Fife Air Quality Annual Progress Report 2017

Fife Council

Report for Fife Council
ED10032

2017 Air Quality Annual Progress Report (APR) for
Fife Council

In fulfilment of Part IV of the
Environment Act 1995

Local Air Quality Management

October 2017

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Contact:

David Hector
Ricardo Energy & Environment
18 Blythswood Square, Glasgow
G2 4BG
t: +44 (0) 1235 75 3523
e: david.hector@ricardo.com

Ricardo-AEA Ltd is certificated to ISO9001 and ISO14001

Author:

Marshall-Padkin, Ellis

Approved By:

Stephen Stratton

Date:

12 October 2017

Ricardo Energy & Environment reference:

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Local Authority Officer	Kenny Bisset
Department	Land & Air Quality Team
Address	Economy, Planning and Employability Services Fife Council Kingdom House Kingdom Avenue Glenrothes Fife KY7 5LY
Telephone	03451 555555. Ext. 440461
e-mail	Kenny.Bisset@fife.gov.uk
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Executive summary

Air Quality in Fife

The Annual Progress Report utilises monitoring data collected throughout 2016. Fife Council carry out monitoring of nitrogen dioxide (NO_2) at 4 automatic stations in Cupar, Kirkcaldy, Dunfermline and Rosyth. Non-automatic monitoring of NO_2 was carried out using diffusion tubes at 59 sites in 2016.

The concentrations measured in 2016, following bias adjustment, were compared against the Air Quality Strategy (AQS) annual mean objective of 40 ug m^{-3} for NO_2. Marginal exceedances of the annual mean objective were evident at the following sites:

- Bonnygate B4, Cupar (41 µg m^{-3})
- City Road 6, St Andrews (42 µg m^{-3})

The marginal exceedance measured within City Road 6 St Andrews diffusion tube site is the result of new monitoring deployed within the town centre which commenced in 2016. This monitoring location is however some distance (just over 2m) from the kerbside and therefore requires to be corrected for NO_2 drop off using the Local Air Quality Management (LAQM) NO_2 fall off with distance calculator[1]. This results in an annual mean concentration of 33 µg m^{-3} at the nearest receptor which is below the objective. Further details of the drop of calculations are provided in Appendix C.

Particulate matter (PM_{10}) is measured at the four automatic sites within Fife at Cupar, Kirkcaldy, Dunfermline and Rosyth. In 2016 the concentrations measured were below the PM_{10} annual mean objective of 18 ug m^{-3} at all sites.

$PM_{2.5}$ concentrations have been measured at Rosyth since July 2015. $PM_{2.5}$ monitoring commenced at Kirkcaldy and Dunfermline during 2016 and these concentrations have been annualised in accordance with TG (16)[2]. $PM_{2.5}$ monitoring commenced in Cupar in December 2016 and will be reported in the 2018 Annual Progress Report. In 2016 the concentrations measured were below the $PM_{2.5}$ annual mean objective of 10 ug m^{-3} at all sites.

The review of all available data relating to carbon monoxide (CO), sulphur dioxide (SO_2) and benzene monitoring during 2016 indicates that it is unlikely that any AQS objectives relating to these pollutants were exceeded during 2016. The review of all other local developments has not identified any locations where there may be a risk of the air quality objectives being exceeded and so no additional air quality assessment is recommended at this time. Longannet Power station ceased operation in March 2016.

There are currently two AQMAs for NO_2 and PM_{10} located within the Fife Council boundary, these are:

- Bonnygate, Cupar, declared in October 2008.
- Appin Crescent, Dunfermline, declared in November 2011 for NO_2 and August 2012 for PM_{10}.

The AQAP for the Bonnygate, Cupar AQMA was last updated in 2015 and has been successful in reducing both NO_2 and PM_{10} concentrations within the Bonnygate area. Only one marginal exceedance of the NO_2 AQS objective was measured within the Bonnygate AQMA during 2016.

The AQAP for Appin Crescent, Dunfermline was last updated in 2015. The AQAP aims to reduce NO_2 and PM_{10} concentrations within Appin Crescent. Initially an AQMA was declared in November 2011 for NO_2 only, however this was amended in August 2012 to include PM_{10}. In 2016 NO_2 annual mean concentrations were below the objective at all locations. PM_{10} concentrations at the automatic monitoring site at Appin Crescent decreased during 2016.

The Air Quality Strategy for Fife 2015 – 2020 was developed from the guidance of the Scottish Government and aims not only to raise awareness of air quality issues but also to promote some of the existing best practice work that the Council has undertaken within existing AQMAs to other parts

[1] NO_2 fall off with distance, available at: https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html
[2] TG.16, available at: https://laqm.defra.gov.uk/technical-guidance/

of Fife. It recognises that no one single authority or Council service can have all the solutions and consequently a collaborative approach with key partners and stakeholders is considered essential in order to bring about improvements in air quality.

Fife Council has a duty to keep their action plans up to date (LAQM.PG(S) (16))[3]. The obligation to keep air quality action plans up to date provides the opportunity for local authorities to periodically review the progress that has been made in implementing the air quality action plan, and assess the significance of improvements in air quality that have been observed since the adoption of the plan.

Following the review of all available data it is recommended that Fife Council carry out the following actions:

1. Consider extending the additional monitoring for NO_2 which commenced in 2016 within St Andrews Town Centre for at least another calendar year (2017) to ensure ongoing compliance with Air Quality Objectives.

2. Submit the next Air Quality Progress Report in June 2018.

3. Maintain the current monitoring programme.

4. Continue to implement the measures outlined in the action plans for Appin Crescent, Dunfermline and Bonnygate, Cupar.

Fife Council confirms it will undertake these recommended actions.

Actions to Improve Air Quality

Measures outlined in the AQAP for Bonnygate, Cupar and Appin Crescent, Dunfermline have been implemented throughout 2016. The installation of the traffic management system within Cupar has been implemented and is now completed. The traffic management system and twin mini roundabout system has been implemented at St Catherine Street/East Bridge to ease the flow of traffic through Cupar, reducing congestion.

In 2016/2017 an updated air quality modelling assessment was conducted for the potential Cupar North Development Zone. The assessment aimed to quantify the potential air quality impact within the Bonnygate AQMA from future traffic associated with the Cupar North development zone. The assessment used the most up to date traffic and NOx emission factors. The conclusions of the report are that when compared with the future 2030 baseline, small improvements in NO_2 and PM_{10} concentrations are predicted with the completed development and the relief road in place in 2030. The executive summary for this report can be found in Section 1.1.3.

