 183	West Marketgait / Guthrie St	R	PDT	83.3		50.7	46.1	46.8	46.1
DT 205	West Marketgait/Old Mill (23)	R	PDT	100.0				54.0	51.6
DT 72	Westport (2)	R	PDT	100.0	37.7	39.0	36.3	33.0	31.2
DT 73	Whitehall Cr (4)	K	PDT	100.0	37.6	39.4	36.3	35.6	33.7
DT 161	Whitehall Cr /Union St (50)	K	PDT	100.0	29.8	30.4	30.5	25.0	24.9
DT 76	Whitehall St (1)	K	PDT	100.0	47.3	49.9	45.9	44.1	43.0
DT 81	Whitehall St (12)	R	PDT	100.0	39.6	41.8	40.8	34.5	35.0
DT 77	Whitehall St (15)	K	PDT	100.0	37.9	40.7	36.1	32.5	32.3
DT 74	Whitehall St (40)	K	PDT	100.0	39.7	39.7	39.5	35.6	35.2
DT 75	Whitehall St (5)	R	PDT	100.0	49.5	46.7	44.1	44.2	40.1
DT 160	Whitehall St (Romon) Average	R	PDT	100.0	41.6	43.1	42.2	36.5	36.6
DT 82	Woodside Ave	UB	PDT	100.0	16.2	15.4	14.9	13.2	13.7

Notes:

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

NO₂ annual means exceeding 60µg/m³, indicating a potential exceedance of the NO₂ 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.

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

Figure A.3a Trends in NO₂ at Automatic monitors

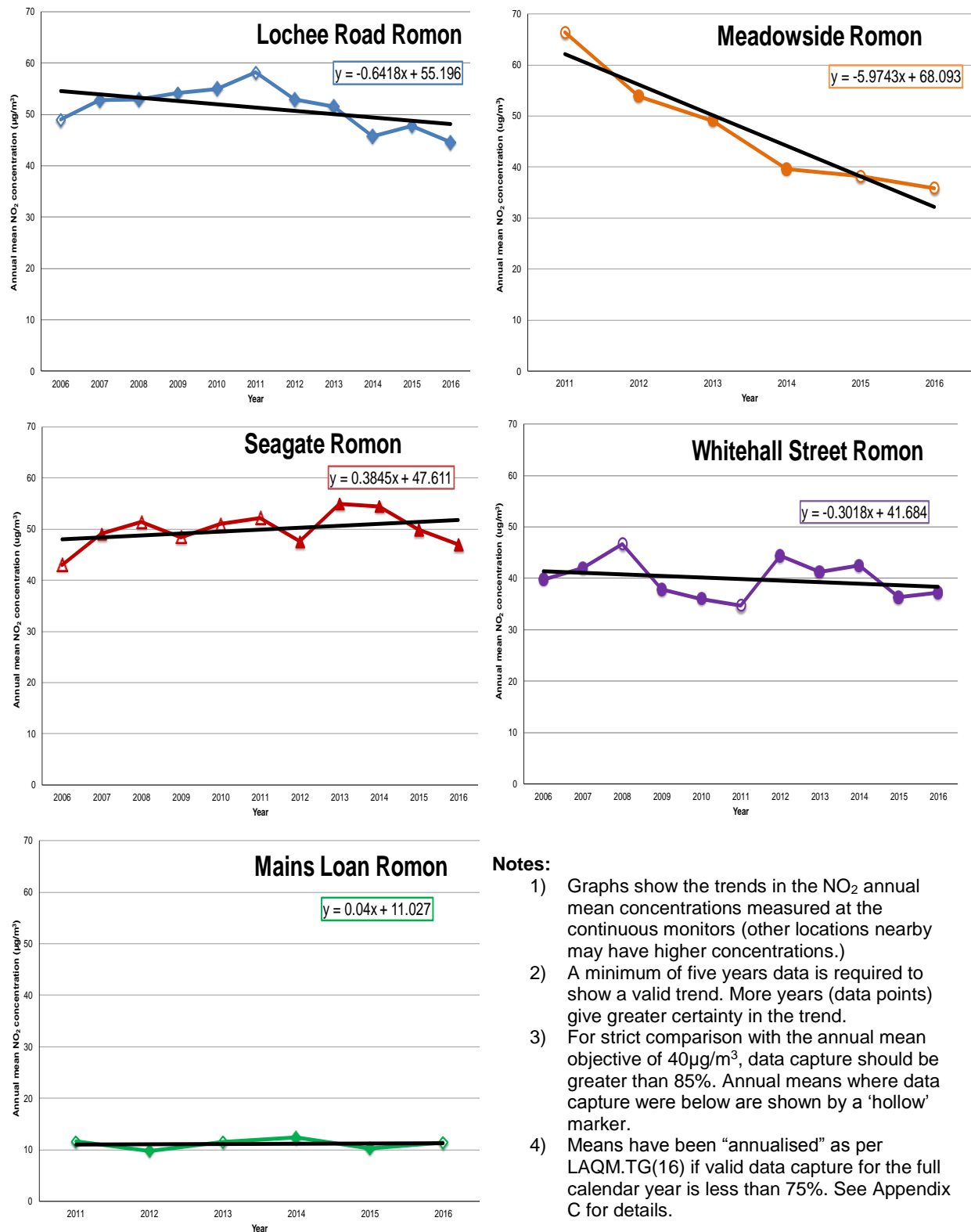


Figure A.3b Trend Analysis at Long-term NO₂ Monitoring Locations

Site Id.	Location	Site Type	No. of years for trend	Trend
CM 14	Meadowside Romon	R	6	-5.97
DT 149	Meadowside (Romon) Average	R	6	-3.71
DT 161	Whitehall Cr /Union St (50)	K	5	-1.51
DT 93	Victoria Rd (10b)	K	8	-1.20
DT 92	Abertay 2	R	8	-1.13
DT 155	Carolina Court LP6	UB	5	-0.99
DT 162	St Andrews St PB (façade)	R	5	-0.99
DT 139	Broughty Ferry Rd (141 Downpipe)	R	6	-0.92
DT 46	Nethergate (95)	K	11	-0.74
CM 4	Lochee Rd Romon	R	11	-0.65
DT 60	Trades Lane (31)	K	11	-0.60
DT 151	South Rd (1 Denbank)	R	6	-0.59
DT 147	Arbroath Rd (38)	K	6	-0.54
DT 72	Westport (2)	R	11	-0.51
DT 54	Seagate (9)	R	11	-0.50
DT 71	Victoria St/Albert St	K	11	-0.50
DT 140	Broughty Ferry Rd (L/P 66)	R	6	-0.49
DT 68	Victoria Rd (60)	R	11	-0.48
DT 48	Nethergate(132) / Marketgait	R	11	-0.48
DT 75	Whitehall St (5)	R	11	-0.47
DT 56	St Andrews St (26)	K	11	-0.45
DT 159	Seagate(Romon) Average	K	11	-0.44
DT 5	Arbroath Rd (13)	K	11	-0.43
DT 164	Broughty Ferry Rd - Lower	UB	5	-0.43
DT 82	Woodside Ave	UB	11	-0.42
DT 50	Seagate (101)	R	11	-0.33
DT 11	Broughty Ferry Rd (141)	R	11	-0.33
DT 20	Dura St (100)	K	11	-0.33
DT 84	Commercial St/Dock St (40)	R	11	-0.32
DT 13	Cleington Rd/ Forfar Rd	K	11	-0.32
DT 158	Lochee Rd (Romon) Average	K	11	-0.31
DT 30	Lochee Rd (138)	K	11	-0.30
CM 6	Whitehall St Romon	R	11	-0.30
DT 39	Loons Rd (1)	R	11	-0.27
DT 27	Kingsway/ Mains Loan	R	11	-0.26
DT 36	Lochee Rd/Polepark Rd	K	11	-0.25
DT 70	Victoria Rd/Hilltown	R	11	-0.24
DT 22	Eastport Roundabout	R	11	-0.22
DT 77	Whitehall St (15)	K	11	-0.20
DT 26	Kingsway East Roundabout	R	11	-0.20
DT 7	Balgavies Place	UB	11	-0.18
DT 9	Birnam Place	UB	11	-0.16
DT 32	Lochee Rd (184)	K	11	-0.15
DT 81	Whitehall St (12)	R	11	-0.14
DT 42	Muirton Rd (6)	R	11	-0.14
DT 145	Broughty Ferry Rd (Greendykes)	R	6	-0.10
DT 59	Strathmore Avenue (353)	K	11	-0.03
DT 31	Lochee Rd (140) Traffic Lts	R	11	-0.03
DT 38	Logie St (98)	K	11	-0.02
DT 83	Forfar Rd (104)	K	11	-0.01
DT 47	Nethergate (40)	R	11	0.00
DT 55	Soapwork Lane	R	11	0.00
DT 49	Rankine St (2)	R	11	0.01
DT 45	Nethergate (6)	R	11	0.03
DT 37	Logie St (114)	R	11	0.03
CM 12	Mains Loan Romon	UB	6	0.04
DT 44	Nethergate (88)	K	11	0.14
DT 85	Dock St (21)	R	11	0.17
DT 160	Whitehall St (Romon) Average	R	11	0.19
DT 76	Whitehall St (1)	K	11	0.21
DT 74	Whitehall St (40)	K	11	0.26
CM 5	Seagate Romon	R	11	0.38
DT 156	Dock St (57)	R	6	0.63
DT 73	Whitehall Cr (4)	K	11	0.88

Note: (1) Locations where the 2016 NO₂ annual mean is exceeded at the monitor are shown in **bold**, borderline locations are **orange**
 (2) Blue is an improving trend, red is a worsening trend
 (3) Methodology explained after **Figure A.5c**

Table A.4 – 1-Hour Mean NO₂ Monitoring Results

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2016 (%) ⁽²⁾	NO ₂ 1-Hour Means > 200µg/m ³ ⁽³⁾				
					2012	2013	2014	2015	2016
CM3	Broughty Ferry Rd	UI	Automatic	95.6	n/a	n/a	n/a	n/a	0
CM4	Lochee Rd Romon	R	Automatic	98.0	36	99	0	0	4
CM12	Mains Loan	UB	Automatic	65.3	0	0 (84.8)	0	0	0 (77.2)
CM14	Meadowside Romon	R	Automatic	82.3	0	0	0	0 (109.5)	0 (102.4)
CM5	Seagate	R	Automatic	99.2	0	10	0	0	0
CM2	Union St Rollalong	R	Automatic	n/a	0 (98.5)	0	0	0	n/a
CM6	Whitehall St Romon	R	Automatic	96.1	0	0	0	0	0

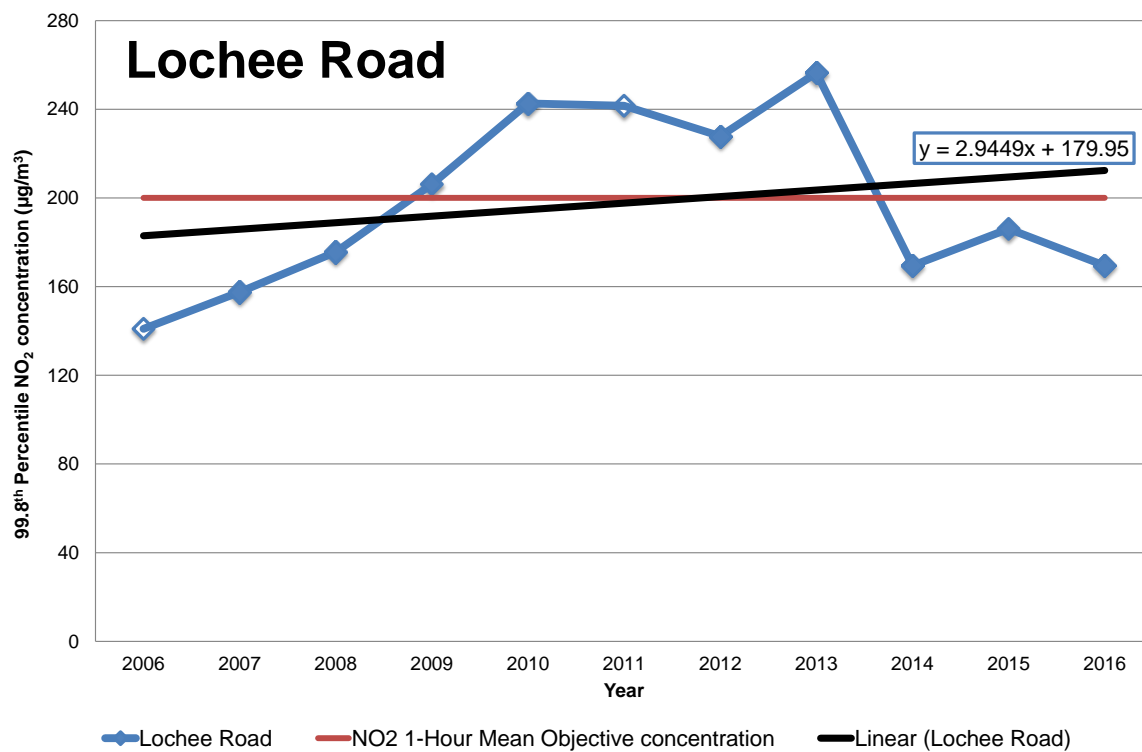
Notes: Exceedances of the NO₂ 1-hour mean objective (200µg/m³ not to be exceeded more than 18 times/year) are shown in **bold**.

(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 99.8th percentile of 1-hour means is provided in brackets (and shaded grey).

Figure A.4 Trend in 99.8th percentile of hourly mean NO₂ concentrations at Lochee Road



Note: Hollow data points indicate those years when the valid data capture was less than 85%

Table A.5 – Annual Mean PM₁₀ Monitoring Results

Site ID	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2016 (%) ⁽²⁾	PM ₁₀ Annual Mean Concentration (µg/m ³) ⁽³⁾				
					2012	2013	2014	2015	2016
CM 2	Union St (TEOM/BAM)	R	Automatic	n/a	15.5	15.1	16.5	16.8	n/a
CM 7	Union St (Osiris)	R	Automatic	n/a	15.5	n/a	n/a	n/a	n/a
CM 6	Whitehall Street (BAM)	R	Automatic	85.8	n/a	n/a	n/a	n/a	15.1
CM 3	Broughty Ferry Rd (TEOM)	UI	Automatic	90.4	14.2	15.9	14.7	12.6	12.1
CM 13	Broughty Ferry Rd (Partisol)	UI	Automatic	92.3	14.3	15.1	14.5	12.6	11.5
CM 16	Broughty Ferry Rd (Osiris)	UI	Automatic	85.0	13.4	15.0	14.6	12.1	11.5
CM 12	Mains Loan (TEOM)	UB	Automatic	67.1	11.4	11.9	12.9	11.9	10.0
CM 5	Seagate (BAM)	R	Automatic	86.5	14.1	16.0	17.7	14.5	13.7
CM 10	Seagate (Osiris)	K	Automatic	n/a	20.6	n/a	n/a	n/a	n/a
CM 14	Meadowside (BAM)	R	Automatic	93.9	18.6	18.6	16.6	16.1	16.4
CM 11	Victoria Rd (Osiris)	K	Automatic	n/a	15.5	n/a	n/a	n/a	n/a
CM 4	Lochee Rd (BAM)	R	Automatic	98.3	16.5	17.9	18.6	19.8	18.9
CM 8	Lochee Rd (Osiris)	K	Automatic	n/a	18.3	n/a	n/a	n/a	n/a
CM 9	Logie St (Osiris)	K	Automatic	38.8	18.0	16.5	16.1	15.5	13.8
CM 17	Myrekirk Tce (Osiris)	R	Automatic	90.2	16.1	15.5	18.3	18.4	15.6
CM 15	Albert St (Osiris)	K	Automatic	90.2	16.8	18.3	21.4	19.0	15.4
CM 18	Stannergate (Osiris)	R	Automatic	87.4	19.9	24.6	26.7	26.9	20.8

Notes: (1) Exceedances of the PM₁₀ annual mean objective of 18µg/m³ are shown in bold (borderline values are orange).
(2) R=Roadside, K=Kerbside, UB=Urban Background, UI=Urban Industrial
(3) 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%).
(4) All means have been “annualised” as per LAQM.TG(16) if valid data capture for the full calendar year is less than 75% (highlighted by shading). See Appendix C for details.

Figure A.5a Trends in Annual Mean PM₁₀ concentrations at Automatic monitors

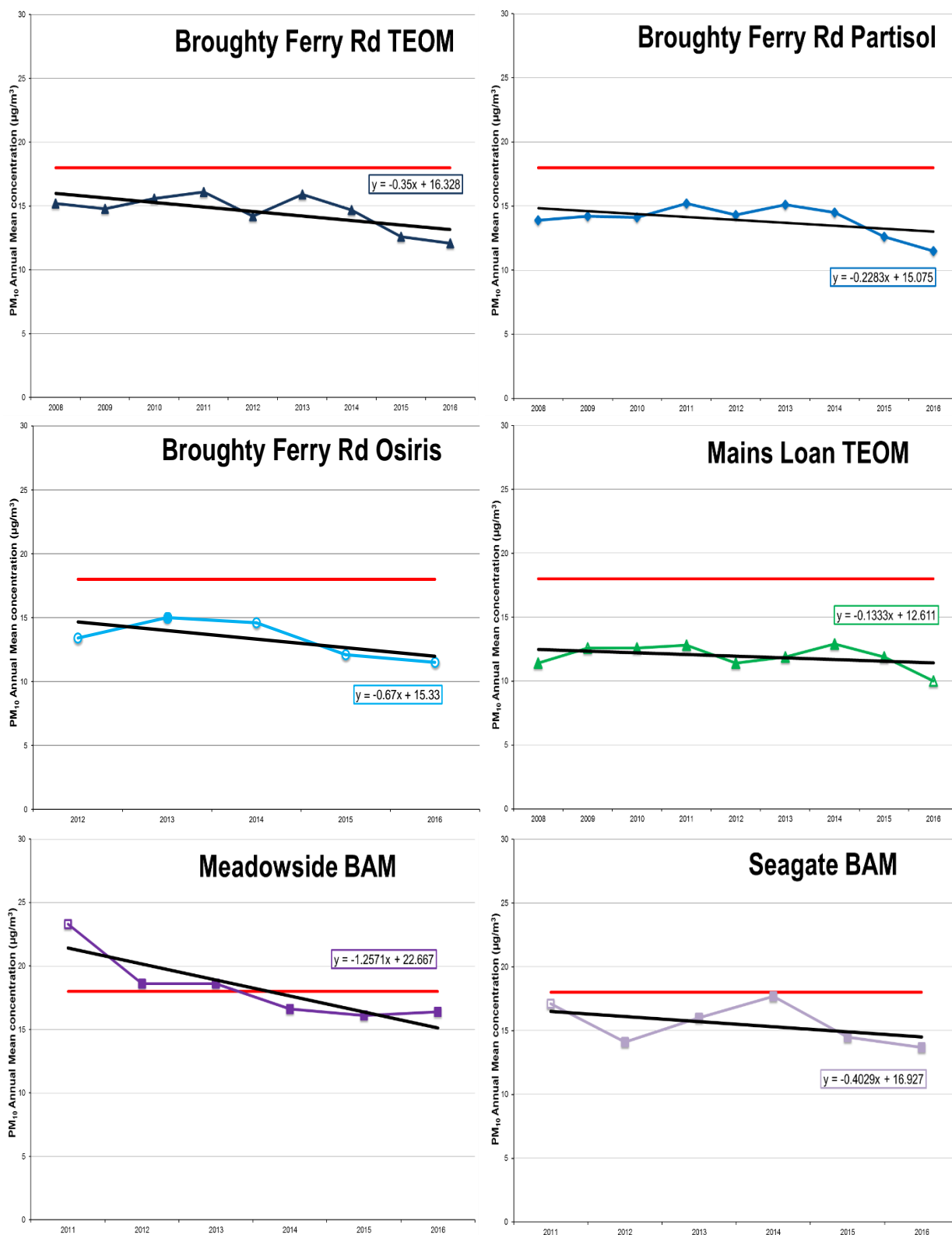


Figure A5.b Trends in Annual Mean PM₁₀ concentrations at Automatic monitors



Figure A5.c Trend analysis of PM₁₀ annual means at long term monitoring sites

Site Id.	Location	No. of years for trend	Trend
CM 14	Meadowside (BAM)	6	-1.257
CM 16	Broughty Ferry Rd (Osiris)	5	-0.670
CM 9	Logie St (Osiris)	9	-0.647
CM 5	Seagate (BAM)	6	-0.403
CM 3	Broughty Ferry Rd (TEOM)	9	-0.350
CM 13	Broughty Ferry Rd (Partisol)	9	-0.228
CM 15	Albert St (Osiris)	5	-0.210
CM 12	Mains Loan (TEOM)	9	-0.133
CM 17	Myrekirk Tce (Osiris)	5	0.190
CM 4	Lochee Rd (BAM)	6	0.231
CM 18	Stannergate (Osiris)	5	0.410

Notes: (1) Locations where the 2016 PM₁₀ annual mean is exceeded are shown in **bold**, borderline locations are **orange**
(2) Blue is an improving trend, red a worsening trend.

Explanation of Methodology for **Figures A.3b** and **A.5c** have 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.