In 2016 Fife Council commissioned Ricardo Energy & Environment to conduct an updated modelling study for the Dunfermline Northern Link Road. This study will be used to inform future decision making on planning applications submitted for the proposed Dunfermline North development and associated relief road. The assessment compared the 'Future 2029 baseline' air quality with the 'Full SLA development in 2029' and the 'Full SLA with candidate sites included in 2029'. The scenario which includes the candidate sites assumes that the whole extent of the Northern Link Road is operational in 2029 whereas the 'Full SLA Development Scenario' assumes that only the section of Northern Link Road between Pilmuir Street and Whitefield Road will be operational. The model results, although based on fairly uncertain estimates of future traffic growth indicated that the NO_2 annual mean objective may be achieved at Appin Crescent in 2020 or 2021. The Northern Link Road study concluded that annual mean PM_{10} concentrations are predicted to be in excess of the 18 $\mu g\ m^{-3}$ Scottish objective in 2029 at a number of receptor locations where relevant exposure is present.

Within the Appin Crescent AQMA, revised lane markings and signage were introduced in March 2013. These measures have resulted in a reduction in NO_2 concentrations on the south side of Appin Crescent.

[3] LAQM.PG(S) 16, available at: http://www.scottishairquality.co.uk/assets/documents/technical%20guidance/LAQM-PG(S)16-April-16.pdf

Local Priorities and Challenges

Fife Council is awaiting grant funding from the Scottish Government for 2017 – 2018. The funding will be used to carry out the following air quality initiatives and studies, which aim to work towards the measures set out in the action plans for Cupar and Dunfermline:

Bonnygate Cupar:

Fife Council will continue to implement the measures set out in the Bonnygate AQAP during 2017. Fife Council's priorities within the designated AQMA over the forthcoming year include:

- Continue the implementation of Fife Council's travel plan including encouraging walking and cycling infrastructure and initiatives
- Seek to update the Regional Dispersion Model
- Fife ECO Stars scheme will continue to operate and encourage and promote 'clean fleet operators'
- Seek to install an AQ Mesh unit for gas and particulates at the façade of buildings on the southern side of the Bonnygate, Cupar street canyon to supplement latest modelling findings.
- Produce updated air quality guidance note for developers to reflect latest policy and technical guidance.

Appin Crescent, Dunfermline:

Fife Council will continue to implement the measures set out in the Appin Crescent AQAP during 2017. Fife Council's priorities within the designated AQMA over the forthcoming year include:

- Seek to install two AQ Mesh units for gas and particulates at the façade of buildings on southern side of Appin Crescent to supplement latest modelling findings.
- Ongoing implementation of Fife ECO Stars Fleet Recognition Scheme (including HGVs, Buses and Taxis)
- Seek to update the Regional Dispersion Model
- Purchase one council electric vehicle to be based at Dunfermline
- Continue the implementation of Fife Council's travel plan including encouraging walking and cycling infrastructure and initiatives
- Produce updated air quality guidance note for developers to reflect latest policy and technical guidance.

How to Get Involved

Members of the public can find information related to air quality on the Fife Council website. Actions that members of the public can take to help reduce air pollution include:

- Car sharing
- Reducing car journeys, choose to walk, cycle or take the bus.
- Maintain and look after your vehicle properly.

Further information is available at the dedicated Fife Council air quality web pages at:

www.fifedirect.org.uk/airquality

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1 Local Air Quality Management

This report provides an overview of air quality in Fife 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 Fife Council to improve air quality and any progress that has been made. Table 1.1 summarises the Air Quality Objectives applicable to Scotland.

Table 1.1 Summary of Air Quality Objectives in Scotland

AQ Objective-Pollutant	Concentration	Measured as	Date to be achieved by
Nitrogen Dioxide (NO_2)	200 µg m^{-3} not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	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

1.1 Summary of Previous Review and Assessment

1.1.1 Previous Review and Assessment Reports

Since the 2nd round of Review and Assessment commenced the following reports have been submitted by Fife Council:

- Updating and Screening Assessment (2003)[4]
- Progress Report (2004)[5]
- Progress Report (2005)[6]
- Updating and Screening Assessment (2006)[7]
- Progress Report (2007)[8]
- Progress Report (2008)[9]
- Detailed Assessment (2009) Appin Crescent, Dunfermline [10]
- Detailed Assessment (2009) Admiralty Road, Rosyth [11]
- Further Assessment (2010) Bonnygate, Cupar [12]
- Progress Report (2010) [13]
- 2nd Detailed Assessment (2011) Appin Crescent, Dunfermline [14]
- Progress Report (2011)[15]
- Further Assessment (2012) Appin Crescent Dunfermline[16]
- Updating and Screening Assessment (2012)[17]
- 2nd Detailed Assessment for Admiralty Road, Rosyth, Fife (2012)[18]
- Detailed Assessment for St Clair Street, Kirkcaldy, Fife (2012)[19]
- Fife Council, Bonnygate Air Quality Action Plan [20]
- Fife Council: Air Quality Action Plan for Appin Crescent, Dunfermline[21]
- Progress Report (2013)[22]
- Appin Crescent Traffic Management Options Appraisal: Scenario Modelling (Phase 2) [23]

[4] Air Quality Updating and Screening Assessment for Fife Council 2003. AEAT/ENV/R/1494. August 2003

[5] Air Quality Review and Assessment Progress Report for Fife Council 2004. AEAT/ENV/R/1678 Issue 2. July 2004

[6] Air Quality Review and Assessment Progress Report for Fife Council -2004/2005. AEAT/ENV/R/1955 Issue 2. Jun 2005

[7] Air Quality Updating and Screening Assessment for Fife Council 2006. AEAT/ENV/R/2237 Issue 2, July 2006

[8] Air Quality Review and Assessment Progress Report for Fife Council 2006/7. AEAT/ENV/R/2452 May 2007

[9] Air Quality Review and Assessment Progress Report for Fife Council 2007/8. AEAT/ENV/R/2597 March 2008

[10] Air Quality Detailed Assessment for Fife Council 2008: Appin Crescent, Dunfermline. AEAT/ENV/R/2705, January 2009

[11] Air Quality Detailed Assessment for Fife Council 2008: Admiralty Road, Rosyth, AEAT/ENV/R/2761, April 2009

[12] Air Quality Review and Assessment, Further Assessment, Bonnygate, Cupar 2010

[13] 2010 Air Quality Progress Report for Fife Council, AEAT/ENV/R/2977, July 2010

[14] Detailed Assessment of Air Quality: Appin Crescent, Dunfermline, AEA/ENV/R/3096 Issue 3, January 2011

[15] Air Quality Review and Assessment Progress Report for Fife Council 2011. AEA/ENV/R/3179 Issue 2. May 2011

[16] Air Quality Further Assessment (2012) Appin Crescent Dunfermline, AEA/R/ED56439. Issue 1, March 2012

[17] 2012 Air Quality Updating and Screening Assessment for Fife Council, AEAT/ENV/R/3293, July 2012

[18] Air Quality Detailed Assessment for Admiralty Road, Rosyth, Fife, AEAT/ENV/R/3321, September 2012

[19] Detailed Assessment of Air Quality 2011 Saint Clair Street, Kirkcaldy, Fife, AEA/ENV/R/3332

[20] Fife Council, Bonnygate Air Quality Action Plan, 2010, AEAT/ENV/R/ED05550006

[21] Fife Council: Air Quality Action Plan for Appin Crescent, Dunfermline, Fife, ED56439- Issue Number 1

[22] Air Quality Review and Assessment Progress Report for Fife Council 2011, Ricardo-AEA/R/3367/, Issue 2, July 2013

[23] The Appin Crescent Traffic Management Options Appraisal: Scenario modelling assessment (Phase 2), Ricardo-AEA/R/ED56439013, Issue 3, Jan 2014

- Cupar Streetscene Air Quality Modelling Assessment[24]
- Progress Report (2014)[25]
- Cupar North Development Zone and Relief Road: Air quality modelling assessment[26]
- Appin Crescent Traffic Management Options Appraisal (Phase 3) AQ Impact Assessment[27]
- Fife Council Appin Crescent Updated Air Quality Action Plan (AQAP) 2015[28]
- Fife Council Bonnygate Updated Air Quality Action Plan (AQAP) 2015[29]
- Fife Council Air Quality USA Report 2015[30]
- Fife Council Annual Progress Report 2016[31]
- Cupar North Development Zone and Relief Road: Updated air quality impact assessment[32]
- Dunfermline Northern Link Road: Updated air quality assessment[33]

Monitoring data for 2006 and 2007 (automatic and diffusion tubes) indicated that it was likely the NO_2 and PM_{10} Air Quality Objectives would not be met in Bonnygate, Cupar. The 2007 Progress Report concluded that a Detailed Assessment should be carried out at this location. Additionally, the 2008 Progress Report concluded that a Detailed Assessment should be carried out for Appin Crescent, Dunfermline (NO_2) and Admiralty Road, Rosyth (PM_{10}).

The Detailed Assessment (2007/2008) for Bonnygate, Cupar considered NO_2 and PM_{10}. The report concluded that an AQMA should be declared for both NO_2 and PM_{10}. The Detailed Assessment (2008) for Appin Crescent, Dunfermline advised that increased monitoring of NO_2 should be carried out to enable improved characterisation of ambient NO_2 concentrations before any further decisions are made. The Detailed Assessment (2009) for Admiralty Road, Rosyth considered PM_{10} concentrations in the area and concluded that no further action was required.

The Further Assessment (2010) for Bonnygate, Cupar concluded that the AQMA was still required and that its boundary was appropriate (see Figure 2.1). The source apportionment found that heavy and light goods vehicles contributed broadly similar oxides of nitrogen (NOx) emissions and that action planning should therefore focus on both vehicle types. An Air Quality Action Plan has been implemented for Bonnygate, Cupar by Fife Council. Progress on measures contained within the Bonnygate, Cupar Air Quality Action Plan are reported in Section 2.2.

The 2010 Progress report concluded that for NO_2 and PM_{10} monitoring, no further action was required over and above that already in progress by Fife Council. It was concluded that if NO_2 concentrations within the Appin Crescent area exceed the annual mean objective when 12 months diffusion tube data was available then Fife Council should proceed immediately to a Detailed Assessment.

At the end of 2010, a Detailed Assessment was carried out at Appin Crescent, Dunfermline. This Detailed Assessment considered NO_2 concentrations and concluded that Fife Council should consider declaring an Air Quality Management Area (AQMA) at Appin Crescent. Fife Council should therefore proceed with a Further Assessment and work towards preparing an Air Quality Action Plan. Due to the NO_2 concentrations measured at Appin Crescent the Detailed Assessment recommended that automatic measurement of PM_{10} should be carried out.

[24] Cupar Streetscene Air quality modelling assessment, Ricardo-AEA/R/ED56439014, Issue 3, March 2014

[25] Air Quality Review and Assessment Progress Report for Fife Council 2014, Ricardo-AEA/ENV/PR2014, May 2014

[26] Cupar North Development Zone And Relief Road: Air Quality Modelling Assessment, Ricardo-AEA/R/ED56439015 Issue Number 2, February 2015

[27] Appin Crescent Traffic Management Options Appraisal (Phase 3) Air Quality Impact Assessment, ED56439019- Issue Number 1, February 2015

[28] Fife Council Appin Crescent Updated AQAP, 2015, ED56439, Version 3, April 2015

[29] Fife Council Bonnygate Updated AQAP, 2015, ED56439, Version 2, April 2015

[30] Fife Council Air Quality USA Report, 2015, ED60521- Version 3, Issue 2, August 2015

[31] Fife Council Air Quality Annual Progress Report, ED60521-Version 5- June 2016

[32] Cupar North Development Zone And Relief Road: Updated air quality impact assessment, Ricardo-AEA, ED60521013 Issue Number 2, March 2017

[33] Dunfermline Northern Link Road: Updated air quality assessment, Ricardo-AEA, ED60521012, Issue 2, March 2017

The 2011 Progress Report concluded that monitoring of NO_2 at the three automatic sites in Fife showed that concentrations at Appin Crescent, Dunfermline; Bonnygate, Cupar and Admiralty Road, Rosyth, were below the annual mean objective. However, NO_2 and PM_{10} concentrations have increased since 2009 at Admiralty Road. Fife Council concluded that to further investigate NO_2 concentrations, diffusion tube monitoring should be increased incorporating more locations of relevant exposure to the general public. If measured concentrations of NO_2 exceed the annual mean objective after 12 months from sites of relevant exposure, then in accordance with the Technical Guidance LAQM. TG (09), Fife Council should proceed with a Detailed Assessment for Admiralty Road.

Local bias adjusted diffusion tube data at 3 locations within Fife exceeded the NO_2 annual mean objective of 40 µg m^{-3} in 2010. These locations were: Appin Crescent, Dunfermline; Admiralty Road, Rosyth and St Clair Street, Kirkcaldy.