Table A.6 – 24-Hour Mean PM₁₀ Monitoring Results

Site ID.	Site Name	Site Type ⁽¹⁾	Monitoring Type	Valid Data Capture 2016 (%) ⁽²⁾	PM ₁₀ 24-Hour Means > 50µg/m ³ ⁽³⁾				
					2012	2013	2014	2015	2016
CM 2	Union St (TEOM/BAM)	R	Automatic	n/a	2 (36.3)	1	2	7	n/a
CM 7	Union St (Osiris)	R	Automatic	n/a	2 (42.3)	n/a	n/a	n/a	n/a
CM 6	Whitehall Street (BAM)	R	Automatic	85.2	n/a	n/a	n/a	n/a	1
CM 3	Broughty Ferry Rd (TEOM)	UI	Automatic	89.3	2	3	1	2	0
CM 13	Broughty Ferry Rd (Partisol)	UI	Automatic	92.3	3	2	1	0	0
CM 16	Broughty Ferry Rd (Osiris)	UI	Automatic	85.0	0 (30.5)	4	3 (40.7)	2 (35.4)	1 (26.2)
CM 12	Mains Loan (TEOM)	UB	Automatic	68.0	1	1	1	1	0 (27.5)
CM 5	Seagate (BAM)	R	Automatic	86.6	1	4	3	3	0
CM 10	Seagate (Osiris)	K	Automatic	n/a	13 (59.5)	n/a	n/a	n/a	n/a
CM 14	Meadowside (BAM)	R	Automatic	92.9	4	4	2	4	3
CM 11	Victoria Rd (Osiris)	K	Automatic	n/a	3 (48.0)	n/a	n/a	n/a	n/a
CM 4	Lochee Rd (BAM)	R	Automatic	99.2	3	3	1	5	2
CM 8	Lochee Rd (Osiris)	K	Automatic	n/a	6 (50.7)	n/a	n/a	n/a	n/a
CM 9	Logie St (Osiris)	K	Automatic	38.8	5	2	2	4 (39.2)	0 (28.6)
CM 17	Myrekirk Tce (Osiris)	R	Automatic	90.2	0 (30.1)	2	3	7 (54.2)	1
CM 15	Albert St (Osiris)	K	Automatic	90.2	2 (43.3)	7	14	8 (63.9)	2
CM 18	Stannergate (Osiris)	R	Automatic	87.4	0 (35.9)	9 (54.1)	16	15 (72.3)	4

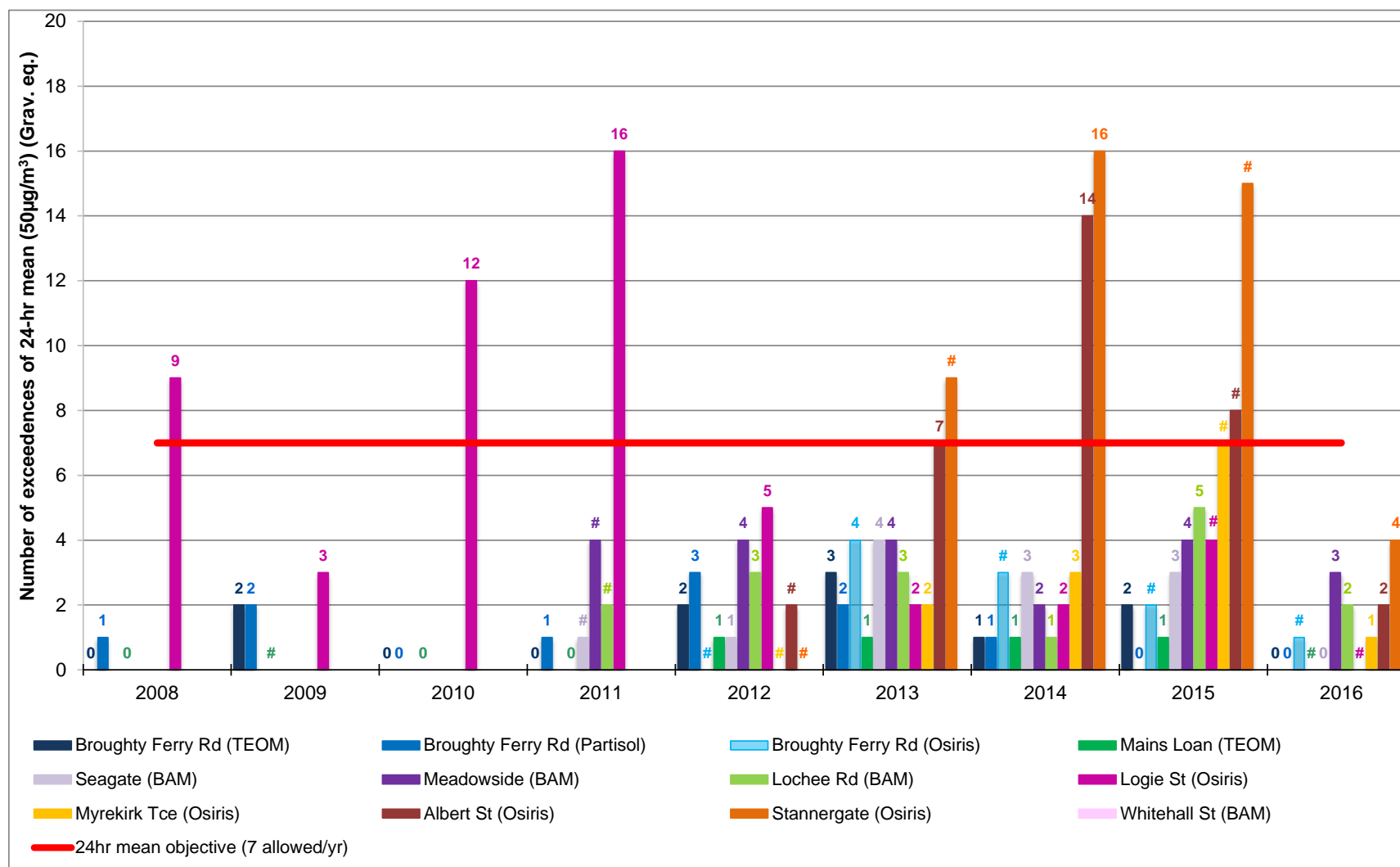
Notes: Exceedances of the PM₁₀ 24-hour mean objective (50µg/m³ not to be exceeded more than 7 times/year) are shown in **bold**.

(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 A.6a Frequency of Exceedances of PM₁₀ 24 hour Mean Objective (50µg/m³, 7 allowed) 2008-2016



Note: # denotes that the actual number of exceedances is unknown as the data capture was less than 85%

Figure A6.b Trends in 98.08th percentile PM₁₀ concentrations at Automatic monitors

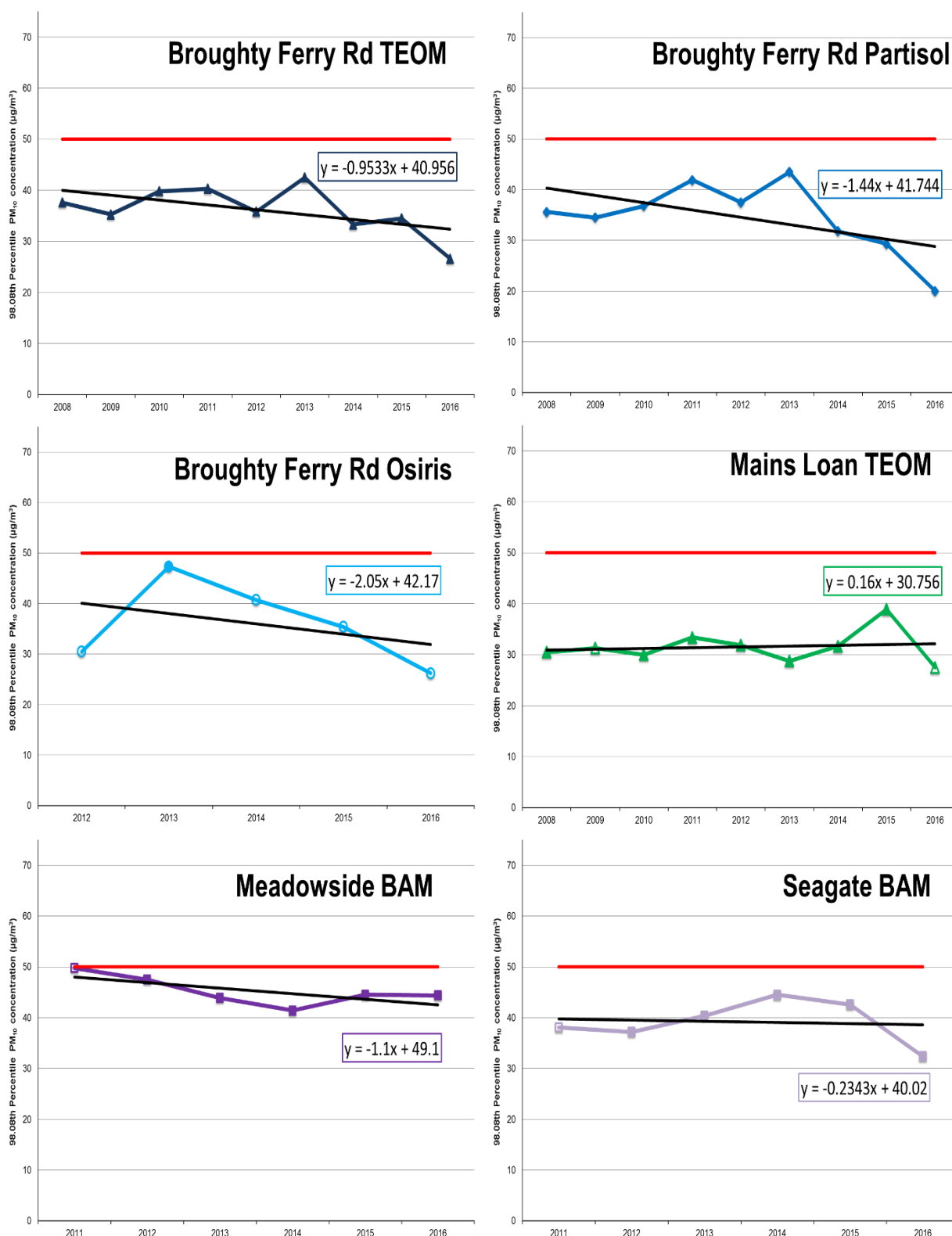
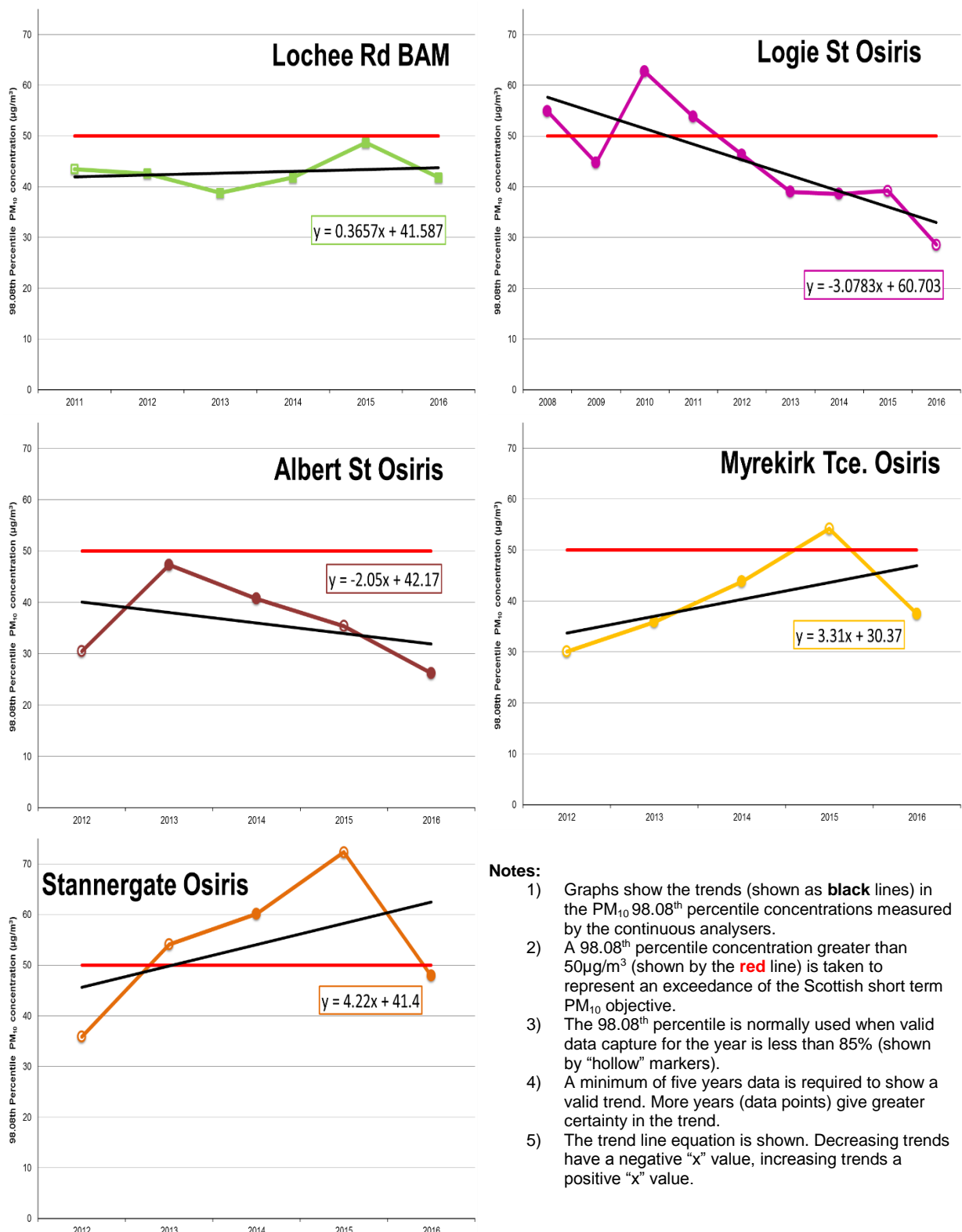


Figure A6.c Trends in 98.08th percentile PM₁₀ concentrations at Automatic monitors



Appendix B: Full Monthly Diffusion Tube Results for 2016

Table B.1 – NO₂ Monthly Diffusion Tube Results for 2016

Site Id. (DT)	Location	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.83)
92	Abertay 2	53.3	51.7	47.2	40.8	41.7	44.6	35.9	35.9	53.2	50.9	47.6	53.8	46.4	100.0	1.0	46.4	38.5
179	Albert St (15)(Façade)	45.1	43.9	42.5	40.8	36.3	41.5	28.9	35.1	41.5	44.9	44.5	41.7	40.6	100.0	1.0	40.6	33.7
180	Albert St (15)(Roadside)	48.8	44.7	46.0	43.5	40.0	41.5	31.6	34.9	43.8	49.4	43.0	46.5	42.8	100.0	1.0	42.8	35.5
187	Albert St (81)	48.8	44.3	M	M	33.4	32.5	24.2	29.1	39.2	44.5	41.0	40.2	37.7	83.3	1.0	37.7	31.3
167	Albert St (191)	45.5	39.2	41.2	42.3	39.6	43.7	24.4	28.1	40.9	56.2	41.4	41.7	40.4	100.0	1.0	40.4	33.5
5	Arbroath Rd (13)	52.7	50.7	47.0	35.7	38.6	31.8	38.6	34.3	46.8	40.8	55.8	54.8	44.0	100.0	1.0	44.0	36.5
147	Arbroath Rd (38)	52.9	50.9	43.1	M	34.5	31.8	27.7	33.6	36.3	44.1	55.5	52.9	42.1	91.7	1.0	42.1	35.0
212	Arbroath Rd (89)	42.5	41.0	36.3	28.5	27.9	31.2	25.2	27.7	35.1	39.4	46.8	44.0	35.5	100.0	1.0	35.5	29.4
7	Balgavies PI	27.7	28.3	24.0	13.7	10.1	9.0	13.1	12.3	18.5	17.6	32.0	29.5	19.7	100.0	1.0	19.7	16.3
9	Birnam PI	17.0	14.8	12.5	9.0	7.6	7.7	6.8	8.0	9.0	12.5	16.3	16.1	11.4	100.0	1.0	11.4	9.5
164	B/ Ferry Rd Lower	26.3	25.2	18.9	11.1	8.2	7.1	12.1	14.6	14.3	16.0	29.4	32.3	18.0	100.0	1.0	18.0	14.9
140	B/Ferry Rd Lp66	44.9	48.0	43.1	29.5	29.5	26.8	35.3	32.2	39.6	34.5	56.5	58.1	39.8	100.0	1.0	39.8	33.1
139	B/Ferry Rd (141) Downpipe	46.0	47.8	45.3	32.8	30.4	26.9	32.6	31.4	37.3	35.3	57.1	59.1	40.2	100.0	1.0	40.2	33.3
11	Broughty Ferry Rd (141)	52.3	57.9	51.5	M	34.7	M	42.5	40.0	36.6	42.3	61.4	67.0	48.6	83.3	1.0	48.6	40.4
145	B/Ferry Rd Greendykes	44.1	52.7	48.2	35.3	35.5	35.1	32.6	32.4	41.1	40.6	54.2	53.8	42.1	100.0	1.0	42.1	35.0
204	B/Ferry Rd (129)	60.7	58.1	47.4	31.6	28.5	38.1	29.5	33.9	39.6	33.9	58.8	60.1	43.4	100.0	1.0	43.4	36.0
155	Carolina Court Lp6	31.6	29.8	27.9	18.5	13.5	11.5	13.1	16.0	21.5	24.6	35.6	32.7	23.0	100.0	1.0	23.0	19.1
171	Claypotts / Arbroath Rd (502)	34.5	46.0	39.2	23.4	18.1	18.2	25.9	24.2	28.4	29.3	44.2	53.2	32.1	100.0	1.0	32.1	26.6
210	Cleghorn Street (57)	39.8	36.1	36.7	31.4	25.6	26.8	24.6	25.4	30.7	33.2	43.7	38.2	32.7	100.0	1.0	32.7	27.1
13	Clelington Rd/ Forfar Rd	49.4	53.6	43.7	40.2	32.6	32.0	30.0	32.8	36.4	40.8	18.5	49.2	38.3	100.0	1.0	38.3	31.8

Site Id. (DT)	Location	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.83)
188	Commercial St (9)	43.5	51.5	47.4	43.7	41.0	45.3	M	36.9	36.3	44.9	56.5	48.4	45.0	91.7	1.0	45.0	37.4
84	Commercial St /Dock St (40)	41.9	51.9	45.5	40.4	32.6	36.4	33.2	35.3	37.4	42.7	56.1	49.2	41.9	100.0	1.0	41.9	34.8
192	Dock St (12)	36.1	38.0	34.9	32.2	26.1	25.6	20.5	26.7	26.9	33.2	40.5	36.8	31.5	100.0	1.0	31.5	26.1
85	Dock St (21)	49.0	55.4	43.9	41.7	33.6	39.1	M	39.8	41.0	39.2	59.4	56.1	45.3	91.7	1.0	45.3	37.6
156	Dock St (57)	77.1	75.5	61.6	51.3	43.7	40.2	52.7	47.6	58.8	51.5	76.2	76.5	59.4	100.0	1.0	59.4	49.3
206	Drumgeith Road (2)	36.1	30.8	25.0	16.8	15.0	13.0	15.2	13.3	15.1	19.9	33.2	32.7	22.2	100.0	1.0	22.2	18.4
20	Dura St (100)	49.0	57.0	52.5	44.7	35.1	39.9	32.0	36.1	39.7	47.6	59.7	48.4	45.1	100.0	1.0	45.1	37.5
214	East Dock St (26)	49.4	49.0	47.0	35.3	34.5	36.4	34.1	33.6	38.9	40.4	55.2	48.1	41.8	100.0	1.0	41.8	34.7
22	Eastport Roundabout	46.4	46.2	43.5	34.5	28.9	34.0	27.5	31.2	34.6	37.8	48.6	45.1	38.2	100.0	1.0	38.2	31.7
211	Forfar Rd (83A)	40.2	50.9	M	27.5	27.5	21.0	37.5	31.2	37.3	32.6	55.2	53.5	37.7	91.7	1.0	37.7	31.3
83	Forfar Rd (104)	70.2	69.4	50.7	47.0	43.9	43.7	48.0	48.8	59.1	50.7	73.2	64.7	55.8	100.0	1.0	55.8	46.3
209	Hawkhill (251)	28.7	30.8	27.7	16.2	13.7	18.5	19.3	22.4	17.9	23.8	61.4	29.7	25.8	100.0	1.0	25.8	21.4
202	High St Lochee (22-24)	38.6	49.7	36.5	30.0	30.8	28.1	26.5	30.0	33.8	40.4	46.9	45.8	36.4	100.0	1.0	36.4	30.2
216	King Street (3)	40.8	36.9	37.8	37.5	38.6	44.2	26.1	29.1	35.1	43.5	35.3	41.9	37.2	100.0	1.0	37.2	30.9
26	Kingsway East Roundabout	47.2	49.7	50.1	33.9	32.0	39.4	41.0	38.6	43.7	44.1	55.2	63.4	44.9	100.0	1.0	44.9	37.2
27	Kingsway/ Mains Loan	45.3	42.5	38.0	M	38.6	44.0	21.3	32.6	27.9	52.1	39.2	35.9	37.9	91.7	1.0	37.9	31.5
177	Kingsway/Strathmartine Rd (N)	49.0	52.7	42.1	29.8	32.8	30.9	37.1	31.2	46.8	37.5	55.8	57.8	42.0	100.0	1.0	42.0	34.8
30	Lochee Rd (138)	69.8	75.9	57.7	45.8	48.2	47.8	49.4	49.2	60.4	50.5	77.1	75.2	58.9	100.0	1.0	58.9	48.9
31	Lochee Rd (140)(Traffic Lts)	77.1	82.9	71.4	52.1	47.4	55.8	52.7	51.7	60.4	55.2	81.4	78.5	63.9	100.0	1.0	63.9	53.0
32	Lochee Rd (184)	51.5	54.8	49.4	32.0	31.0	27.4	32.8	32.0	42.3	38.4	56.8	59.4	42.3	100.0	1.0	42.3	35.1
	Lochee Rd (Romon 1)	66.5	67.7	59.3	44.3	42.3	38.9	40.6	42.7	48.6	48.0	67.0	68.9	52.9	100.0	1.0	52.9	43.9
	Lochee Rd (Romon 2)	68.5	73.5	57.2	44.7	41.7	38.1	41.7	42.7	46.1	45.8	69.9	66.6	53.0	100.0	1.0	53.0	44.0
	Lochee Rd (Romon 3)	68.5	71.0	47.0	46.4	40.6	36.4	42.7	42.9	46.5	45.8	70.3	69.9	52.3	100.0	1.0	52.3	43.4

Site Id. (DT)	Location	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.83)
158	Lochee Rd (Romon) Average	67.8	70.7	54.5	45.1	41.5	37.8	41.7	42.8	47.1	46.5	69.1	68.5	52.8	100.0	1.0	52.8	43.8
36	Lochee Rd/Polepark Rd	46.0	41.4	35.7	27.1	26.5	24.6	21.5	25.0	28.4	31.8	46.0	44.8	33.2	100.0	1.0	33.2	27.6
37	Logie St (114)	71.4	78.8	74.3	55.0	53.6	54.8	54.2	52.3	64.0	68.5	76.5	73.9	64.8	100.0	1.0	64.8	53.8
38	Logie St (98)	52.5	51.5	41.9	32.8	34.1	28.2	34.5	33.0	37.9	41.0	57.8	50.9	41.3	100.0	1.0	41.3	34.3
39	Loons Rd (1)	48.0	55.2	51.5	39.8	45.1	44.8	29.8	40.2	38.1	57.2	55.8	52.9	46.5	100.0	1.0	46.5	38.6
182	Meadowside (28)	51.1	55.0	49.9	30.4	35.7	M	37.8	32.8	41.4	34.9	46.0	60.4	43.2	91.7	1.0	43.2	35.9
	Meadowside (Romon 1)	51.3	57.9	50.7	44.7	46.4	40.5	43.9	43.5	45.5	46.0	78.1	58.8	50.6	100.0	1.0	50.6	42.0
	Meadowside (Romon 2)	52.1	59.7	54.6	48.0	45.5	42.7	43.1	42.5	42.2	46.8	54.2	59.4	49.2	100.0	1.0	49.2	40.9
	Meadowside (Romon 3)	54.4	51.7	51.1	41.4	45.8	43.3	43.3	34.7	48.1	46.6	57.8	62.0	48.4	100.0	1.0	48.4	40.1
149	Meadowside (Romon) Average	52.6	56.4	52.1	44.7	45.9	42.2	43.4	40.2	45.3	46.5	63.4	60.1	49.4	100.0	1.0	49.4	41.0
42	Muirton Rd (6)	37.8	35.7	32.0	27.3	30.4	33.2	19.7	24.2	32.0	44.7	34.1	33.8	32.1	100.0	1.0	32.1	26.6
185	Murraygate (46)	M	30.8	27.1	M	19.7	20.2	19.1	19.1	M	28.7	31.4	33.5	25.5	75.0	1.0	25.5	21.2
189	Myrekirk Rd (29)	49.7	54.0	45.5	37.3	31.2	28.7	30.0	31.0	M	36.7	55.2	47.1	40.6	91.7	1.0	40.6	33.7
45	Nethergate (6)	45.8	56.0	46.8	33.6	38.8	38.4	38.8	39.6	44.3	42.9	53.2	53.5	44.3	100.0	1.0	44.3	36.8
47	Nethergate (40)	43.1	43.1	44.7	36.3	44.9	44.8	34.7	38.8	44.2	47.2	45.1	44.5	42.6	100.0	1.0	42.6	35.4
213	Nethergate (64)	51.9	47.8	50.3	43.9	43.5	42.2	35.1	35.9	53.2	50.5	47.8	52.9	46.3	100.0	1.0	46.3	38.4
44	Nethergate (88)	53.1	50.7	52.3	49.4	53.3	59.1	35.7	42.9	M	55.4	49.2	54.8	50.5	91.7	1.0	50.5	41.9
48	Nethergate (132)/Marketgait	40.0	47.2	42.5	37.5	31.2	27.9	23.2	25.0	40.4	36.3	41.7	39.6	36.0	100.0	1.0	36.0	29.9
46	Nethergate (95)	43.3	47.6	44.7	36.3	33.6	33.3	23.6	24.2	33.0	40.6	44.3	M	36.8	91.7	1.0	36.8	30.5
207	Pitkerro Road (42)	43.5	38.8	42.9	33.9	31.2	35.8	28.5	35.7	41.0	47.2	40.9	51.5	39.2	100.0	1.0	39.2	32.6
49	Rankine St (2)	58.7	55.2	51.3	37.3	32.0	31.4	33.6	34.5	35.3	33.2	63.0	61.7	43.9	100.0	1.0	43.9	36.5
54	Seagate (9)	45.3	45.8	45.5	38.4	34.3	39.1	32.2	34.5	35.6	38.8	46.0	43.8	39.9	100.0	1.0	39.9	33.2
190	Seagate (97)	52.1	52.1	55.2	M	50.1	56.5	44.3	42.7	49.1	50.5	47.9	53.8	50.4	91.7	1.0	50.4	41.8

Site Id. (DT)	Location	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.83)
50	Seagate (101)	54.4	57.5	49.9	41.9	42.3	35.0	39.0	M	45.0	44.1	48.8	55.2	46.6	91.7	1.0	46.6	38.7
	Seagate (Romon 1)	54.4	56.4	45.8	51.7	47.0	55.8	40.6	41.0	45.8	53.8	47.3	55.5	49.6	100.0	1.0	49.6	41.2
	Seagate (Romon 2)	54.2	56.0	51.1	42.5	47.0	53.5	41.2	44.1	46.8	52.3	55.5	56.8	50.1	100.0	1.0	50.1	41.6
	Seagate (Romon 3)	51.7	52.1	48.2	51.3	50.3	49.1	40.2	42.5	45.0	52.9	54.8	56.5	49.6	100.0	1.0	49.6	41.1
159	Seagate (Romon) Average	53.4	54.8	48.4	48.5	48.1	52.8	40.7	43.3	45.9	53.0	52.5	56.3	49.7	100.0	1.0	49.7	41.3
55	Soapwork Lane	54.0	53.8	45.5	36.7	31.0	32.0	M	32.4	37.4	43.9	55.2	47.8	42.7	91.7	1.0	42.7	35.4
151	South Road (1 Denbank)	47.6	56.0	42.7	34.9	34.9	33.2	31.0	30.0	36.9	40.4	47.9	48.1	40.3	100.0	1.0	40.3	33.4
162	St Andrews St/Seagate(116)	51.1	47.6	47.0	38.2	38.8	36.9	35.1	34.1	40.9	40.6	46.0	50.9	42.3	100.0	1.0	42.3	35.1
56	St Andrews St (26)	42.9	42.9	38.6	32.8	35.1	36.9	25.9	28.9	35.9	44.5	40.2	41.7	37.2	100.0	1.0	37.2	30.9
208	St Ann Street (2)	30.6	27.9	22.6	18.3	18.5	18.2	11.7	16.0	18.2	27.9	28.7	25.3	22.0	100.0	1.0	22.0	18.3
59	Strathmore Ave (353)	52.3	56.2	50.1	43.5	43.3	53.8	36.3	42.1	42.2	50.3	53.2	46.9	47.5	100.0	1.0	47.5	39.4
60	Trades Lane (31)	41.9	41.0	36.7	29.5	24.8	26.8	25.4	26.1	29.4	33.9	41.2	39.6	33.0	100.0	1.0	33.0	27.4
191	Victoria Rd (4 India Buildings)	43.1	43.9	35.5	34.5	32.2	33.5	24.0	26.5	33.6	42.9	41.0	45.3	36.3	100.0	1.0	36.3	30.2
93	Victoria Rd (10)	45.5	47.4	43.5	37.5	35.5	35.5	24.0	29.3	32.5	41.9	43.0	42.0	38.1	100.0	1.0	38.1	31.7
70	Victoria Rd/Hilltown	56.6	85.4	55.2	47.0	51.7	43.5	56.2	53.6	60.7	54.0	84.4	86.7	61.3	100.0	1.0	61.3	50.8
68	Victoria Rd (60)	37.5	52.1	47.6	41.2	39.6	41.0	32.6	33.6	38.1	42.5	48.8	47.3	41.8	100.0	1.0	41.8	34.7
184	Victoria Rd (104)/William St)	40.6	39.6	38.4	37.5	33.0	36.4	26.3	27.7	35.0	42.3	37.1	35.1	35.8	100.0	1.0	35.8	29.7
71	Victoria St / Albert St	43.1	43.1	39.8	38.8	30.8	34.8	23.6	28.5	32.5	44.9	46.9	39.9	37.2	100.0	1.0	37.2	30.9
72	Westport (2)	43.1	48.6	38.8	28.3	28.1	27.7	33.6	32.0	40.1	38.8	45.3	47.3	37.6	100.0	1.0	37.6	31.2
183	West Marketgait/Guthrie St	65.7	70.6	59.9	49.7	46.4	38.9	M	42.9	M	49.7	63.4	68.3	55.6	83.3	1.0	55.6	46.1
205	West Marketgait/ Old Mill (23)	95.6	83.7	60.7	42.7	48.2	43.2	54.2	45.3	67.6	49.4	81.4	73.9	62.2	100.0	1.0	62.2	51.6
73	Whitehall Cr (4)	49.9	51.1	39.2	36.5	32.4	29.1	34.9	33.6	37.8	38.2	57.1	46.9	40.6	100.0	1.0	40.6	33.7
161	Whitehall Cr/Union St (50)	37.3	38.4	29.1	28.9	21.7	24.8	23.8	24.6	26.3	33.4	37.1	35.0	30.0	100.0	1.0	30.0	24.9

Site Id. (DT)	Location	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Mean	% Data	Period Adj' Factor	Annual Mean	Annual mean Bias (0.83)
74	Whitehall St (40)	49.7	51.3	43.3	45.3	39.4	38.2	31.0	32.2	36.1	48.2	47.8	46.1	42.4	100.0	1.0	42.4	35.2
81	Whitehall St (12)	45.3	44.5	43.5	44.7	44.1	46.8	32.4	35.3	36.6	46.2	42.5	44.5	42.2	100.0	1.0	42.2	35.0
76	Whitehall St (1)	59.7	54.0	56.2	42.9	41.9	46.1	45.5	46.4	54.5	53.6	59.7	61.1	51.8	100.0	1.0	51.8	43.0
75	Whitehall St (5)	49.9	58.3	52.3	41.2	37.5	39.9	48.6	40.0	49.1	45.1	58.4	59.1	48.3	100.0	1.0	48.3	40.1
77	Whitehall St (15)	36.5	47.6	41.4	39.4	34.5	34.5	31.0	31.8	35.1	42.5	45.3	47.6	38.9	100.0	1.0	38.9	32.3
	Whitehall St (Romon 1)	49.7	48.6	45.5	46.4	46.6	42.8	35.7	37.3	32.5	50.9	43.8	48.1	44.0	100.0	1.0	44.0	36.5
	Whitehall St (Romon 2)	48.0	48.8	46.0	43.9	44.9	46.6	34.3	39.0	42.2	51.9	48.4	47.3	45.1	100.0	1.0	45.1	37.4
	Whitehall St (Romon 3)	46.8	42.3	44.1	43.3	40.4	40.1	34.1	38.8	41.7	52.3	46.3	47.8	43.2	100.0	1.0	43.2	35.8
160	Whitehall St (Romon) Average	48.2	46.6	45.2	44.5	44.0	43.2	34.7	38.4	38.8	51.7	46.2	47.7	44.1	100.0	1.0	44.1	36.6
82	Woodside Ave	23.2	22.0	15.2	11.7	11.5	10.8	9.6	11.9	13.5	20.1	25.1	23.5	16.5	100.0	1.0	16.5	13.7

Notes

- (1) Exceedances of the NO₂ annual mean objective are shown in **bold**. (Borderline values are coloured **orange**).
- (2) NO₂ annual means greater than 60µg/m³ are shown in **bold & underlined**, indicating a potential exceedance of the NO₂ 1-hr mean objective.
- (3) Sites shaded green were monitoring locations installed in 2016.
- (4) 'M' means that the diffusion tube was either missing or else interference meant that the results were considered invalid.

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

Appendix C.1 Air Quality Monitoring Data QA/QC

QA/QC of Automatic Monitoring

All 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.

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).

QA/QC of Diffusion Tube Monitoring

Monitoring of NO₂ 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 is a new scheme, started in April 2014, which combines two long running PT schemes: LGC Standards STACKS PT scheme and HSL WASP PT scheme. AIR NO₂ PT forms an integral

part of the UK NO₂ 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/ga-qc-framework.html>. This information is updated on a quarterly basis following completion of each AIR PT round.

Tayside Scientific Services has demonstrated satisfactory performance in the latest report.³

Tube Precision

For the purposes of Local Air Quality Management, tube precision is separated into two categories, "Good" or "Poor", as follows: tubes are considered to have "good" precision where the coefficient of variation of duplicate or triplicate diffusion tubes for eight or more periods during the year is less than 20%, and the average CV of all monitoring periods is less than 10%. Tubes are considered to have "poor" precision where the CV of four or more periods is greater than 20% and/or the average CV is greater than 10%.

A spreadsheet tool has been developed to calculate the overall precision of a particular co-location study or any sets of duplicate or triplicate results. The tube precision of each study calculated using this spreadsheet⁴ is summarised in **Table C.1**. The distinction between "good" and "poor" precision is an indicator of how well the same measurement can be reproduced. This precision reflects the laboratory's performance/consistency in preparing and analysing the tubes, as well as the subsequent handling of the tubes in the field. Any laboratory can show "poor" precision for a particular period/co-location study, if this is due to poor handling of the tubes in the field.

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 Website⁵ for Tayside Scientific Services is **0.77** (Spreadsheet version 03/17v2). This is based the kerbside National inter-comparison site at Marylebone Road (0.77).

Factor from Local Co-location Studies

Dundee City Council co-locates three nitrogen dioxide diffusion tubes with each of the roadside automatic nitrogen dioxide analysers. Co-location studies were carried out at 4 automatic monitoring locations in 2016. The factor for each study is shown in **Table C.1** 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 the Dundee City Council co-location studies met the criteria in 2016. 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 the quarterly AIR-PT/WASP rounds up to February 2016. The automatic analyser period means are calculated from mid-day on tube changeover days.

³ <https://laqm.defra.gov.uk/assets/tubeprecision2016version0317finalreducedv2.pdf>

⁴ <http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html>

⁵ <http://laqm.defra.gov.uk/bias-adjustment-factors/national-bias.html>

Table C.1 Bias Factors from 2016 Co-location Studies and National Bias Adjustment Spreadsheet (Version 03/17v2)

Site Name	Site Type ¹	Length of Study (months)	PDT ² Mean Conc. (Dm) ($\mu\text{g}/\text{m}^3$)	Analyser Mean Conc. (Cm) ($\mu\text{g}/\text{m}^3$)	%DC ³	Bias (B)	Tube Precision & average CV ⁴	Bias Adjustment Factor (A) (Cm/Dm)
Lochee Road	R	12	53	45	98	16%	G (3%)	0.86
Meadowside	R	9	49	36	94	39%	G (3%)	0.72
Seagate	R	12	50	47	99	6%	G (4%)	0.94
Whitehall Street	R	11	44	37	99	18%	G (5%)	0.84
Marylebone Road Intercomparison	K	12	103	79	n/a	30.0%	G	0.77

1 - R= Roadside, K= Kerbside

2 - PDT = Passive Diffusion Tube for NO₂

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 nitrogen dioxide 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 spreadsheets⁶) was 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 available on the Defra website prepared by Air Quality Consultants⁷ (AQC) (see **Table C.2**). The factor obtained using only local roadside sites was **0.83**, and **0.82** when the kerbside site at Marylebone Road was included. The **0.83** bias correction factor represents a more conservative approach and has been used to bias correct the diffusion tube data presented in this report.

⁶ <http://laqm.defra.gov.uk/bias-adjustment-factors/local-bias.html>

⁷ <http://laqm.defra.gov.uk/documents/NO2-Diffusion-Tube-Collocation-Methodology.pdf>

Table C.2 Manual Approximate Orthogonal Regression Calculation 2016

Co-location Sites 2015	Site Type ¹	Bias Factor A	Bias B
Lochee Road	R	0.86	16%
Meadowside	R	0.72	39%
Seagate	R	0.94	6%
Whitehall St	R	0.84	18%
Mean Local		0.84	19.8%

National: Marylebone Road Intercomparison	K	0.77	30.0%
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Combined Local & National: Mean Combined		0.83	21.8%
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Manual orthogonal regression Calculation as para 2.4 AQC doc ²		
Express as a factor	Add 1	Inverse
0.198	1.198	0.83

0.218	1.218	0.82
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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."

PM₁₀ Monitoring Adjustment

Dundee utilise several methods for monitoring particulate matter (PM₁₀) within the city. TEOM and Osiris monitors have heated inlets. These tend to drive off volatile organic particulate matter and in consequence the measured concentrations tend to be lower than those measured by gravimetric reference standard monitors. 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. TEOM PM₁₀ data presented in this report have been corrected using the Volatile Correction Methodology (VCM) since 2008.

DCC have five Osiris analysers, four of which were re-located during 2012. These are also non-equivalent but their measurements are considered indicative of particulate concentrations. Dundee commenced a yearly study in 2005 to compare the PM₁₀ data measured using an Osiris analyser with that from a TEOM. This study determined that the Osiris generally exaggerates peak values compared to the TEOM. Annually, post service, all 5 Osiris monitors are co-located in-house and their data is compared with that of the designated "master" to derive, if necessary, individual adjustment factors. The factors used to adjust the 2016 data can be made available on request⁸. 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 2016 data was **1.407**. 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.

In addition, DCC have four unheated Beta-Attenuation Monitors (BAM), which are gravimetric equivalent monitors. The PM₁₀ data from these have been corrected for slope by Ricardo

⁸ T:\Pollution\Air Quality\Progress Reports\Progress Report 2017\PM10

using the factor (0.8333) determined by the UK Equivalence Testing Programme⁹. For comparison with the NAQS objectives annual mean concentrations are calculated from an hourly time base.

Short-term to Long-term Data adjustment

Annualisation of data was required for two automatic analysers with less than 75% data capture in 2016, Mains Loan and Logie Street. The methodology outlined in Box 7.9 of LAQM.TG(16) was used. The urban background sites used are shown in the tables below along with the annualisation factors applied to the data. There was poor data capture at nearby urban background locations in 2016, hence the suburban site at Edinburgh Currie was used in the calculation after consultation with Edinburgh City Council.