For 2010, all diffusion tubes sites (2,3,5 and 6) within Appin Crescent that exceeded the objective were located on the south side of Appin Crescent between Park Lane and Couston Street. Diffusion tubes within this area have consistently shown elevated concentrations contrary to those seen at the automatic monitoring site. Data from the 2011 Progress Report supported the conclusion made in the 2011 Detailed Assessment for Appin Crescent. It is concluded that Fife Council should consider declaring an AQMA at Appin Crescent, encompassing as a minimum all residential properties which lie between Park Lane and Couston Street. It also concluded that Fife Council should consider declaring an area larger than that stated to account for any uncertainties in monitoring and modelling carried out. Figure 2.2 shows the AQMA boundary encompassing residential properties located on Appin Crescent, Dunfermline.

For 2010, diffusion tube data at Bonnygate Cupar did not exceed the 40µg m^{-3} objective when using the locally derived bias adjustment factor (0.71). However, when using the National derived bias adjustment factor (0.78) concentrations at one Bonnygate location exceeded the objective with a borderline concentration of 41 µg m^{-3}. Data showed that NO_2 diffusion tube concentrations have reduced since the introduction of traffic management measures in 2009. In 2008 Fife Council declared Bonnygate, Cupar as an AQMA for NO_2 and PM_{10} and has since adopted an Air Quality Action Plan in 2010 to address the air quality issues. St Clair Street, Kirkcaldy diffusion tubes sites (1 and 2) have consistently measured concentrations around the 40 µg m^{-3} objective, with concentrations exceeding the objective in 2008 and 2010. As a result of this, Fife Council have installed an automatic monitoring station (monitoring NO_2 and PM_{10}) at St Clair Street to further investigate concentrations in this area, which commenced in February 2011.

PM_{10} data collected for 2010 showed that both the Bonnygate and Admiralty Road sites exceeded the annual mean objective with concentrations of 19 µg m^{-3}. Bonnygate Cupar has been declared an AQMA for PM_{10} since 2008 and an Action Plan has been adopted since 2010. Figure 2.1 shows the AQMA boundary encompassing Cupar Town Centre.

It was concluded that Fife Council should continue monitoring PM_{10} at Admiralty Road for another year before moving on to a Detailed Assessment. This conclusion was reached due to:

- The annual concentration (19 µg m^{-3}) being a borderline exceedance of the objective.
- 2010 being the first year concentrations exceeded the objective in the area.
- Unusual weather conditions for the year may have contributed to the increase in concentrations.

Results for SO_2 monitoring in Fife in 2010 indicated that AQS objectives for SO_2 were unlikely to be exceeded. There were no new industrial processes, road or other developments that required detailed assessment with respect to this pollutant. Hence, new information in 2009 confirmed the conclusion of previous reports that a Detailed Assessment is not required for SO_2.

Previous Review and Assessment reports have concluded that concentrations of lead, 1,3-butadiene and benzene are well below their respective objective at all locations in Fife. There has been no change in sources of these pollutants so they are not considered further in this report.

The Further Assessment (2012) for Appin Crescent concluded that there were continued current exceedances of the NO_2 annual mean objective in Appin Crescent, Dunfermline. The spatial extent of the exceedances remained quite small and the current AQMA boundary was adequate for NO_2 (Figure 2.2). The assessment also indicated that were exceedances of the Scottish annual mean PM_{10} objective within the Appin Crescent AQMA and as this pollutant is not currently included in the AQMA order for the location, it was recommended that the order be amended accordingly. The results of the source apportionment indicated that for PM_{10}, existing background concentrations are thought to be predominant in the overall concentrations at all locations in Appin Crescent. For NOx/NO_2 the contribution from road traffic is dominant overall. The contribution from moving and queuing vehicles was also assessed: the contribution from moving traffic is thought to predominate between the two, although emissions from queuing vehicles are also important, though perhaps more so for NOx than PM_{10}. Of the vehicle classes assessed, cars and HGVs are the most significant sources of vehicular NOx, whilst cars and LGVs have been identified as the most significant sources of vehicular PM_{10}. Buses are also an important source of both pollutants.

An AQAP has been implemented for Appin Crescent, Dunfermline by Fife Council. The report on the finalised AQAP was approved in May 2013 and progress on the implemented measures are reported in Section 2.2.

The Updating and Screening Assessment (2012) concluded that no further action is required with respect to pollutants carbon monoxide, benzene, 1,3-butadiene, lead and sulphur dioxide. The assessment also indicated that the 2011 nitrogen dioxide (NO_2) and particulate matter (PM_{10}) monitoring data supports the requirement for Air Quality Management Areas in Bonnygate, Cupar and Appin Crescent, Dunfermline due to exceedances of the annual mean objectives for both pollutants. PM_{10} concentrations at Admiralty Road, Rosyth have increased above the annual mean objective of 18 µg m^{-3} and it was therefore recommended that Fife Council carry out a further Detailed Assessment to assess PM_{10} concentrations in the area. The Cupar 2011 monitoring data indicated an overall downward trend in NO_2 concentrations since the introduction of the traffic queue relocation system in the Bonnygate. PM_{10} concentrations had also decreased relative to 2007 PM_{10} levels and the exceedance is currently marginal.

The annual mean NO_2 objective of 40 µg m^{-3} was exceeded at 6 diffusion tube sites located in three areas of Fife (Appin Crescent, Dunfermline, St Clair Street, Kirkcaldy and Bonnygate, Cupar) during 2011. All 6 diffusion tube sites are considered to be locations of relevant exposure. Both Appin Crescent, Dunfermline and Bonnygate, Cupar are included within existing Air Quality Management Areas (AQMAs). St Clair Street, Kirkcaldy is not currently included within any existing AQMAs and it is therefore recommended that Fife Council carry out a Detailed Assessment for nitrogen dioxide in the area of St Clair Street, Kirkcaldy.

The Detailed Assessment of St Clair Street, Kirkcaldy (2012) was undertaken to investigate the potential scale and extent of exceedances of Air Quality Objectives in the study area. The modelling study, which used the most recent traffic data, NO_2 measurements and meteorological data indicated that it was unlikely that exceedances of the NO_2 annual mean objective had occurred at locations with relevant exposure in 2011. The annual mean objective exceedances occurred at ground level locations within the study area close to main junctions on St Clair Street where traffic congestion is known to occur. These are not however locations of relevant exposure as the properties are used for commercial purposes. NO_2 concentrations in excess of the annual mean objective were not observed and are not occurring where ground level or first floor residential properties are present within the study area. In light of this Detailed Assessment of Air Quality, Fife Council is not required to declare an Air Quality Management Area at this time. It was recommended that Fife Council continue to monitor NO_2 and PM_{10} concentrations at this location and may wish to locate diffusion tube monitoring sites closer to the locations where ground floor residential properties are present on St Clair Street.