Table C.3 Period Adjustment Calculation Mains Loan NO₂

Urban Background Locations	Annual Mean, A _m (µg/m ³)	Period Mean, P _m (µg/m ³)	Ratio, A _m /P _m	Average Ratio, R _a
Grangemouth Moray	17.82	18.69	0.953	0.929
Edinburgh -Currie	6.98	7.74	0.903	
Aberdeen -Errol Place	20.83	22.36	0.931	
Site to be annualised				
Mains Loan - NO ₂	11.4	12.28		

Table C.4 Period Adjustment Calculation Mains Loan PM₁₀

Urban Background Locations	Annual Mean, A _m (µg/m ³)	Period Mean, P _m (µg/m ³)	Ratio, A _m /P _m	Average Ratio, R _a
Falkirk_MC	12.81	13.24	0.968	0.98
Edinburgh -Currie	9.20	9.34	0.984	
Aberdeen -Errol Place	11.81	11.97	0.987	
Site to be annualised				
Mains Loan - PM ₁₀	10.0	10.20		

Table C.5 Period Adjustment Calculation Logie Street PM₁₀

Urban Background Locations	Annual Mean, A _m (µg/m ³)	Period Mean, P _m (µg/m ³)	Ratio, A _m /P _m	Average Ratio, R _a
Falkirk_MC	12.81	11.71	1.094	1.058
Edinburgh -Currie	9.20	9.08	1.013	
Aberdeen -Errol Place	11.81	11.06	1.068	
Site to be annualised				
Logie Street - PM ₁₀	13.8	13.04		

Note: annualised mean shown in red

⁹ <http://laqm.defra.gov.uk/laqm-faqs/faq104.html>

Appendix C.2 Overview of NO₂ Annual Mean Concentrations Across the City

Union Street & Whitehall Street

Figure C.1 NO₂ Monitoring Locations in Union Street and Whitehall Street

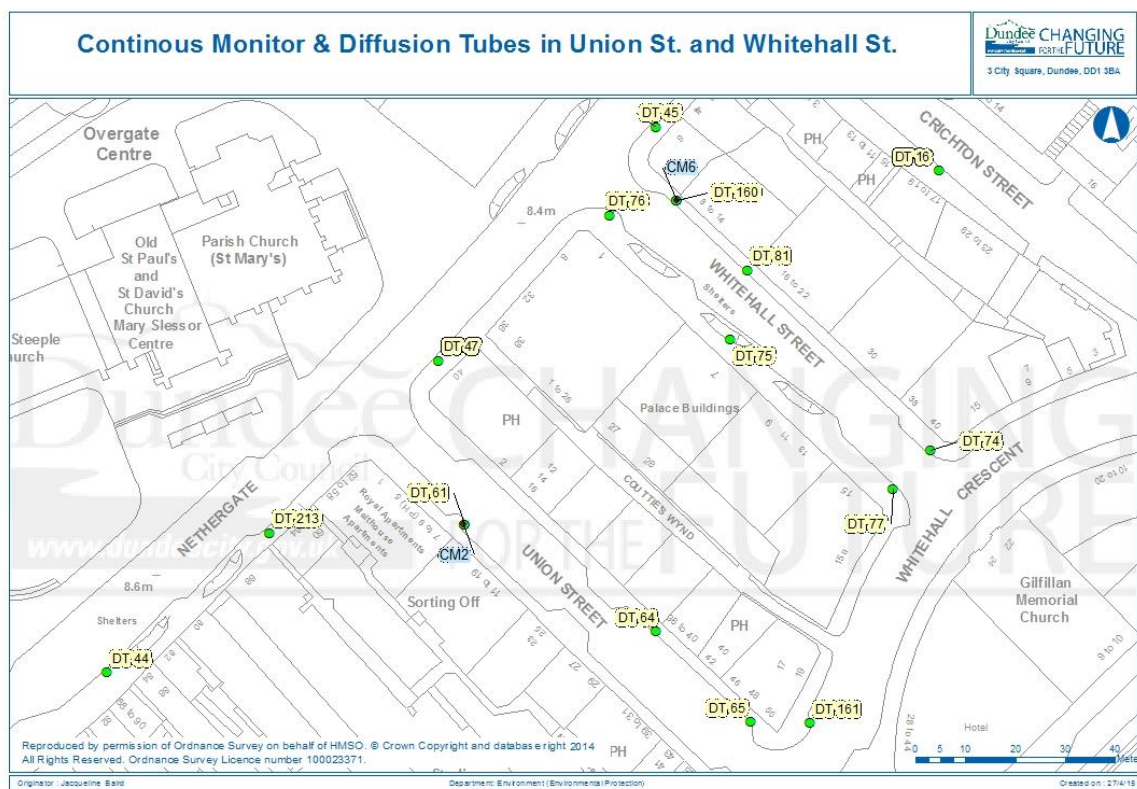


Figure C.2 Overview of NO₂ Concentrations in Union St and Nethergate (east of Marketgait)

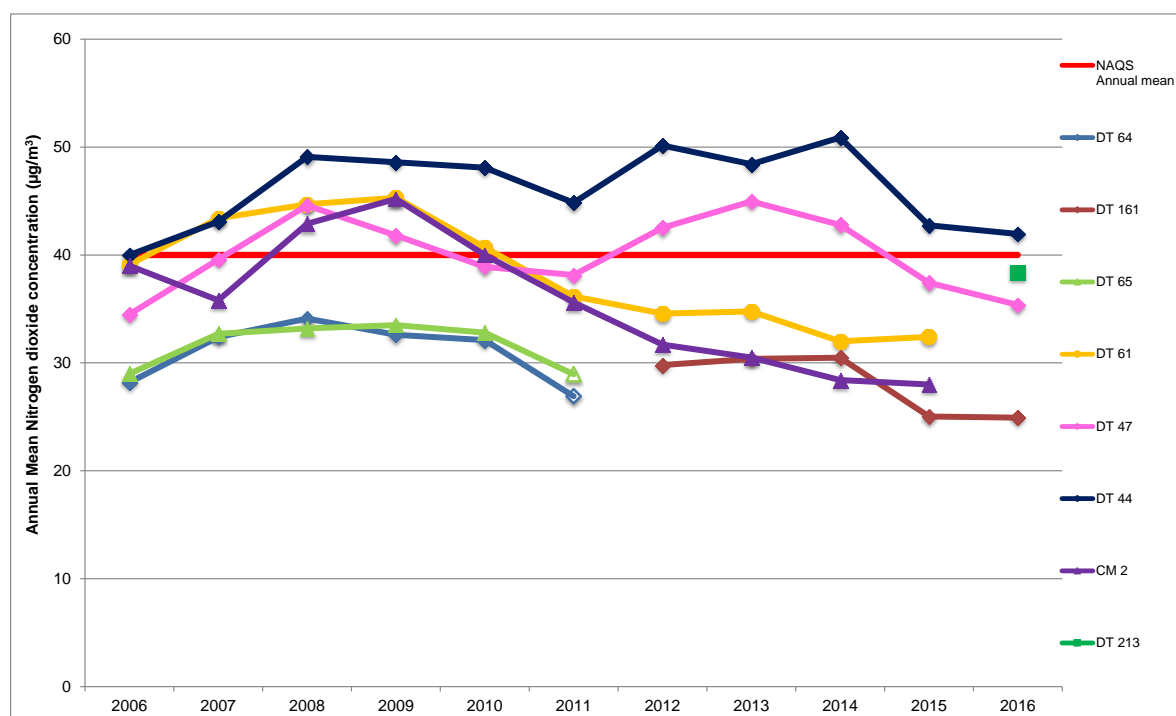
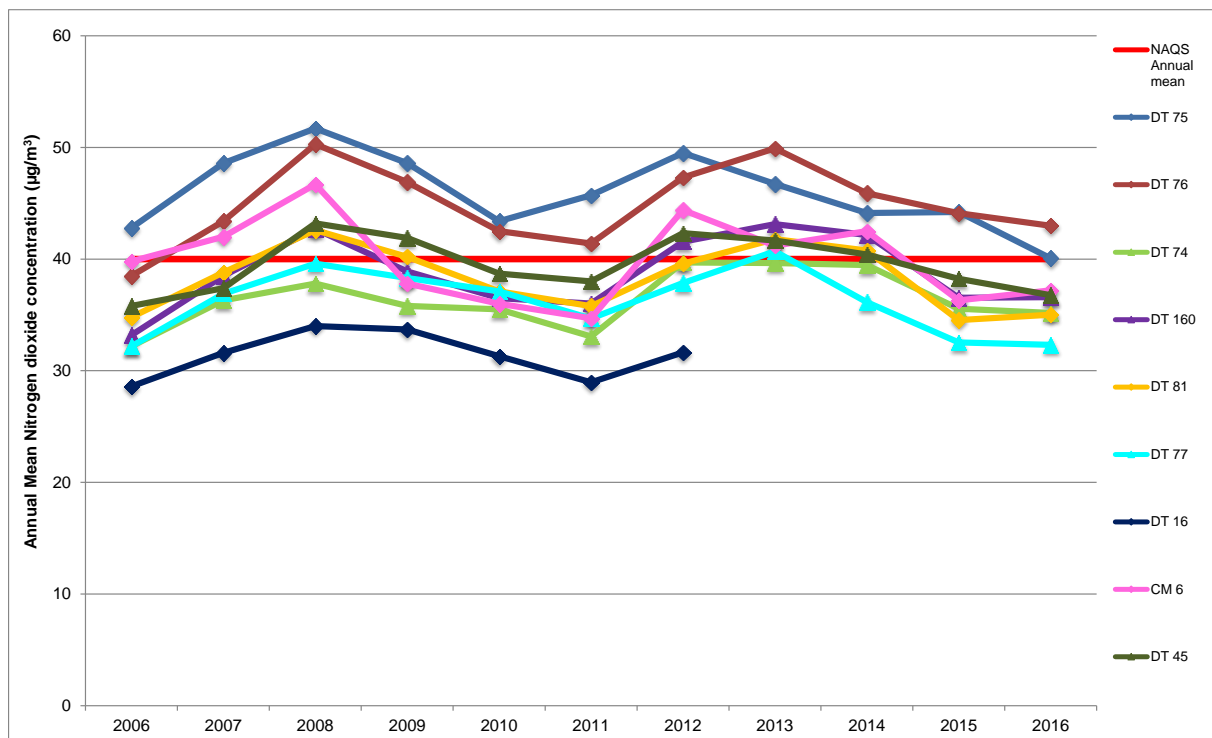


Figure C.3 Overview of NO₂ Concentrations in Whitehall St and Crichton St.



Seagate

Figure C.4 NO₂ Monitoring Locations in Seagate

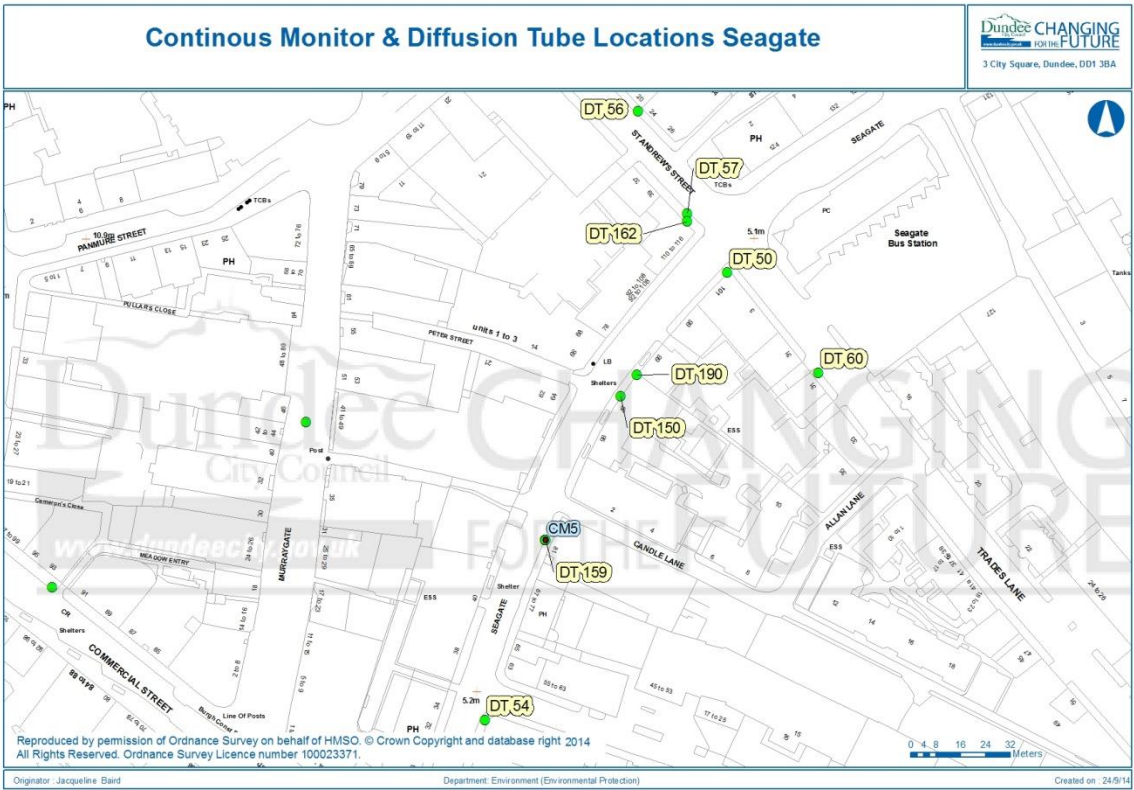
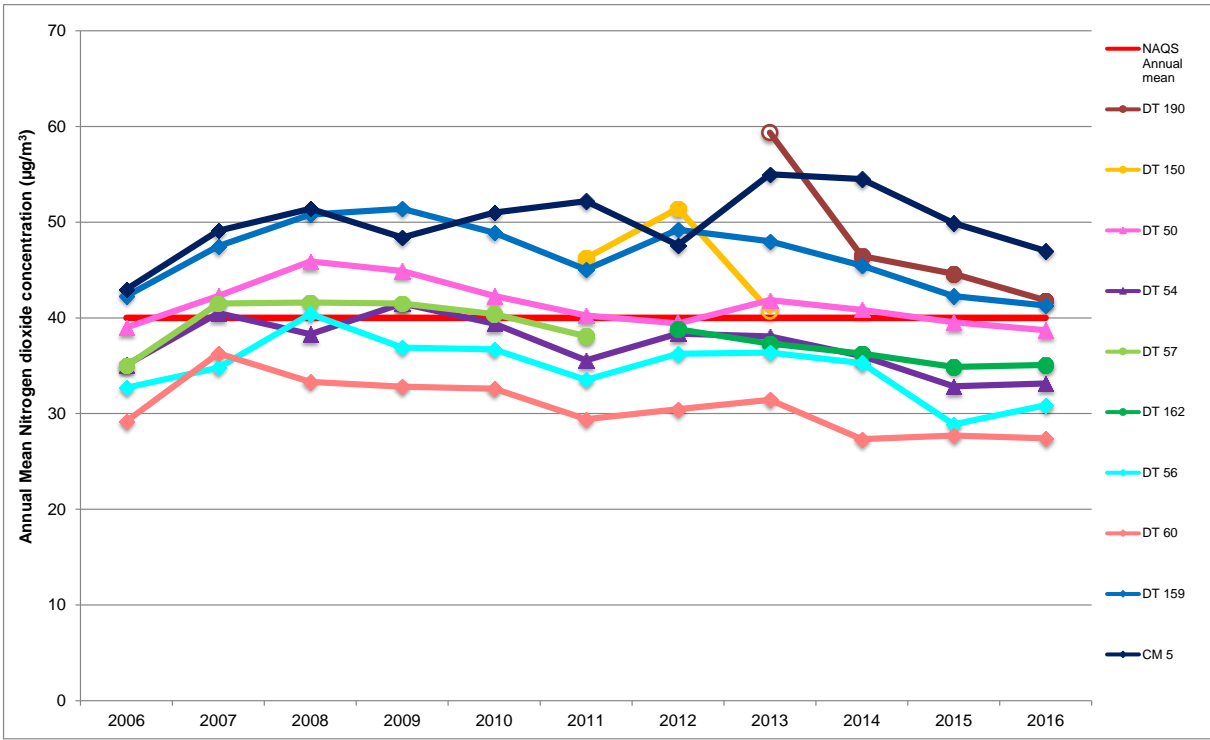


Figure C.5 Overview of NO₂ Concentrations in Seagate.



Nethergate

Figure C.6 NO₂ Diffusion Tube Locations in Nethergate

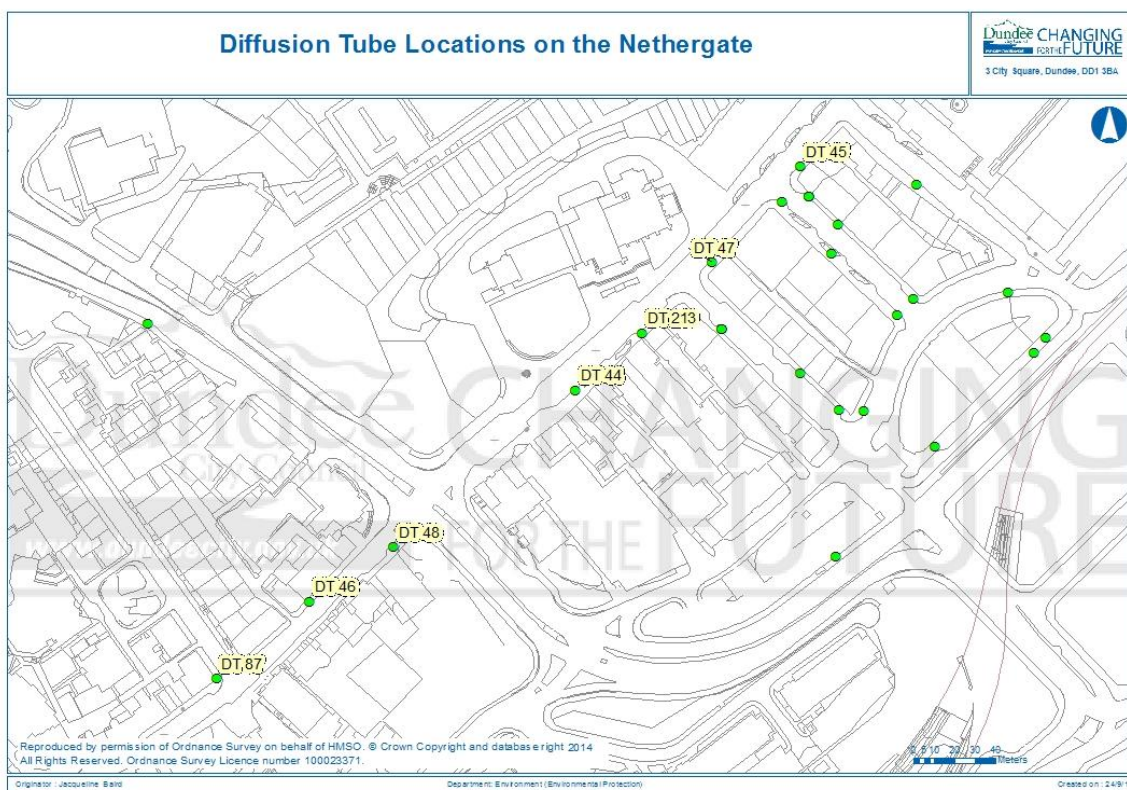
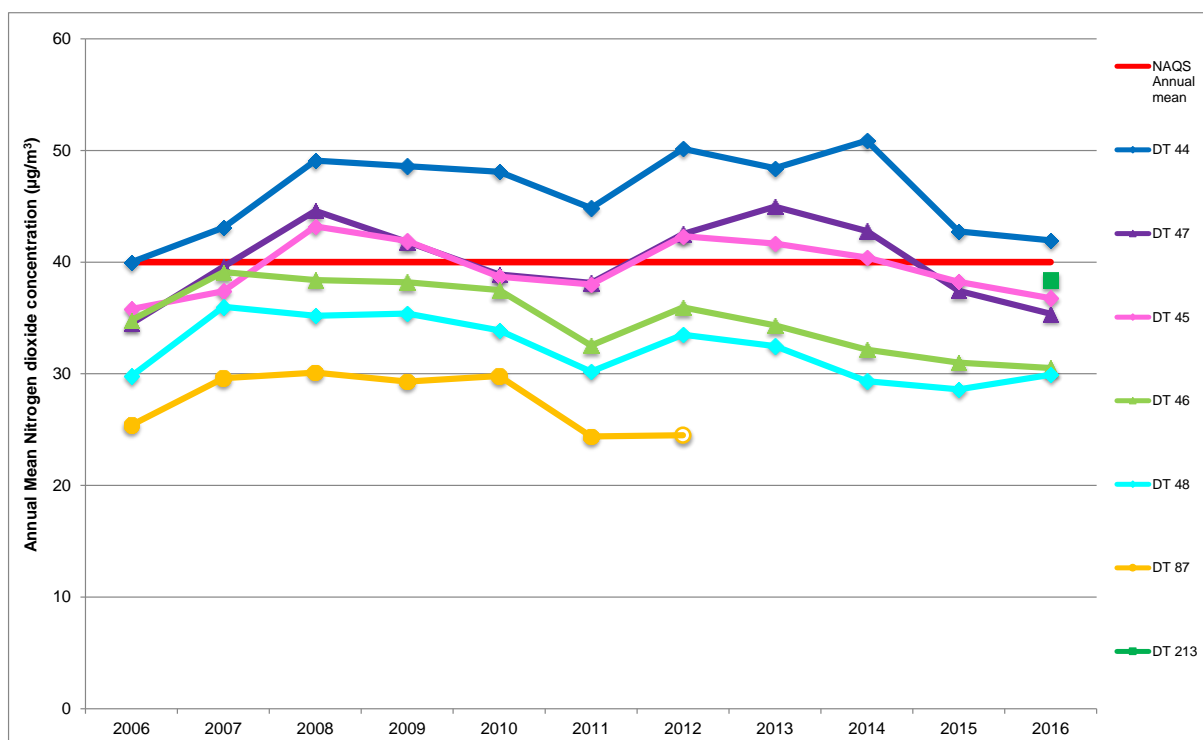


Figure C.7 Overview of NO₂ Diffusion Tube Concentrations in Nethergate.



Victoria Road / Meadowside

Figure C.8 NO₂ Diffusion Tube Locations in Victoria Road / Meadowside

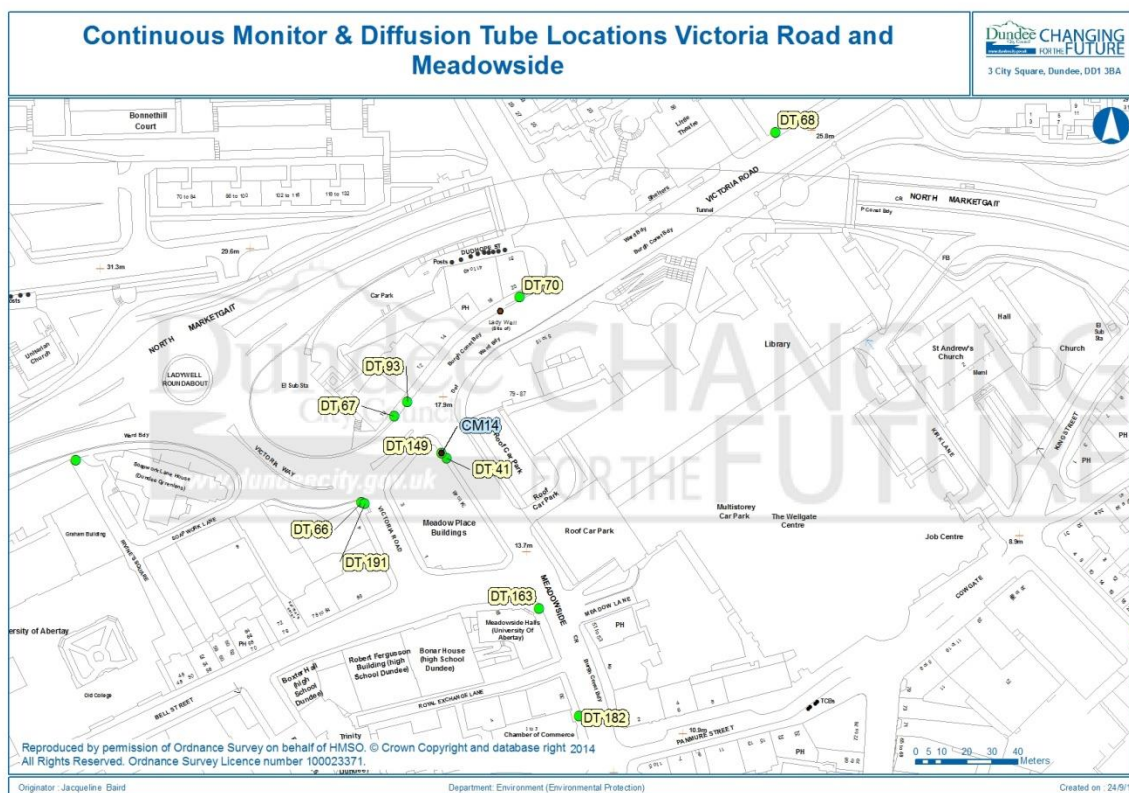
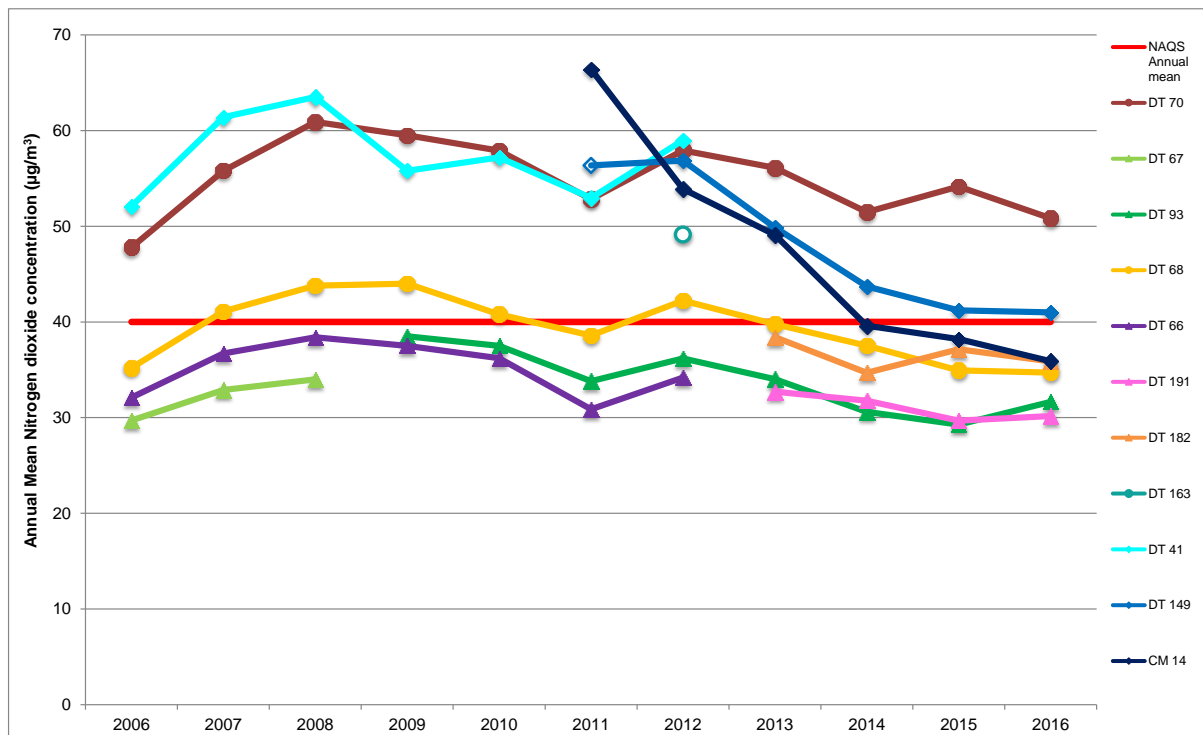


Figure C.9 Overview of NO₂ Diffusion Tube Concentrations in Victoria Road / Meadowside.



Albert Street / Dura Street

Figure C.10 NO₂ Diffusion Tube Locations in Albert Street / Dura Street

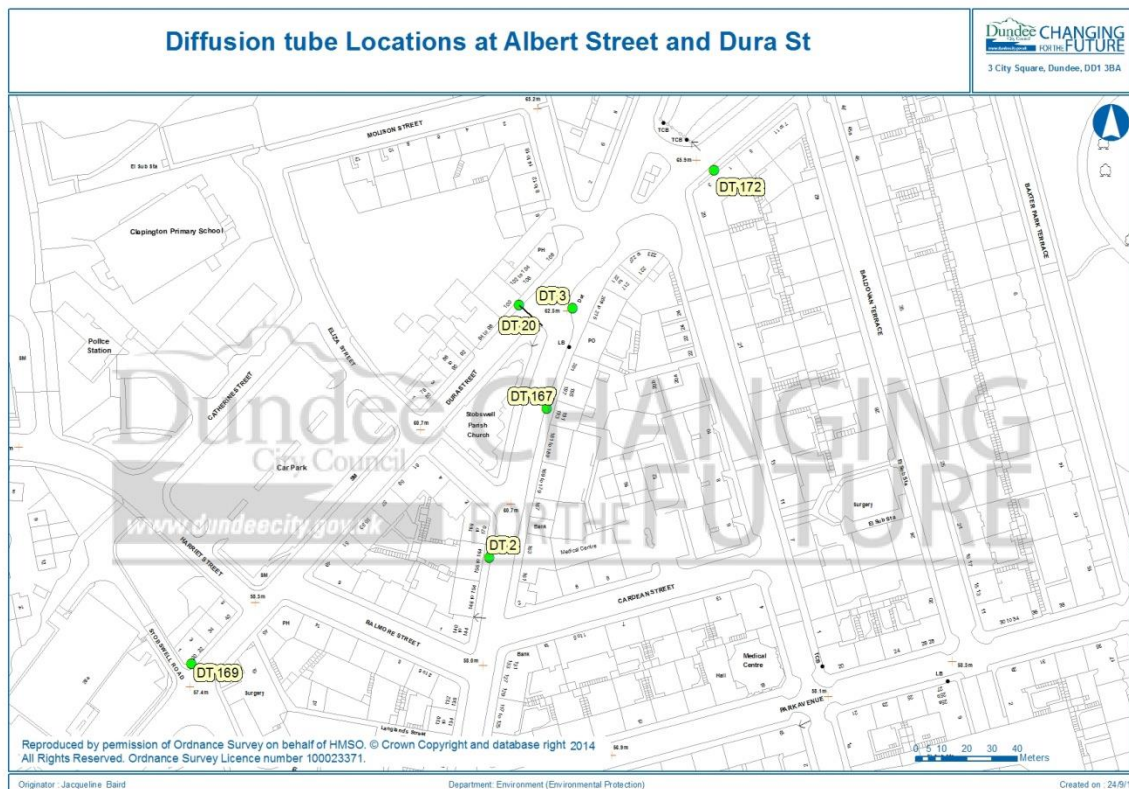
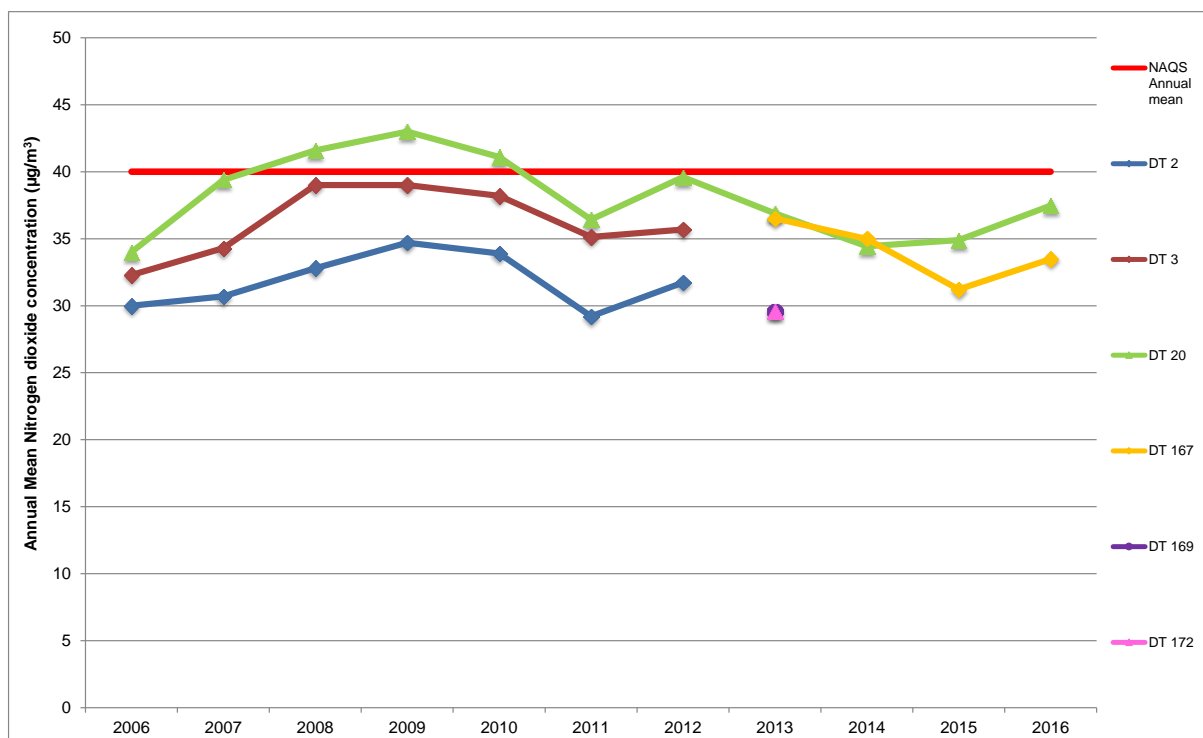


Figure C.11 Overview of NO₂ Diffusion Tube Concentrations in Albert Street / Dura Street.



Lochee Road

Figure C.12 NO₂ Monitoring Locations in Lochee Road

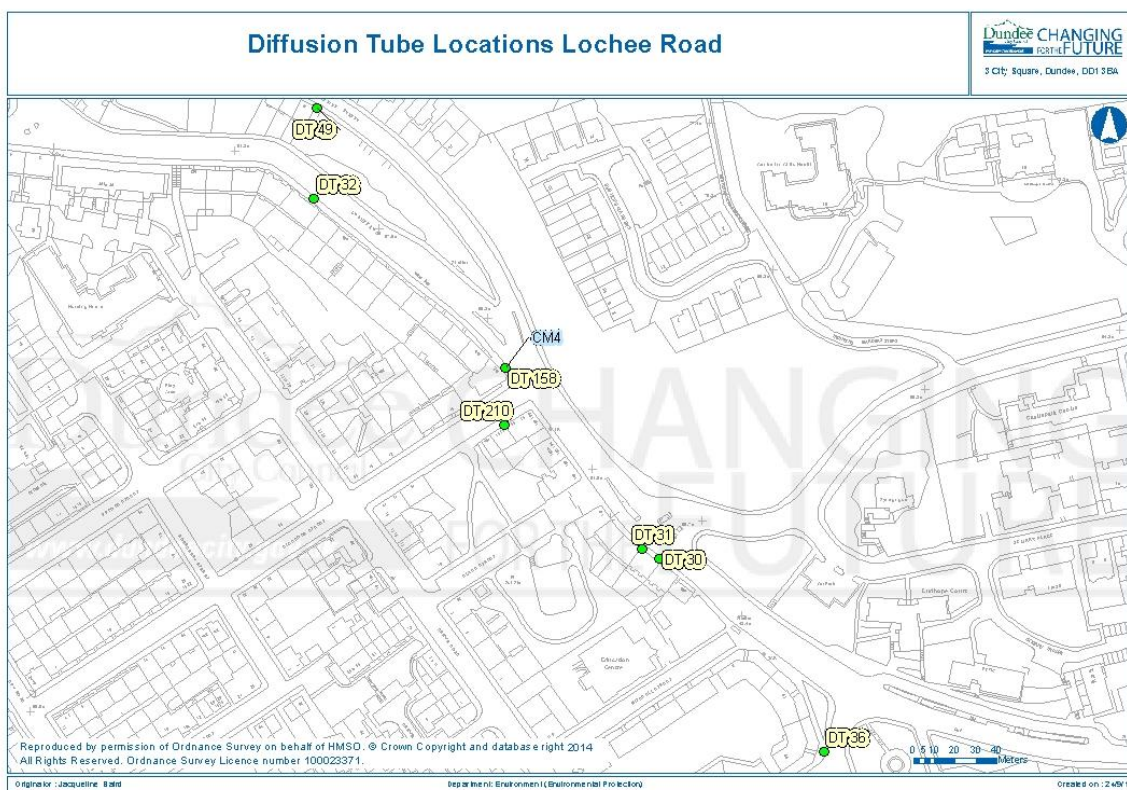
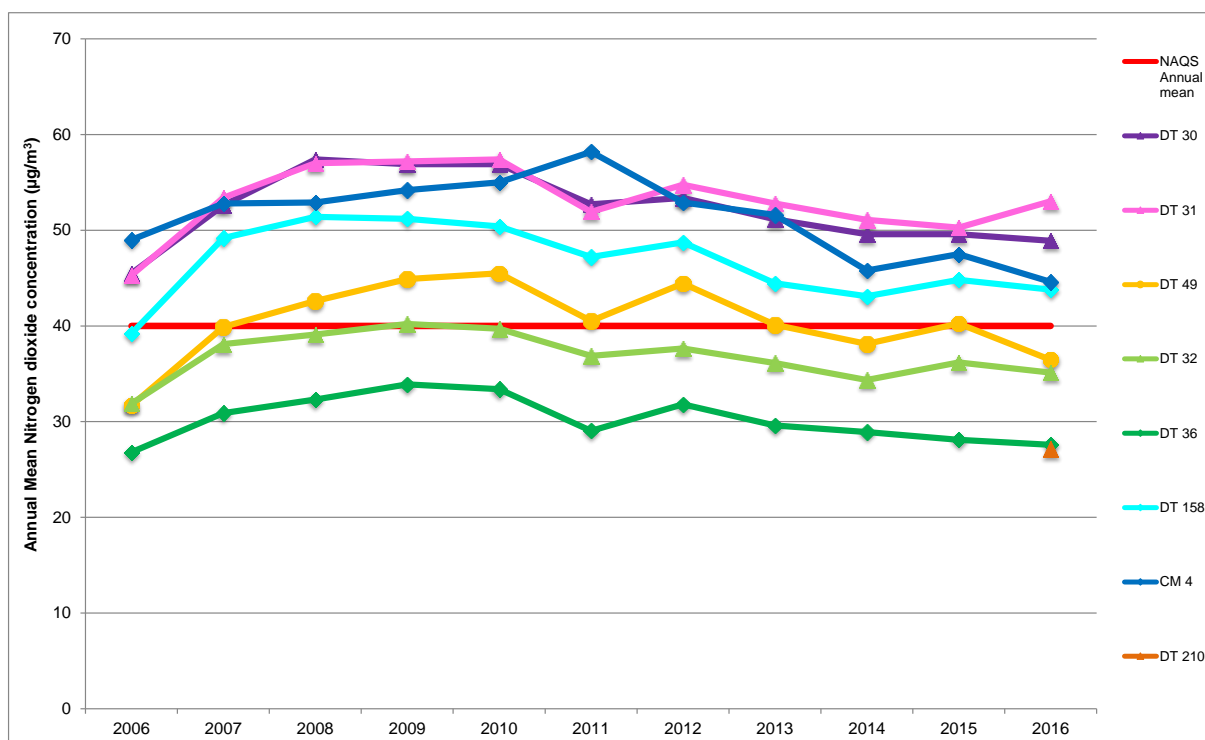


Figure C.13 Overview of NO₂ Concentrations in Lochee Road



Logie Street

Figure C.14 NO₂ Diffusion Tube Locations in Logie Street

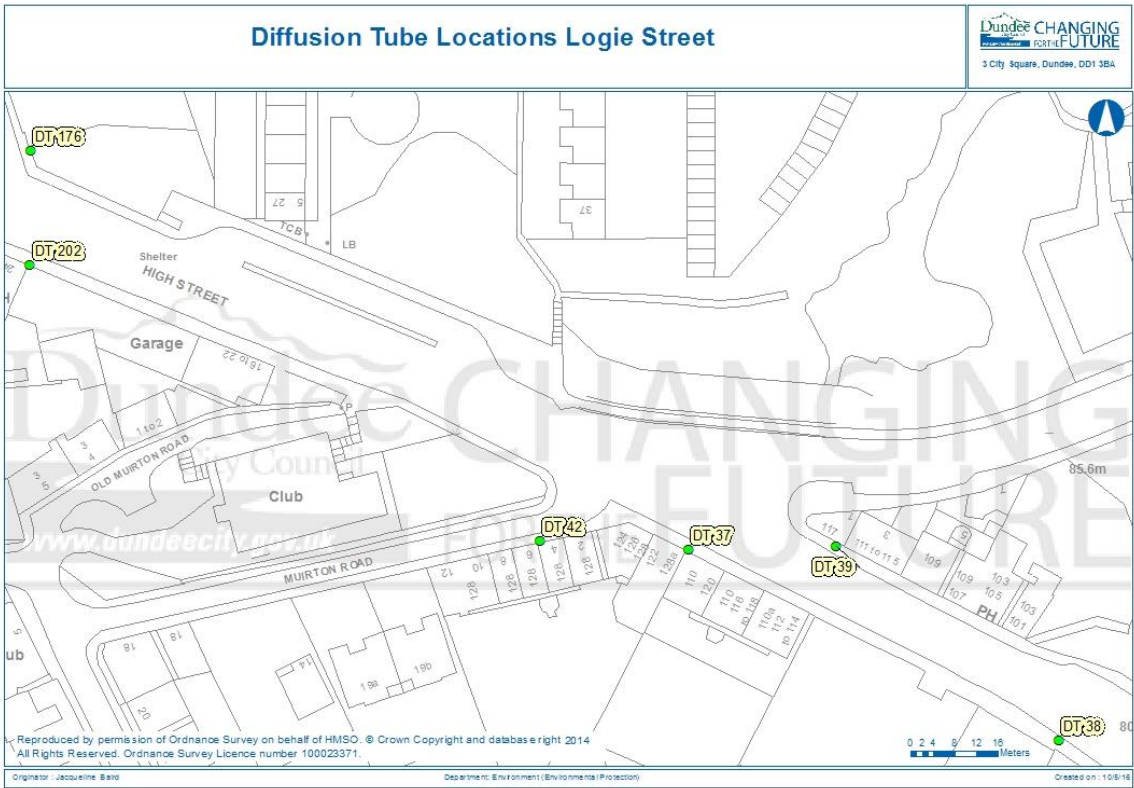
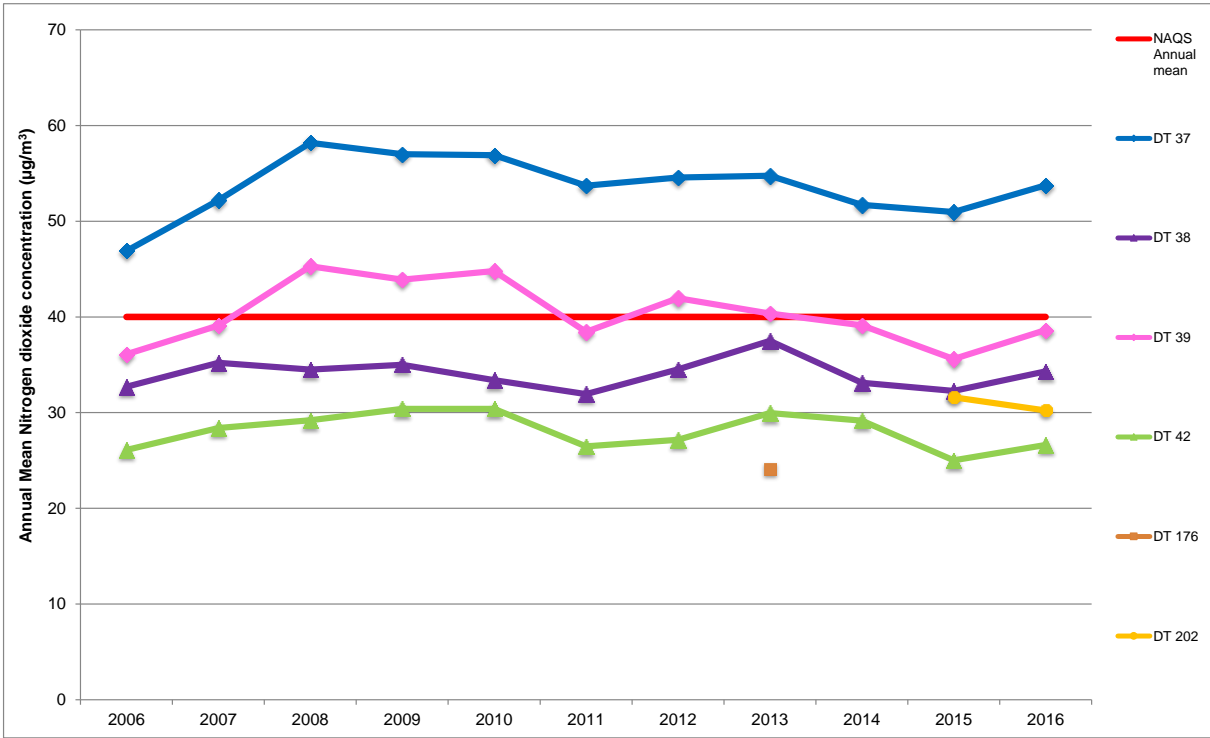


Figure C.15 Overview of NO₂ Diffusion Tube Concentrations in Logie St.