The Detailed Assessment of Admiralty Road, Rosyth, Fife (2012) was undertaken to investigate the potential scale and extent of exceedances of Air Quality Objectives in the study area. Dispersion modelling indicates that exceedances of the PM_{10} annual mean objective of 18 µg m^{-3} may have occurred at two receptors. It is also likely that the annual mean objective has been equalled at a further 41 receptors throughout the study area. However, the modelling also indicates that the daily mean objective has not been exceeded at any location on Admiralty Road. In light of this Detailed Assessment it is recommended that Fife Council should consider either declaring an Air Quality

Management Area (AQMA) for the PM_{10} annual mean objective, which should encompass the study area detailed in this report.

Fife Council currently monitors PM_{10} using a Tapered Element Oscillating Microbalance-Filter Dynamic Measurement System (TEOM-FDMS) at one location on Admiralty Road. An analysis of FDMS data from the UK Automatic and Urban Network (AURN) identified baseline offsets in some FDMS analysers. As a result of this study a baseline check of the Rosyth FDMS was carried out, which consisted of running particle-free air through the analyser for 3 days. The results from this check indicated that there may be a positive offset in the 2012 Rosyth FDMS data; and as a consequence measured PM_{10} concentrations might have been over-estimated. Furthermore, the offset may also exist in the 2011 data; however, this cannot be confirmed as a baseline check was not carried out during 2011. It was therefore recommended that Fife Council change the drier unit to the FDMS analyser at Admiralty Road and to defer any AQMA declaration for a further year following the FDMS drier change in order to confirm the exceedance of the PM_{10} annual mean objective. Following discussions with the Scottish Government, it was agreed that Fife Council should defer its decision as to whether or not to declare an AQMA at Admiralty Road, Rosyth until at least six months monitoring data is available using a new FDMS drier in PM_{10} monitoring equipment.

The 2013 Progress Report concluded that Fife Council should maintain its current monitoring programme and confirmed that Fife Council is not required to declare an AQMA at Admiralty Road, Rosyth at that time.

The Appin Crescent Traffic Management Options Appraisal: Scenario modelling assessment (2014) considered the possible effects that a change in traffic management will have on the NO_2 and PM_{10} concentrations in 2015. Using modelling software and monitoring data, the report explains the predicted outcomes of possible traffic management scenarios in Appin Crescent, Dunfermline. The report concludes that none of the proposed traffic management scenarios made a significant difference to concentrations of NO_2 and PM_{10} at locations of relevant exposure. Whilst outcomes of dispersion modelling of the proposed Appin Crescent bypass option reveal that this may reduce concentrations of NO_2 and PM_{10} on Appin Crescent to below the relevant air quality objectives, it is still considered prudent to explore other traffic management measures that may deliver more cost effective and feasible solutions to addressing air quality issues in Appin Crescent.

The Cupar Streetscene Dispersion Modelling Report 2014 used atmospheric dispersion modelling to assess the potential air quality impacts that proposed traffic management changes in Cupar may have on the NO_2 and PM_{10} concentrations in 2017. The report concludes that both modelled Design Options 1 (includes introduction of mini-roundabouts at the East Bridge/St Catherine Street junction as well as the East Bridge/East Burnside junctions on the A91) and 2 (includes reconfiguration of the junctions at East Bridge/St Catherine Street and East Bridge/East Burnside junctions on the A91) will lead to a general reduction in NO_2 and PM_{10} emissions when compared to the 2017 baseline. Based on modelling predictions Option 1 provides greater air quality benefits than Option 2 for the Bonnygate AQMA. Both of these options were implemented in 2014.

The 2014 Progress Report concluded that Fife Council should maintain its current monitoring programme and there was no requirement to declare any new AQMAs. It also identified the successful reduction of both NO_2 and PM_{10} concentrations below the objectives within the Bonnygate AQMA. It concluded that the reductions were principally a result of traffic signalling and road layout improvements.

The Cupar North Development Zone and Relief Road: Air Quality Modelling Assessment 2015 aimed to quantify the potential air quality impact within the Bonnygate AQMA of future traffic associated with the Cupar North development zone. Future air quality impacts were assessed assuming that completion of different zones of the development are phased over time up to 2030, and that completion of the relief road may not occur until all of the residential and commercial developments are completed in 2030. This approach was used as projected vehicle pollutant emission rates and background concentrations are available until 2030 only. The report concludes that the results for each approach are very similar and indicate that there will be no exceedances of the NO_2 annual mean objective at the receptor locations in any of the future years assessed. However when emissions from the additional traffic from the development rollout phases are included the results indicate that exceedances of the 18 $\mu g\ m^{-3}$ Scottish PM_{10} annual mean objective will occur at the

same receptor locations where exceedances are predicted for the future baseline years. These receptor locations are at 1st floor height within the Bonnygate. When compared with the future 2030 baseline, small improvements in NO_2 and PM_{10} concentrations are predicted with the completed development and the relief road in place in 2030. The report also recommends that when considering the cumulative impact of the development without the relief road in place, that air quality and potential mitigation measures to counteract the impact of the additional development traffic are considered in the planning process.

Appin Crescent Traffic Management Options Appraisal (Phase 3) Air Quality Impact Assessment (2015) investigated the potential impact of traffic management scenarios which aim to improve traffic flow though Appin Crescent and hence reduce vehicle emissions and improve local air quality. Using modelling software and monitoring data, the report explains the predicted outcomes of these scenarios in Appin Crescent, Dunfermline. The report concludes that Test Option 1 (Optimisation of Holyrood Place / Appin Crescent signals (also linked to Sinclair Gardens roundabout)) does not appear to provide any air quality benefits and may lead to an increase in annual mean NO_2 concentrations. Test Options 2 (Reconfigure Appin Crescent / Garvock Hill mini roundabout to signalised junction (right turn storage allowed but runs opposed)) and test option 3 (Removal of bus stops on Appin Crescent) will provide improvements in both NO_2 and PM_{10} concentrations but neither of these options offer the opportunity to reduce concentrations of NO_2 and PM_{10} on Appin Crescent to below the respective air quality objectives. Test Option 3 investigated the removal of the bus stops on Appin Crescent. The report suggests that a cost-benefit analysis of this option may be beneficial as it could be relatively inexpensive to implement and will provide improvements in NO_2 and PM_{10} concentrations.

1.1.2 2015 Updating and Screening Assessment

The 2015 Updating and Screening Assessment assessed the monitoring data carried out in 2014. The review of all other local developments within the local authority did not identify any locations where there may be a risk of the air quality objectives being exceeded and so no additional air quality assessment was required.