Albert Street / Arbroath Road

Figure C.16 NO₂ Diffusion Tube Locations in Albert St. / Arbroath Road

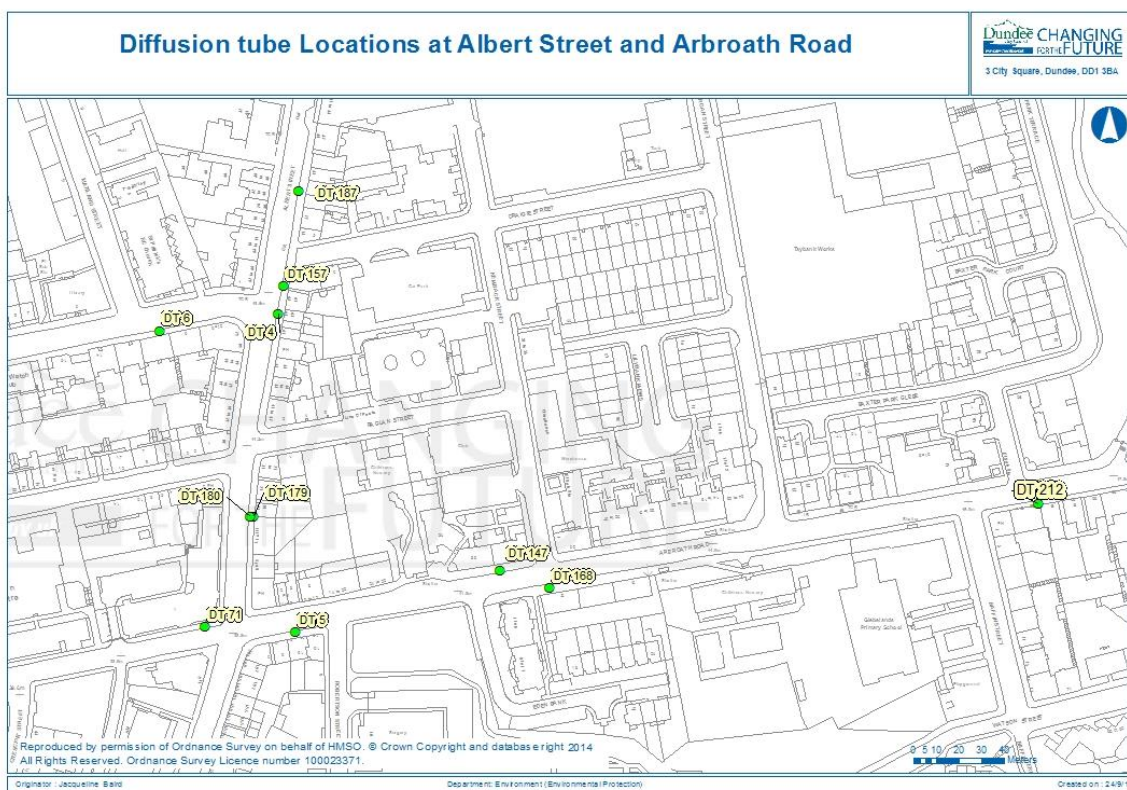
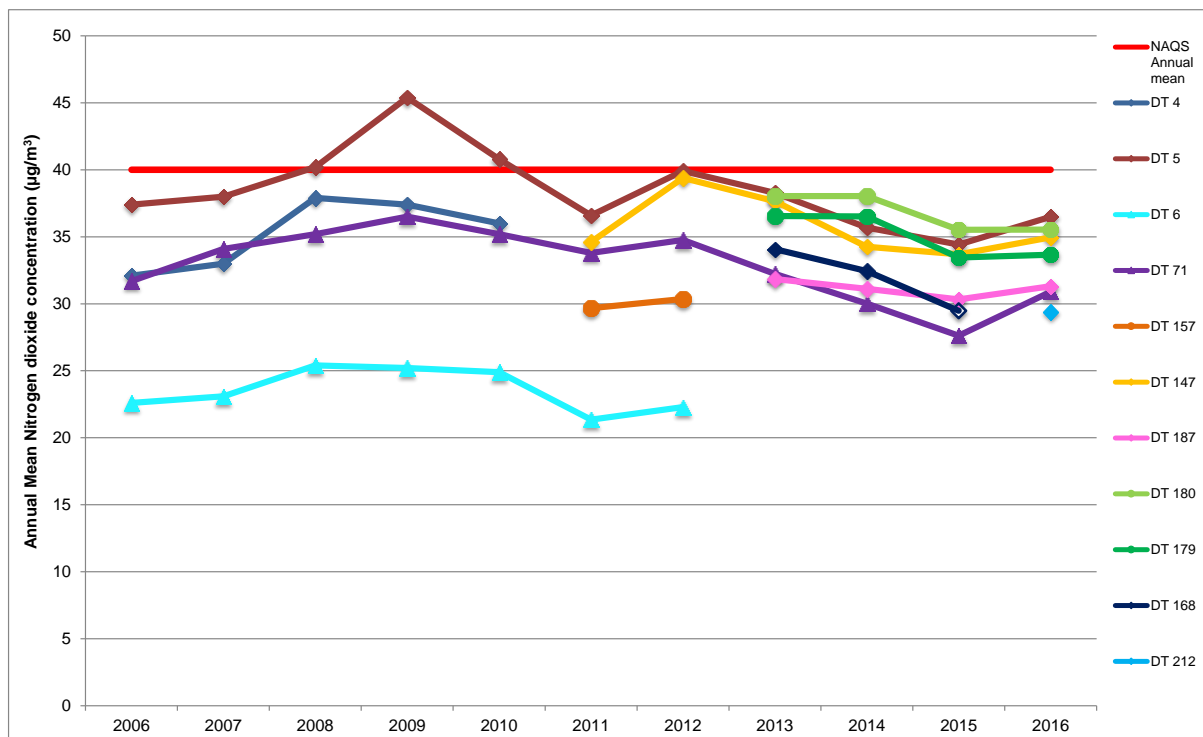


Figure C.17 Overview of NO₂ Diffusion Tube Concentrations in Albert St. / Arbroath Road



Kingsway / Forfar Road.

Figure C.18 NO₂ Diffusion Tube Locations on/near the Kingsway

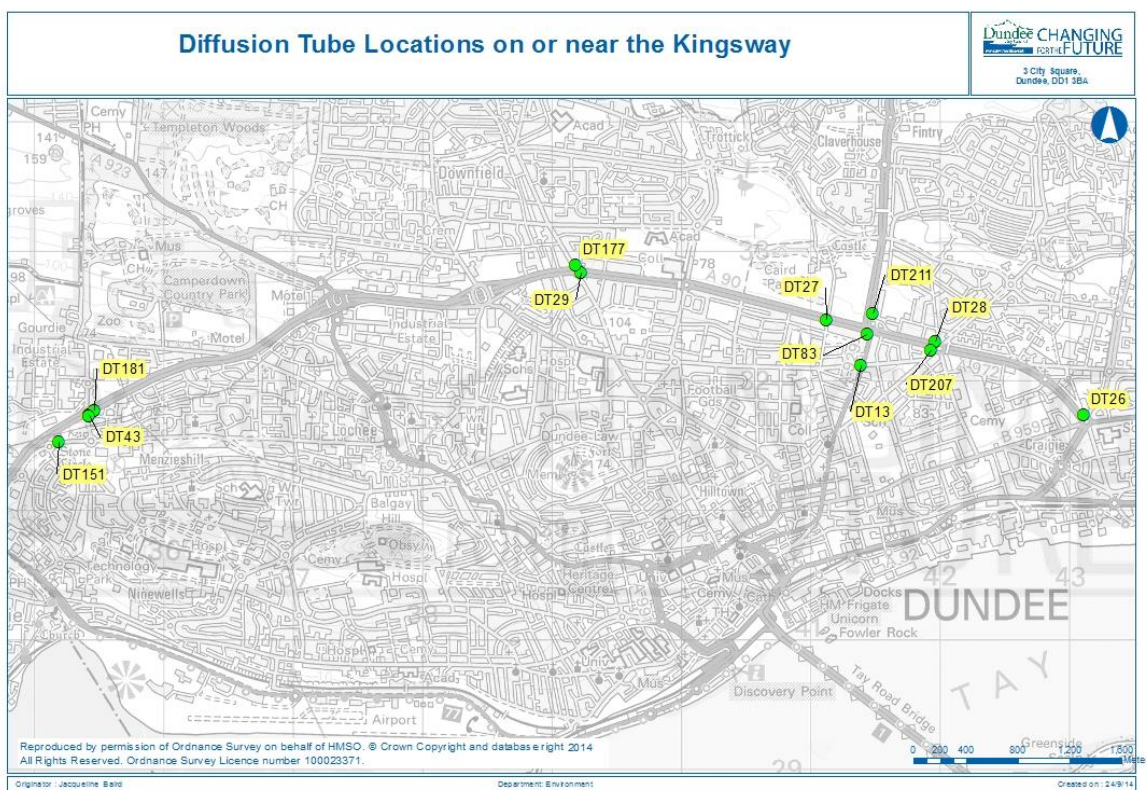
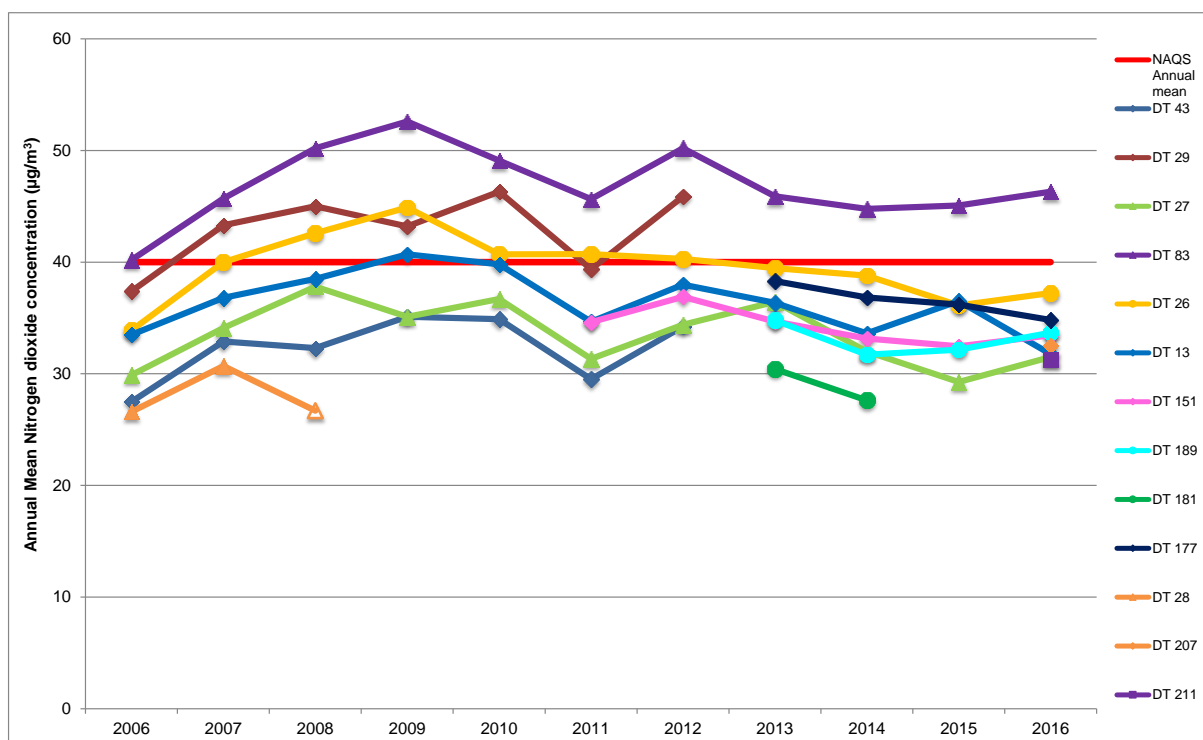


Figure C.19 Overview of NO₂ Diffusion Tube Concentrations on/near the Kingsway



Bus Corridor

Figure C.20 Other NO₂ Diffusion Tube Locations on Bus Corridor

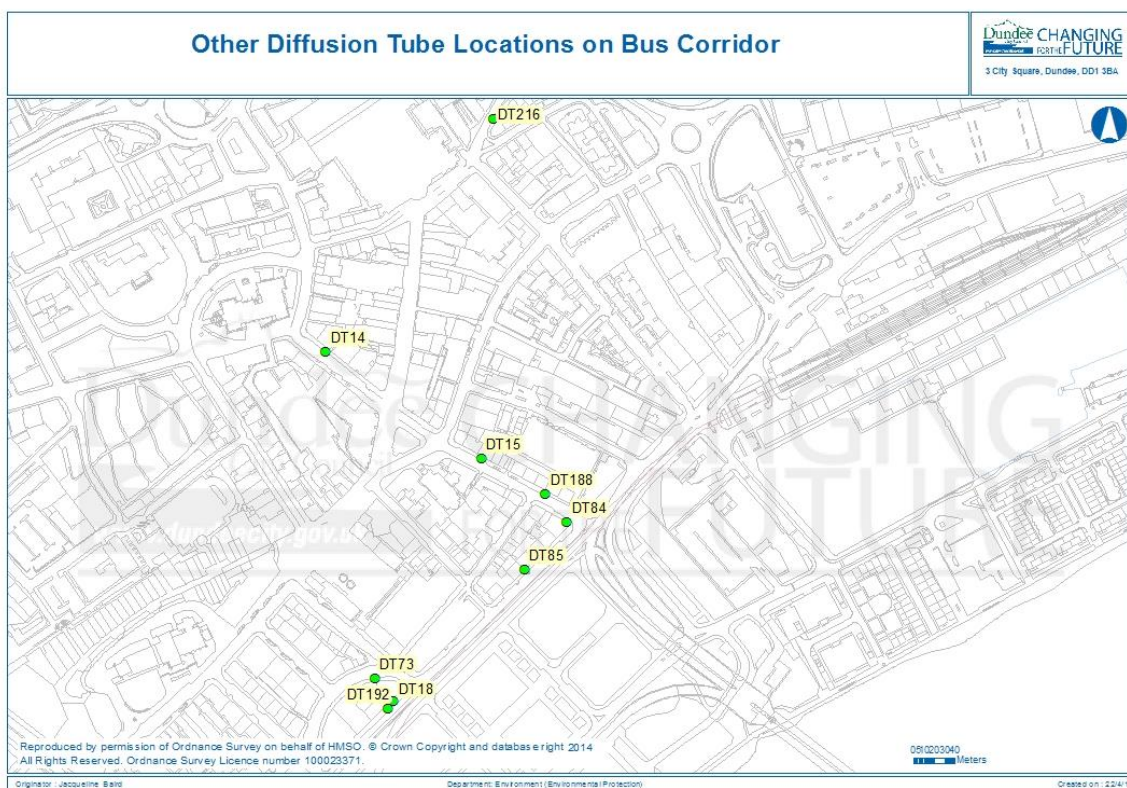
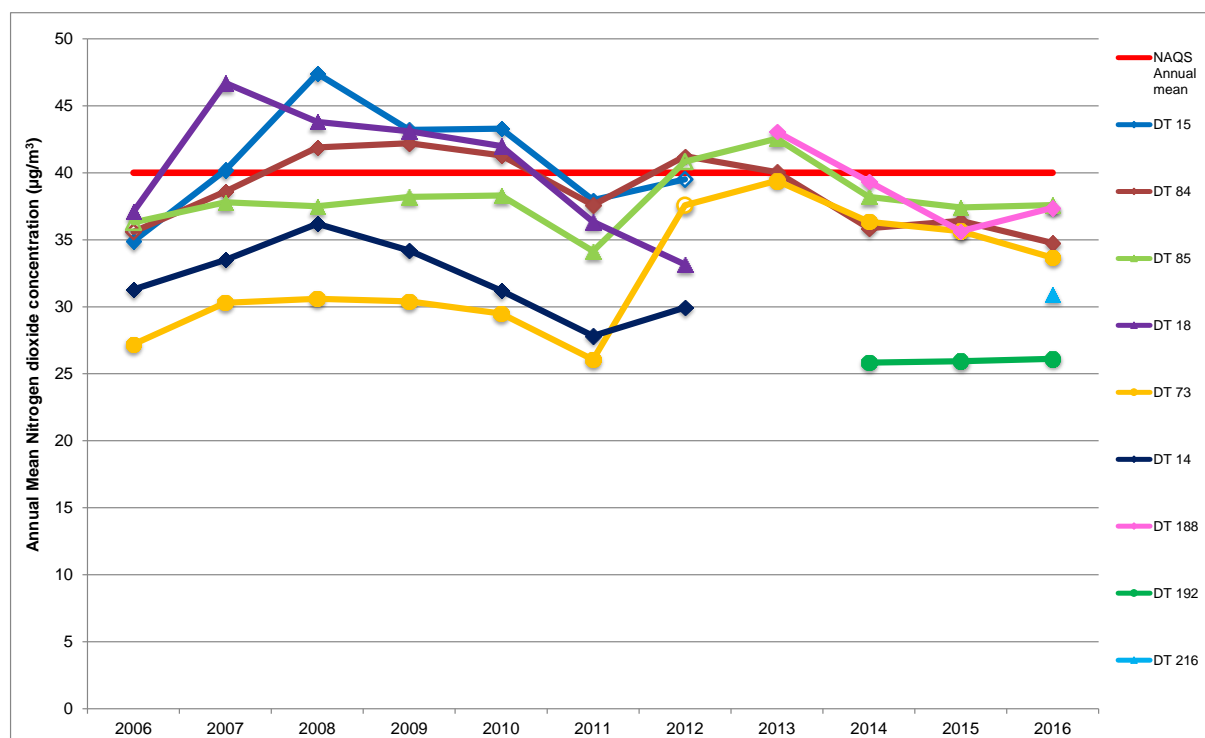