The Air Quality Action Plan (AQAP) for the Bonnygate, Cupar AQMA has been successful in reducing both NO_2 and PM_{10} concentrations within the Bonnygate. The reductions have principally been a result of the traffic signalling and road layout improvements carried out during 2009. No exceedances of the NO_2 or PM_{10} AQS objectives were measured within the Bonnygate AQMA during 2014.
The Air Quality Action Plan for Appin Crescent, Dunfermline was finalised in May 2013 and aims to reduce NO_2 and PM_{10} concentrations within Appin Crescent. Initially an AQMA was declared in November 2011 for NO_2 only, however this was amended in August 2012 to include PM_{10}. In 2014 only 1 diffusion tube location in Appin Crescent was found to be marginally exceeding (40.3 µg m^{-3}) the annual mean objective. The annual mean NO_2 concentration at the automatic monitoring site in Appin Crescent was 27 µg m^{-3}.

1.1.3 2016 Annual Progress Report

The 2016 Annual Progress Report (APR) utilised monitoring data collected throughout 2015. Fife Council carried out monitoring of nitrogen dioxide (NO_2) at 4 automatic stations in Cupar, Kirkcaldy, Dunfermline and Rosyth. Non automatic monitoring of NO_2 was carried out using diffusion tubes at 48 sites in 2015. The concentrations measured in 2015, following bias adjustment, were compared against the Air Quality Strategy (AQS) annual mean objective of 40 µg m^{-3} for NO_2. Exceedances of the Annual mean objective were evident at the following sites:

- Appin Crescent (2), Dunfermline (40 µg m^{-3})
- Appin Crescent (6), (A), (B), (C), Dunfermline (43 µg m^{-3})

The marginal exceedances measured were within the current Appin Crescent, Dunfermline Air Quality Management Area (AQMA). The Air Quality Action Plan (AQAP) for Appin Crescent presents actions that will be implemented to address these exceedances.

The 2016 APR concluded there were no exceedances measured in the Cupar AQMA during 2016, indicating that the measures successfully implemented from the AQAP have had a positive effect.

Particulate matter (PM_{10}) was measured at the four automatic sites within Fife at Cupar, Dunfermline, Kirkcaldy and Rosyth. In 2015 the concentrations measured were below the PM_{10} annual mean objective of 18 µg m^{-3} at all sites.

$PM_{2.5}$ was measured at the Admiralty Road, Rosyth air quality site starting July 2015. As the monitoring commenced in the latter half of 2015, results were annualised in accordance with TG(16). The AQS annual mean objective from $PM_{2.5}$ came into force on 1st April 2016; the annual mean objective set is 10 µg m^{-3}. During 2015 the annual mean for $PM_{2.5}$ at Rosyth was 7 µg m^{-3}.

The review of all available data relating to carbon monoxide (CO), sulphur dioxide (SO_2) and benzene monitoring during 2015 indicated that it is unlikely that any AQS objectives relating to these pollutants were exceeded during 2015. The review of all other local developments did not identify any locations where there may be a risk of the air quality objectives being exceeded and so no additional air quality assessment was recommended at this time.

1.1.3 Cupar North Development Zone and Relief Road: Updated Air Quality Assessment 2017

Fife Council commissioned Ricardo Energy & Environment to conduct an updated air quality modelling assessment using the latest available information on the development and vehicle emissions. An air quality assessment of the estimated future baseline air quality was undertaken. The baseline was then used to predict the impact of additional road traffic generated by the proposed Cupar North development and associated relief road.

Trip generation and distribution data from the transport assessment for the development was used to estimate future vehicle emissions and pollutant concentrations within the Bonnygate AQMA. Two future 'with development' traffic scenarios were assessed by comparison with future baseline conditions for both annual mean NO_2 and PM_{10} concentrations.

Phase 1 2024 scenario results

The Phase 1 scenario modelled emissions from additional vehicles generated by the Cupar North development in 2024, just prior to the relief road becoming operational. No exceedances of the 40 µg m^{-3} NO_2 annual mean objective are predicted in 2024 using either of the emissions calculation methods. The maximum impact is classified as **'moderate'** and was predicted using emissions calculated with the CURED V2A[34] emission model, the predicted NO_2 annual mean at this location was 34.8 µg m^{-3}, which is less than the 40 µg m^{-3} objective.

The model results therefore indicated that the annual mean NO_2 concentrations are not predicted to be in excess of the annual mean objective in the Bonnygate AQMA in the future scenarios modelled.

Exceedances of the 18 µg m^{-3} Scottish objective were predicted in 2024 at three 1st floor height receptors where relevant human exposure may be present and at two ground level locations. The increase in annual mean PM_{10} concentrations attributable to development traffic are classified as **'substantial'** at two of these receptors and **'moderate'** at three. The points of maximum impact are located on the southern side of the narrow sections of the Bonnygate street canyon.

[34] Air Quality Consultants (2016) Deriving Background Concentrations of NOx and NO2 for Use with 'CURED V2A' – August 2016

The model results indicated that additional emissions from vehicle trips generated by the Cupar North development will contribute to what could be considered a significant increase in annual mean PM_{10} concentrations within the Bonnygate AQMA in 2024 prior to the relief road becoming operational.

Completed development 2030 scenario results

The completed development scenario assumed that the entire Cupar North mixed use development and the relief road is operational by 2030. Although there will be significantly more traffic generated by the completed development at that time, examination of the trip distribution data in the transport assessment indicates that through traffic will be reduced in Cupar town centre as a results of traffic using the relief road.

No exceedances of the 40 µg m^{-3} NO_2 annual mean objective are predicted in 2030. When using both methods of calculating future year NOx emissions, the predicted impact of the completed development in 2030 is classified as either beneficial or negligible at all receptors.

Exceedances of the 18 µg m^{-3} Scottish objective are predicted at the 1st floor height receptor Bonnygate 9 and at the diffusion tube Bonnygate B4 location. PM_{10} concentrations either reduce or stay constant for the 'with full development' scenario in 2030. As expected, the model results indicated that the relief road is likely to have a beneficial effect on PM10 concentrations within the Bonnygate AQMA.

The Fife Council AQ Steering Group is already considering the contents of this report in assisting in future strategic deliberations relating to the Cupar North Development Zone and Relief Road. This has included a submission to the Scottish Government for 1 X AQMesh monitor to be installed on the Southern side of the narrow section of Bonnygate canyon for the purposes of monitoring PM_{10} & $PM_{2.5}$ as an automatic monitoring station & cabinet cannot be installed at the narrowest section of the street canyon due to access and health and safety reasons. The outputs of this monitoring are intended to further inform future modelling studies of the Cupar North Development Zone and associated Relief Road.