Figure C.21 Overview of Other NO₂ Diffusion Tube Concentrations on Bus Corridor



Inner Ring Road

Figure C.22 NO₂ Diffusion Tube Locations on Inner Ring Road

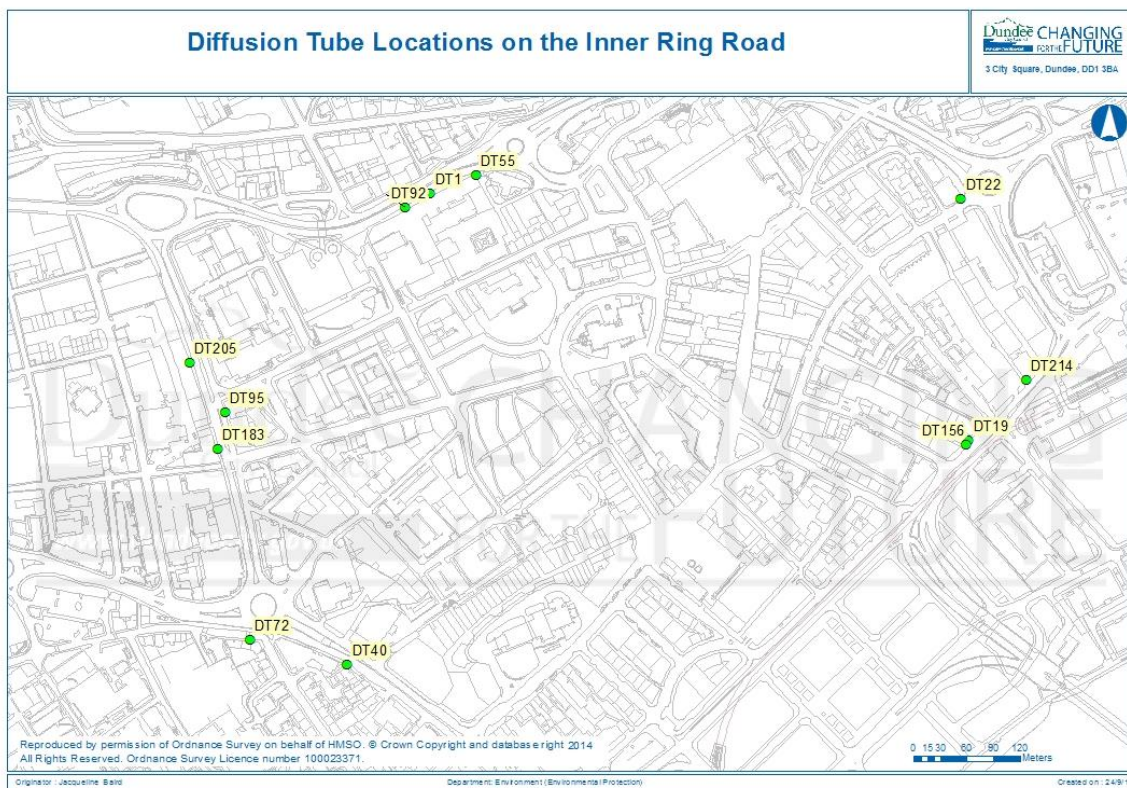
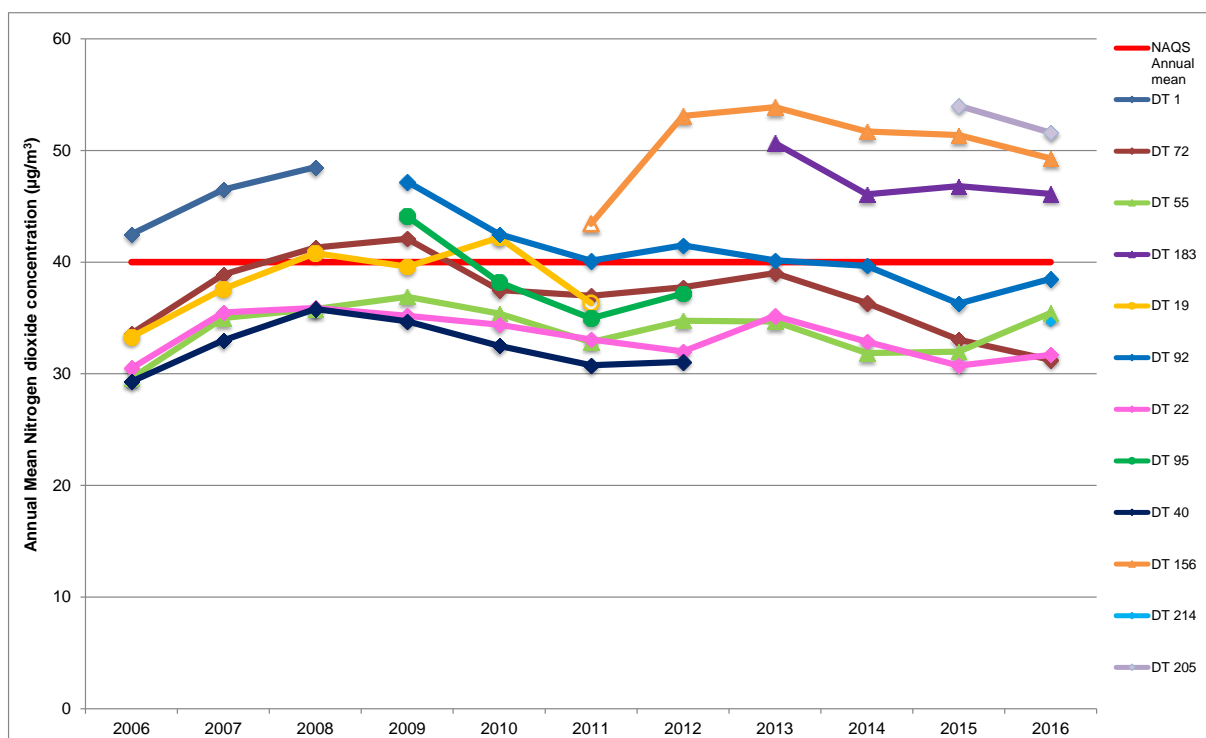


Figure C.23 Overview of NO₂ Diffusion Tube Concentrations on Inner Ring Road



Stannergate Roundabout

Figure C.24 NO₂ Diffusion Tube Location at Stannergate Roundabout

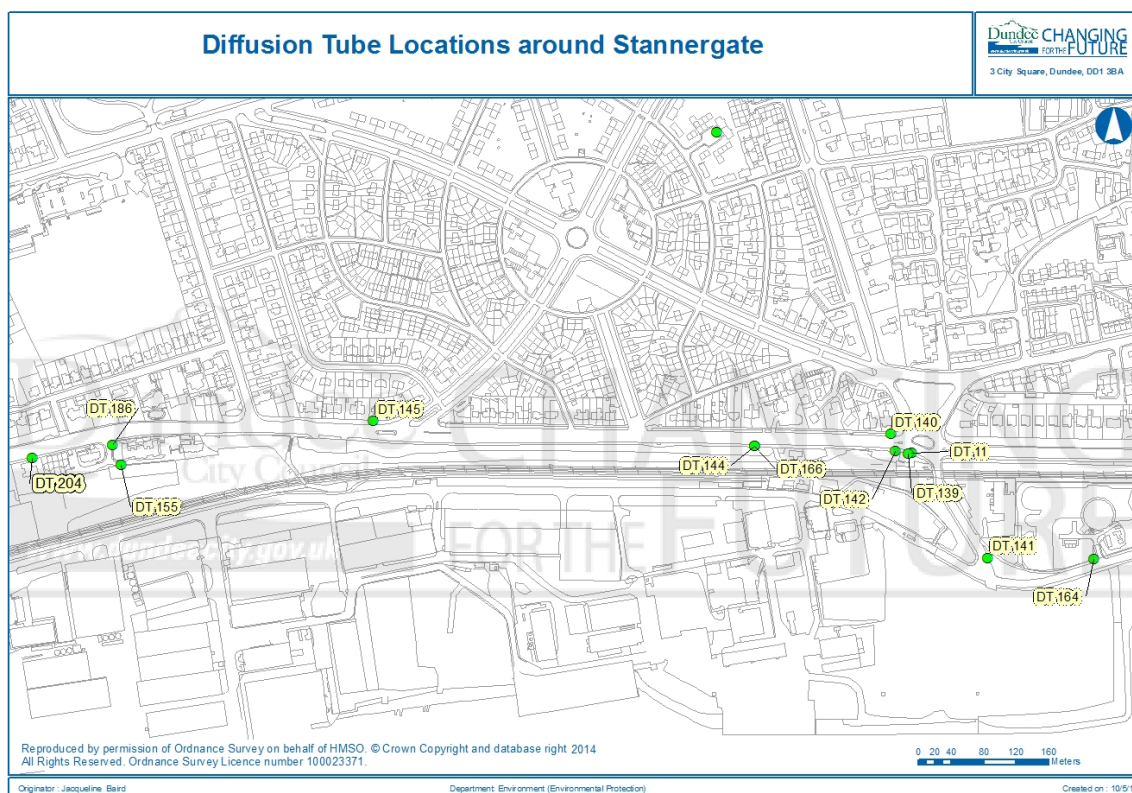
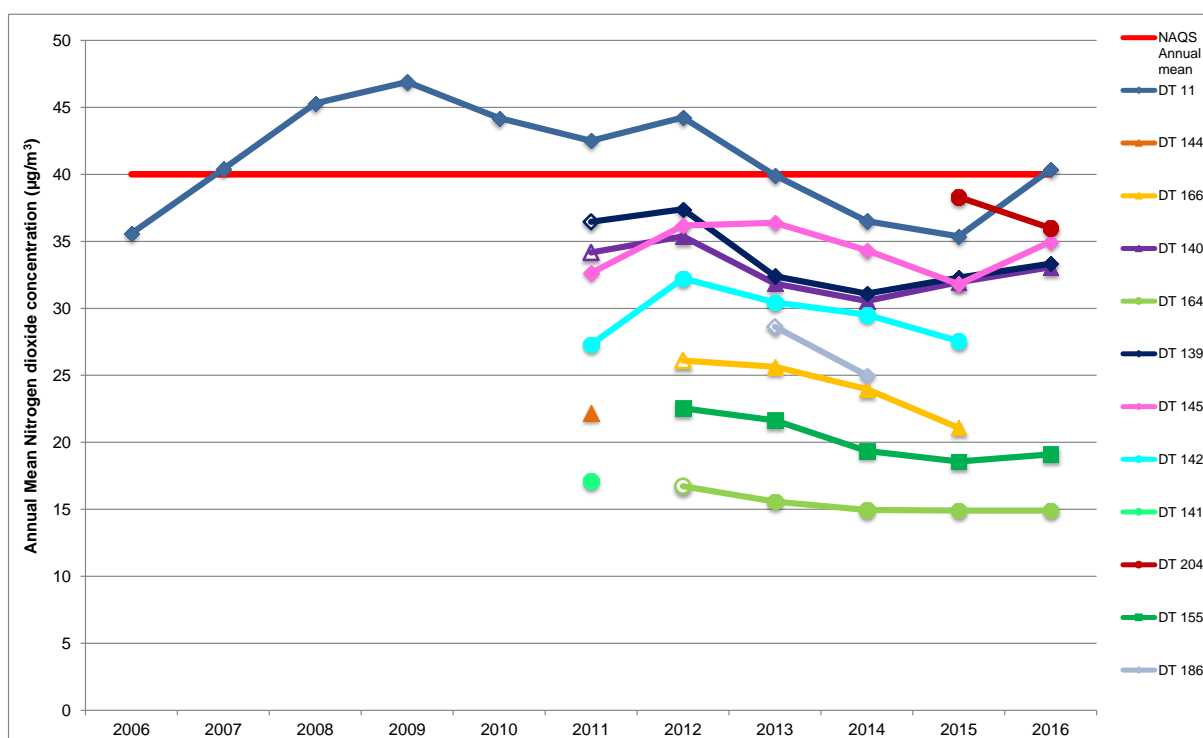


Figure C.25 Overview of NO₂ Diffusion Tube Concentration at Stannergate Roundabout



Strathmore Avenue

Figure C.26 NO₂ Diffusion Tube Location at Strathmore Avenue

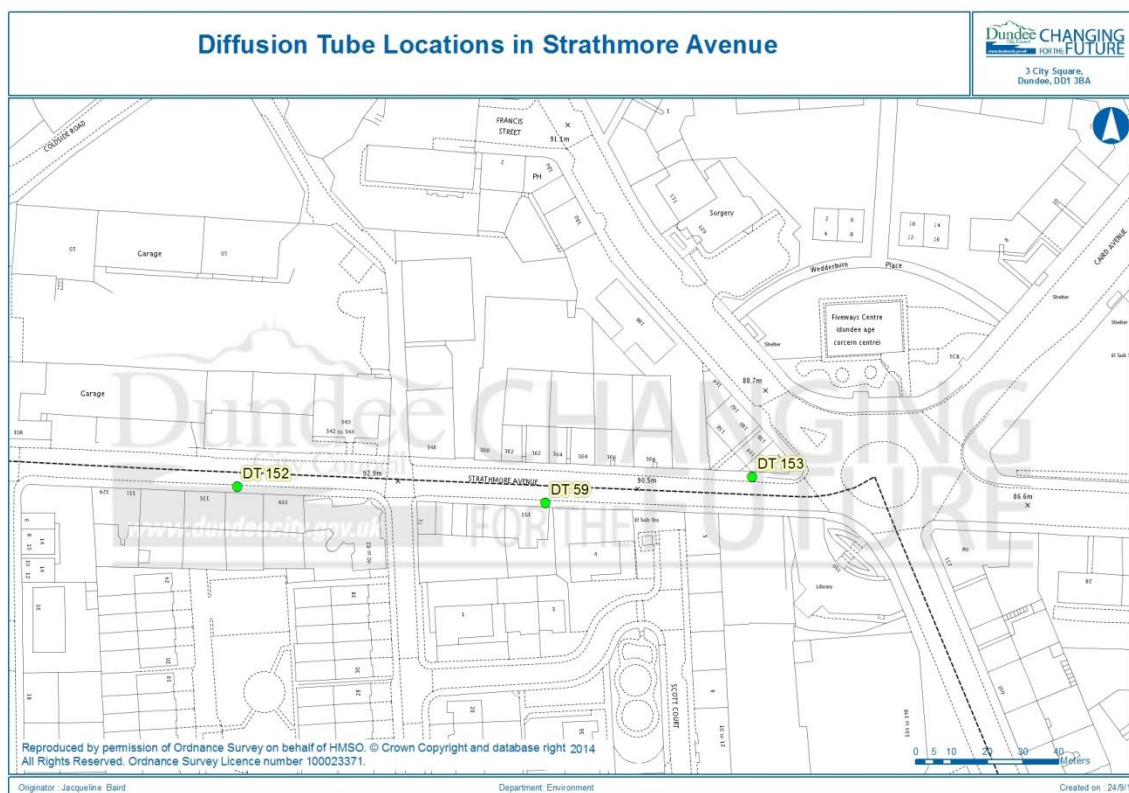


Figure C.27 Overview of NO₂ Diffusion Tube Concentration at Strathmore Avenue

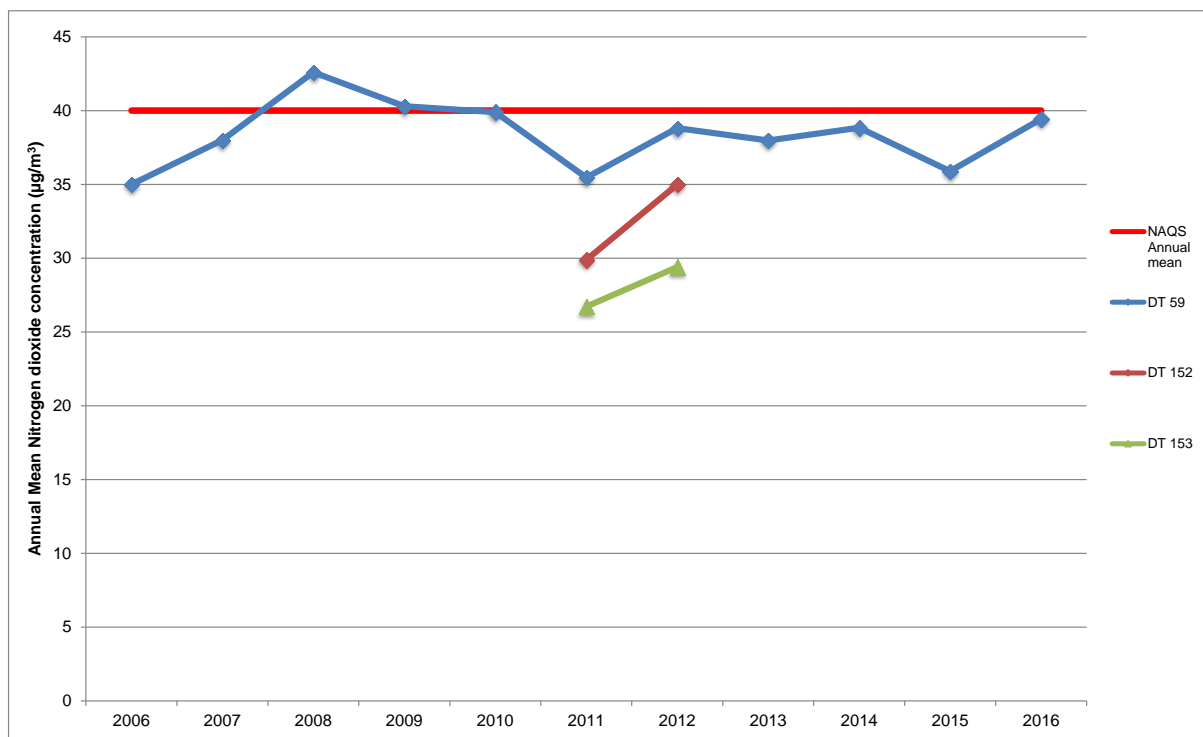


Figure C.28 Urban Background NO₂ Monitoring Locations

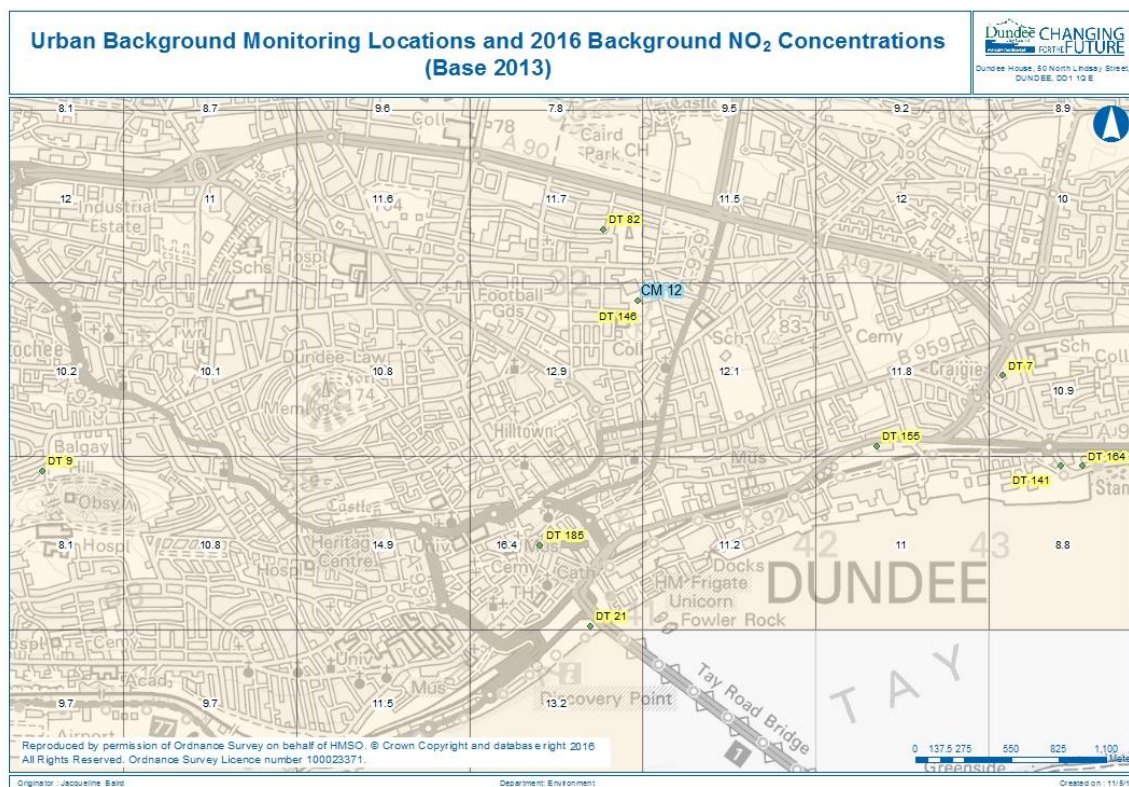
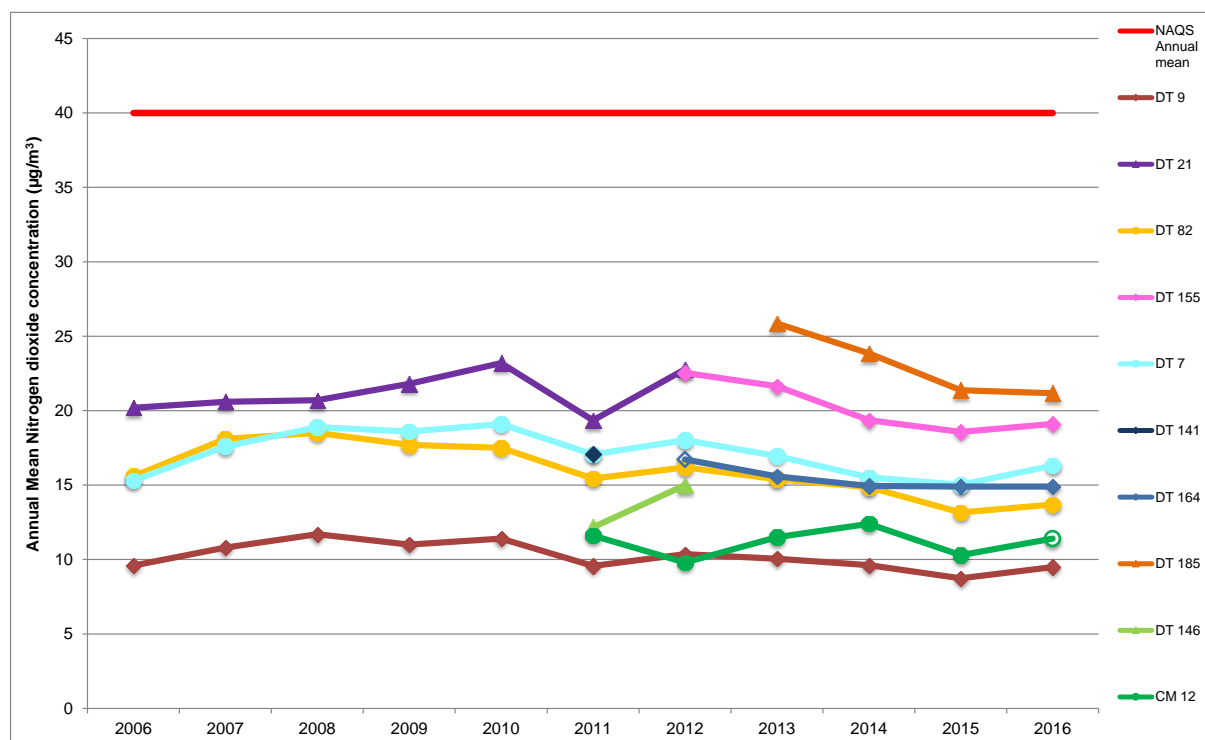
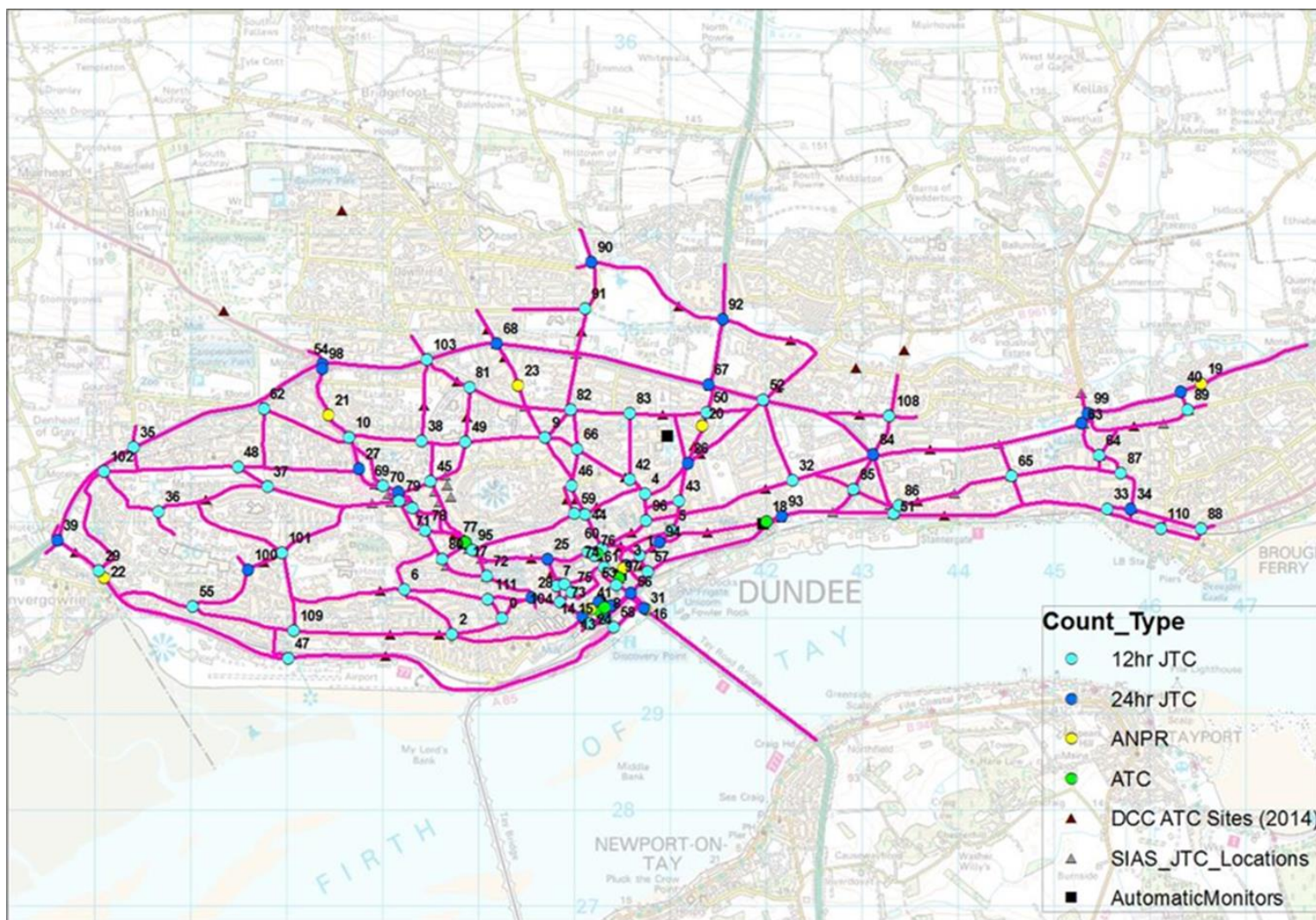


Figure C.29 Overview of NO₂ Concentrations at Urban Background Locations



Appendix C.3 Road Traffic Data

Figure C.30 Road Network and Traffic Count Locations for NMF City Model for Dundee



Note: Picture provided by Mark Williams of Scottish Environment Protection Agency

Table C.6 Road Traffic Reduction Sites – Annual Average Daily Traffic

RTRA count location	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Bar Chart
Arbroath Rd (E of Kenilworth Ave)	13186	13335	14054	13153	13846	12869	13283	13697	13142	13174	13287	13642	
Blackness Rd (W of Marchfield)	6574	6675	6435	6195	6145	5938	5911	5844	5102	5509	5676	6487	
Broughty Ferry Rd (E of Dalgleish Rd)	31956	31802	31535	30098	27640	27756	27315	24741	29322	30272	26809	28161	
Dens Rd (S of Hillbank Rd)	10852	10664	10672	11023	10833	10083	10062	10178	9744	9707	10315	10322	
Forfar Rd (N of Janefield Pl)	9278	9640	9880	8222	9224	9213	8861	9053	8768	9063	9209	8876	
Hilltown (N of Stirling St)	6024	5710	5895	5701	5753	5656	5416	5492	5608	4268	5782	5828	
Lochee Rd (N of Rankine St)	13477	13681	13438	13286	13296	12983	12684	11603	11285	11880	11821	11770	
Perth Rd (E of Windsor St)	8341	7434	7583	7531	7695	7352	7053	7184	7180	7214	7328	6650	
Pitkerro Rd (S of Baxter Park)	10107	9522	9975	9950	9789	9359	8623	8608	8827	8899	9085	9126	
Rankine St (N of Lochee Rd)	8098	7294	8069	7927	7605	7121	7115	6862	7188	6939	7118	7035	
Riverside Dr (nr Airport)	18875	19056	18918	19045	17907	17654	17024	15900	16213	15932	15923	17343	
Rosebank St (N of Kinloch St)	4821	4867	4722	4623	4528	4603	4426	4489	4621	4587	4655	4615	
Tay Bridge	24475	24686	24748	25045	25406	25235	25484	24753	24770	24925	21762	25993	

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 C.7 Road Traffic Reduction Sites – Percentage Growth

RTRA count location	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Bar Chart
Arbroath Rd (E of Kenilworth Ave)	100	101	107	100	105	98	101	104	100	100	101	104	
Blackness Rd (W of Marchfield)	100	102	98	94	93	90	90	89	78	84	86	99	
Broughty Ferry Rd (E of Dalglish Rd)	100	100	99	94	86	87	85	77	92	95	84	88	
Dens Rd (S of Hillbank Rd)	100	98	98	102	100	93	93	94	90	89	95	95	
Forfar Rd (N of Janefield Pl)	100	104	106	89	99	99	96	98	95	98	99	96	
Hilltown (N of Stirling St)	100	95	98	95	96	94	90	91	93	71	96	97	
Lochee Rd (N of Rankine St)	100	102	100	99	99	96	94	86	84	88	88	87	
Perth Rd (E of Windsor St)	100	89	91	90	92	88	85	86	86	86	88	80	
Pitkerro Rd (S of Baxter Park)	100	94	99	98	97	93	85	85	87	88	90	90	
Rankine St (N of Lochee Rd)	100	90	100	98	94	88	88	85	89	86	88	87	
Riverside Dr (nr Airport)	100	101	100	101	95	94	90	84	86	84	84	92	
Rosebank St (N of Kinloch St)	100	101	98	96	94	95	92	93	96	95	97	96	
Tay Bridge	100	101	101	102	104	103	104	101	101	102	89	106	

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 C.10 List of Industrial Processes

Process Name/Address	Process Type	PPC Sector	New source since APR 2016?	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 no significant increase in LAQM pollutants
Dundee Energy Recycling, Baldovie, Dundee	Chapter 5: Waste Management	IPPC S5.01 & S5.01b	No	No	No	Yes, previously assessed	No	No	No Change, planning application granted for new incinerator
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	Site is now effectively a Part B process, but a formal surrender of the Part A has not yet been submitted. Air emissions remain low with the site running fully on gas, with occasional use of gasoil only.
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
Hanson Aggregates Piper Street, Dundee	Chapter 3: Mineral Industries cement batchers	3.1.a.(ii)	No	No	No	No	No	No	Not operating.

Dundee City Council

Process Name/Address	Process Type	PPC Sector	New source since APR 2016?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
Subsea Protection Systems	Chapter 3: Mineral Industries cement batching	3.1.b	No	No	No	Yes, previously assessed	No	No	Permit surrender application received March 2017.
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
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

Dundee City Council

Process Name/Address	Process Type	PPC Sector	New source since APR 2016?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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
Ferry Laundrette Broughty Ferry	Chapter 7: SED Activities	Chapter 7: SED Activities	No	No	No	No	No	No	No Change

Dundee City Council

Process Name/Address	Process Type	PPC Sector	New source since APR 2016?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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	No Change
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, 1 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
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	No Change

Dundee City Council

Process Name/Address	Process Type	PPC Sector	New source since APR 2016?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
J T Inglis, Riverside Works, Dundee	Chapter 6: Other Activities Textile Treatment	6.4.d	No	No	No	No	No	No	Site Closed, surrender application received
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	New extension completed. No change to emissions.
Michelin Tyre Plant, Dundee	Chapter 1: Energy Industries, Combustion	1.1.a	No	No	No	Yes, previously assessed	No	No	New extension under construction. No change to combustion emissions.
D C Thomson Printers, Dundee	Chapter 6: Other Activities printing process	6.4.b	No	No	No	No	No	No	Not operating permitted activity
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	Site closed 2016. Small scale non-licensed process still operating but expected to also close down 2017..
RMC Readymix Ltd, Dundee	Chapter 3: Mineral Industries, Cement Batching	3.1.a.(ii)	No	No	No	No	No	No	No change
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

Process Name/Address	Process Type	PPC Sector	New source since APR 2016?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
Armitages Pet Products Ltd, Broughty Ferry Road-Dundee	Chapter 6: Other Activities, Pet Food Manufacture	6.8.a	No	No	No	No	No	No	No change
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	No change
New PVR at Asda, Myrekirk Road	Chapter 1: Energy Industries, Petrol Station	1.2.c.(ii)	No	No	No	Yes, but no relevant receptors	No	No	New site
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	New biodiesel PPC processing site. Permit issued Sept 2014 – not pursued permit revoked 2016

Dundee City Council

Process Name/Address	Process Type	PPC Sector	New source since APR 2016?	Existing process with new exposure?	Is change substantial (>30%)?	Process Potentially Requiring Review & Assessment~	Nomogram screening assessment required?	Detailed assessment Required?	SEPA Comments
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
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.
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

Notes: **Yes*** see Section 4.3
 ~ With reference to Annex 2 Appendix E TG.03
 Part A - Processes shaded purple

Appendix C.11: DMRB Calculations

Input Data

Location	Coordinates of Background Grid Squares (1km x 1km)		Background Concentrations			
	x	y	Year	NO _x	NO ₂	PM ₁₀
A	341500	731500	2015	19.2	12.8	11.7
B	343500	733500	2015	14	9.4	11.1
C	337500	731500	2015	16	10.7	11
D	346500	730500	2015	10.8	7.2	10

DMRB Inputs

Location	Link Number	Distance from link to road centre (m)	AADT (combined , veh/day)	Annual Average Speed (km/h)	Road Type (A,B,C,D)	Total % LDV (<3.5t GVW)	Total % HDV (>3.5t GVW)
A	1	6.51	12701	32	B	94	6
B	1	10.87	13169	48.2	B	93	7
C	1	11.91	16122	32.2	B	95.4	4.6
	2	43.03	6619	32.2	B	93.1	6.9
	3	58.11	13583	32.2	B	96.4	3.6
D	1	9.32	11377	48.2	B	96.1	3.9
	2	17.43	1838	24.1	B	96	4
	3	7.77	473	24.1	B	99	1

DMRB Results

RECEPTOR (x,y denote the DCC corporate address point)				Description	Year	Rd NO _x (1)	Verification Factor	Adj Rd NO _x (2)	Background NO _x	Adj Total NO _x (3)	Total NO ₂ (4)	PM ₁₀ Annual Mean (ug/m ³)	PM ₁₀ No. of Days >50
Location	X	Y	Name										
A	341438	731117	89 Arbroath Road	urban free flow	2015	11.21	2.7093	30.36	19.2	49.56	27.98	12.95	0
B	343890	733017	2 Drumgeith Road	urban free flow	2015	10.19	2.7093	27.60	14	41.60	23.5	12.06	0
C	337603	731908	1 Earl Street	junction	2015	15.74	2.7093	42.66	16	58.66	31.62	12.86	0
D	346353	730990	305 to 317 Queen Street	junction	2015	8.75	2.7093	23.72	10.8	34.52	19.54	10.97	0

Notes:

¹ Rd NO_x = Road NO_x direct from DMRB local output sheet (following Box 1 from DMRB guidance note provided at <http://laqm.defra.gov.uk/laqm-fags/>)

² Adj Rd NO_x = Rd NO_x x verification factor

³ Adj Total NO_x = Adj Rd NO_x + Background NO_x

⁴ Total NO₂ = from NO_x to NO₂ calculator (available at LAQM Support website)

Background Figures taken from the Scottish Government Background Maps (Base2013), road sector contributions were not removed from these concentrations based on advice given by LAQM helpdesk. Figures in Orange cells were derived from the NO_x to NO₂ calculator v5.1

Verification

DMRB Verification Results

Verification Sites					Background			2015		DMRB	Total	Road	Canyon	In	Verification	Verification factored		
Site ID (DT)	Site type	Description	x	y	NO _x	NO ₂	PM ₁₀	NO ₂ tube conc (bias-corrected)	NO ₂ tube Road NO _x	Road NO _x	NO ₂	NO ₂	?	canyon Total NO ₂	Factor	Road NO _x	Total Adj NO ₂	Road adj NO ₂
184	R	urban free flow	340697	730950	26.1	17.2	13	27.3	20.11	13.33	24	6.8	n	n/a	2.7093	36.11	34.67	17.47
92	R	urban free flow	340019	730612	26.1	17.2	13	36.3	39.83	9.77	22.23	5.03	n	n/a	2.7093	26.46	30.29	13.09
27	R	urban free flow	341124	732468	18.1	12.1	12.2	29.3	34.63	16.14	20.47	8.37	n	n/a	2.7093	43.73	33.36	21.26
204	R	urban free flow	342244	731066	18.6	12.4	11.7	38.3	54.7	14.24	19.81	7.41	n	n/a	2.7093	38.58	31.36	18.96

Notes: Background Figures taken from the Scottish Government Background Maps (Base 2013), road sector contributions were not removed from these concentrations based on advice given by LAQM helpdesk. Figures in Orange cells were derived from the NO_x to NO₂ calculator v5.1

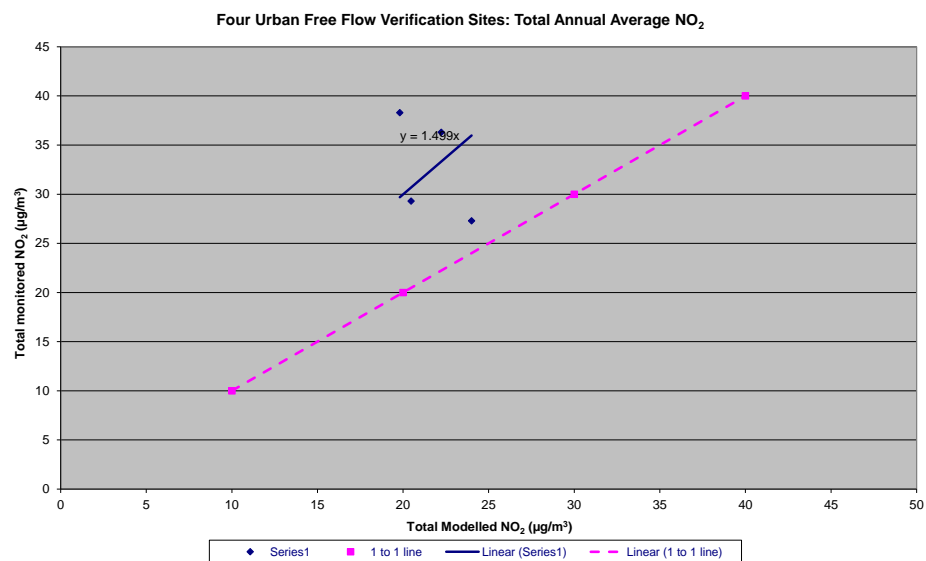
Summary of Modelled vs Monitoring NO₂ Results before Adjustment

Summary	Number
within +10%	0
within -10%	0
Within +-10%	0
within +10% to 25%	0
within -10% to 25%	1
Within +-10% to 25%	1
over +25%	0
under -25%	3
Greater +-25%	3
Within +-25%	1

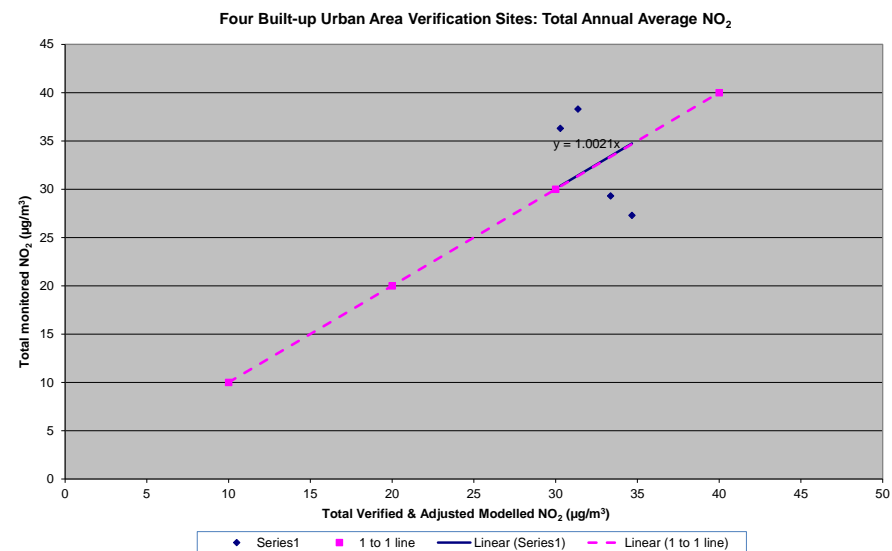
Summary of Modelled vs Monitoring NO₂ Results after Adjustment

Summary	Number
within +10%	0
within -10%	0
Within +-10%	0
within +10% to 25%	2
within -10% to 25%	2
Within +-10% to 25%	4
over +25%	0
under -25%	0
Greater +-25%	0
Within +-25%	4

Graph of Monitored vs Modelled NO₂ Results before Adjustment



Graph of Monitored vs Modelled NO₂ Results after Adjustment



Glossary of Terms

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
APR	Air quality Annual Progress Report
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
AQO	Air Quality Objective
AQS	Air Quality Strategy
ATC	Automatic Traffic Count
AURN	Automatic Urban and Rural Network (Defra funded 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 Strategy
CHP	Combined Heat and Power
CO	Carbon Monoxide
DCC	Dundee City Council
Defra	Department for Environment, Food and Rural Affairs
DERL	Dundee Energy Recycling Ltd
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
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.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)
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	Oxides of nitrogen
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
P&T	Planning and Transportation
PM _{2.5}	Legal definition ¹⁰ of Particulate Matter less than 2.5µm aerodynamic diameter
PM ₁₀	Legal definition ¹¹ of Particulate Matter less than 10µm aerodynamic diameter
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
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
TEA	Triethanolamine
TEOM	Tapered Element Oscillating Microbalance
UKAS	United Kingdom Accreditation Service
ULEV	Ultra Low Emission Vehicle
USA	Updating and Screening Assessment
µg/m ³	Micrograms per cubic metre
VCM	Volatile Correction Method
VOC	Volatile Organic Compound
vpd	Vehicles per day
WASP	Workplace Analysis Scheme for Proficiency

¹⁰ <http://www.legislation.gov.uk/ssi/2016/162/regulation/2/made>

¹¹ <http://www.legislation.gov.uk/ssi/2000/97/schedule/made>

References

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