1.1.4 Dunfermline Northern Link Road Updated: Air Quality Assessment 2017

Fife Council commissioned Ricardo Energy & Environment to update the Dunfermline Northern Link Road Modelling study. A number of zones within Dunfermline have been allocated for residential and other urban land use developments. The additional vehicle trips generated by these developments are likely to have an impact on road traffic emissions within the Appin Crescent AQMA.

A measure that will likely help reduce traffic numbers and hence vehicle emissions in Appin Crescent is the construction of the proposed Northern Link Road which would initially link Pilmuir Street and Whitefield Road in the area of Dunfermline to the North of Appin Crescent. Completion of the Northern Link Road would link Pilmur Street with the main road network at the east of Dunfermline. This would provide an alternative route for traffic that would otherwise use the Halbeath corridor and Appin Crescent to travel in and out of Dunfermline from the east.

This updated air quality assessment presents results calculated using the latest published vehicle emission functions (COPERT5), and also uses recent advances in dispersion modelling techniques.

The 2011 Dunfermline Strategic Land Allocation (SLA) Transport Assessment concluded that for effective operation of the road network, and in addition to a number of other upgrades to the road infrastructure, the link road will likely be required at some point between 2021 and 2029 depending on the rollout of residential and commercial developments in the SLA area.

The assessment compares the 'Future 2029 baseline' air quality with the 'Full SLA development in 2029' and the 'Full SLA with candidate sites included in 2029'. The scenario which includes the candidate sites assumes that the whole extent of the Northern Link Road is operational in 2029 whereas the 'Full SLA Development Scenario' assumes that only the section of Northern Link Road between Pilmuir Street and Whitefield Road will be operational.

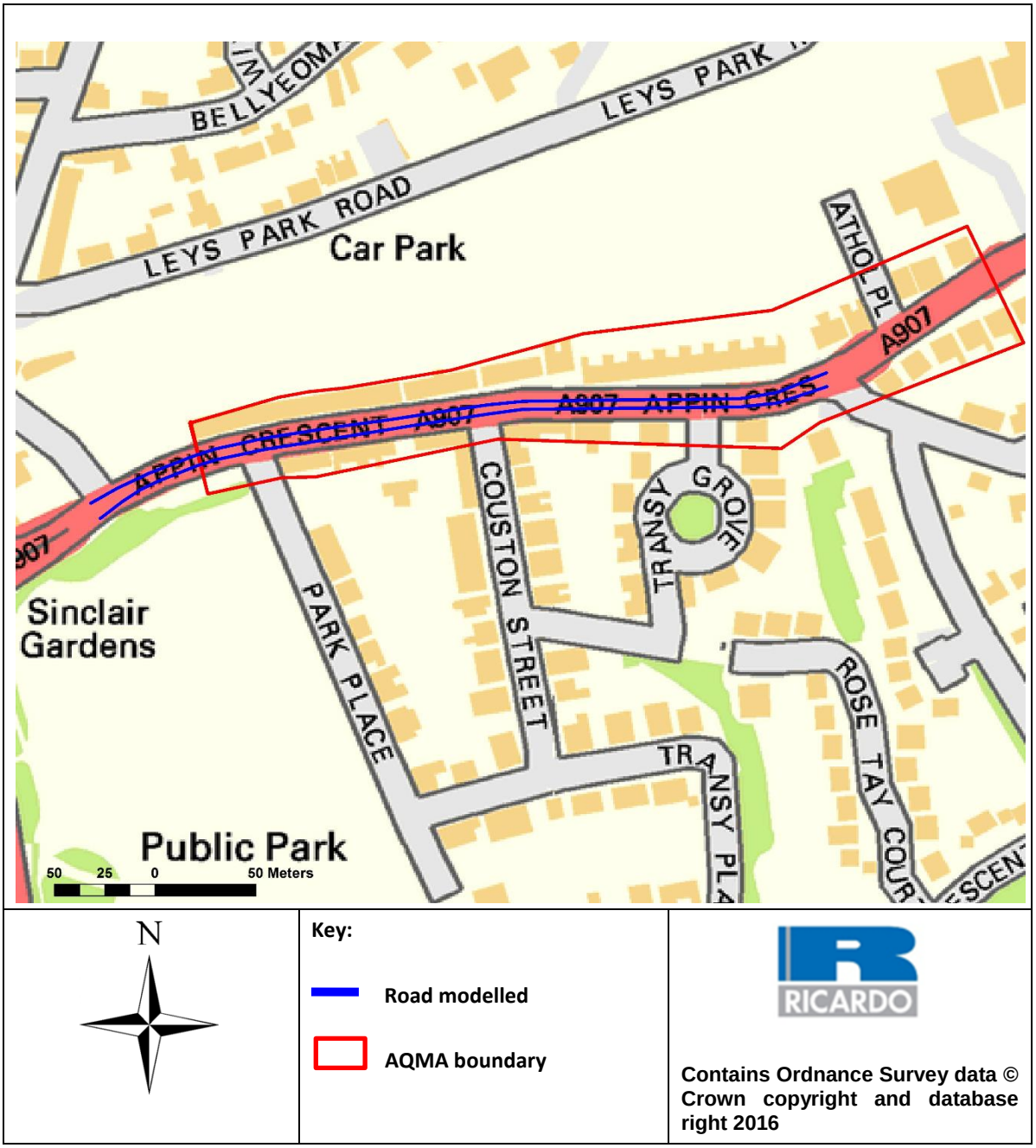
Comparison of the predicted pollutant concentrations for each scenario modelled indicate that:

- The NO_2 annual mean objective is not expected to be exceeded in 2029 for any of the scenarios modelled when using either the COPERT5 vehicle emission rates or the CUREDV2A emissions calculator.
- NO_2 annual mean concentrations calculated using the COPERT5 vehicle emission rates are higher than those calculated using the CUREDV2A method. At the receptors where the highest NO_2 concentrations are predicted in 2029, vehicle NOx emissions calculated using COPERT5 produce annual mean concentrations up to 22% greater than when using CUREDV2A.
- Annual mean PM_{10} concentrations are predicted to be in excess of the 18 µg m^{-3} Scottish objective in 2029 at a number of receptor locations where relevant exposure is present.
- Slightly lower NO_2 and PM_{10} annual mean concentrations are predicted for the 'Full SLA with candidate sites included in 2029' scenario; this is due to lower projected daily traffic flows as the Northern Link Road being fully operational was assumed in the traffic modelling for this test option. Even though additional traffic will be generated by the candidate sites, the completed Northern Link Road will provide an alternative route to Appin crescent and the Halbeath corridor.

The model results, although based on fairly uncertain estimates of future traffic growth indicate that the NO_2 annual mean objective may be achieved at Appin Crescent in 2020 or 2021. A map showing the extent of the study area is presented below. It should be noted that slight changes to the proposed route of the Nothern Link route could occur prior to the delivery of the road, and changes will be reflected within future reports.

Given the above uncertainties in the modelling study, Fife Council has applied for Scottish Government Air Quality Grant funding for 2017-18 to include the introduction of two AQMesh monitoring pods for PM_{10} & $PM_{2.5}$ at the South side of Appin Crescent. This recent development in monitoring technology allows for monitoring at the South side of Appin Crescent as the narrow width of pavement at the South side does not allow for the installation of automatic continuous monitoring equipment and associated cabinet at this location.

Figure 1.1 Northern Link Road Modelling Study Area



1.1.5 Bright Green Hydrogen / Levenmouth Community Energy Project

Green hydrogen power is becoming widely recognised as a key catalyst to driving forward transport and associated infrastructure for generations to come. One of Scotland's leading forces behind making this a reality is Fife through its pioneering Levenmouth Community Energy Project[35], a collaborative initiative which is being led by Bright Green Hydrogen and supported by a number of partners including Fife Council and Toshiba. Part of this involves Levenmouth becoming home to one of Europe's largest fleet of hydrogen dual-fuel vehicles (up to 25 vehicles), some of which will be operated by Fife Council. The fleet includes 10 electric-powered Renault Kangoo vans with H_2 fuel

[35] Further information available at: http://brightgreenhydrogen.org.uk/home/levenmouth-community-energy-project-2/levenmouth-community-energy-project/

cell range extender which will be 100% zero emissions if charged using The Hydrogen Office's 100% green electric vehicle charging station.

Methil

The project has completed several key stages in recent months. Consequently, the hydrogen system at Methil is now functional and ready for Toshiba commissioning of the control system to take place in May. This has been achieved despite several issues that were outside of the project's control which included software issues; a sensor failure; issues with the integration of some of the key components - mainly the fuel cell and the larger electrolyser. A local grid study has now been commissioned to identify a robust, long term solution to this issue.

Despite the equipment constraints, the project has moved ahead as best it can and as a result the delivery phase is now nearing completion. In addition, all vehicles have been commissioned on hydrogen however there are some snagging issues with the Bright Green Hydrogen Kangoos which require repairs. The Fife Council fleet team are currently assisting with use of the vehicle workshop to address the Kangoo repairs. Training, maintenance and all procedural documentation for the Methil site and for hydrogen transportation are now being developed.

Bankhead

The hydrogen refuelling station was commissioned in February 2017 and all civils works relating to the installation of the station are now complete. Training for the majority of the fleet workshop staff and drivers has now been delivered and procedural documentation and manuals have been issued.

A new Triscan unit will be installed w/c 24th April 2017 and final adaptations to the fuel dispenser and compression unit will be completed during the same week.

Wifi access at Bankhead and the work to address issues with the in-vehicle devices for the transits is still underway. A business case for the Phase 2 integration of an electrolyser has been submitted to the Council's Climate Change Mitigation Fund for consideration.

Fife's leading the way in clean energy with our new hydrogen & diesel refuse collection vehicle, May 2016

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

A summary of AQMAs declared by Fife 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 http://www.scottishairquality.co.uk/laqm/aqma. The boundaries of the AQMA's declared by Fife Council are shown in Figure 2.1 (Bonnygate, Cupar) and Figure 2.2 (Appin Crescent, Dunfermline) A steering group including key representatives from relevant services of Fife Council was formed to develop the draft AQAPs for both Bonnygate and Appin Crescent. The steering group considered the findings of the Further Assessments and the wide range of potential options for improving air quality within the AQMAs. The steering group meetings regularly to discuss the progress of the action plan measures outlined in the AQAP.

Figure 2.1 Bonnygate, Cupar AQMA Boundary

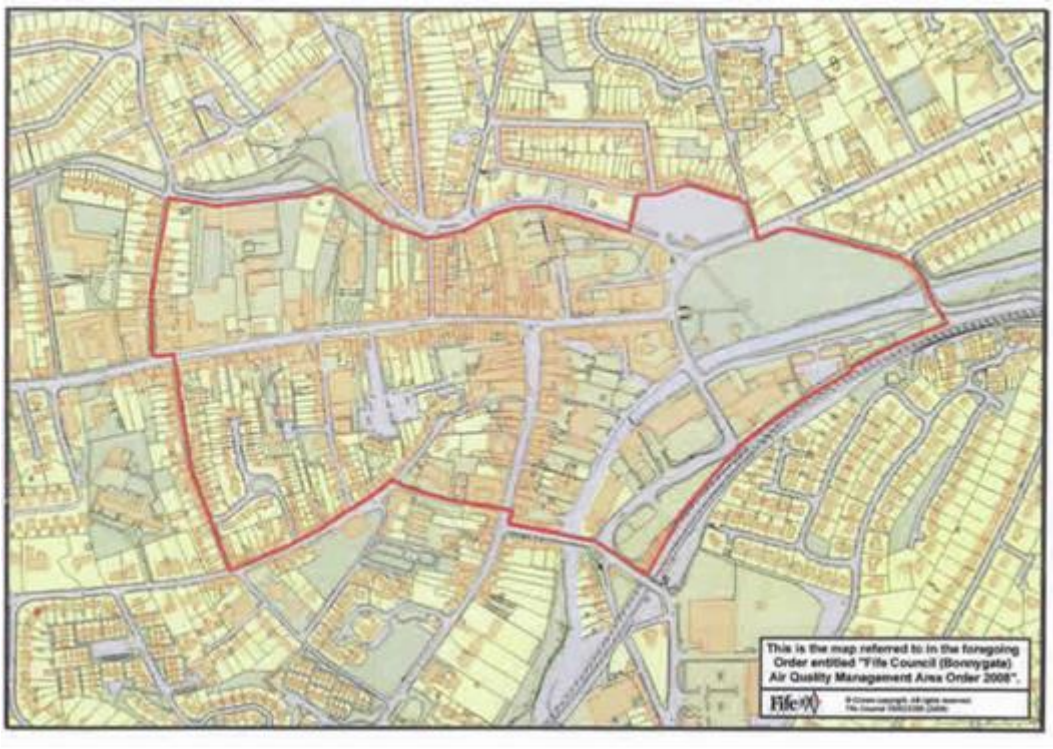
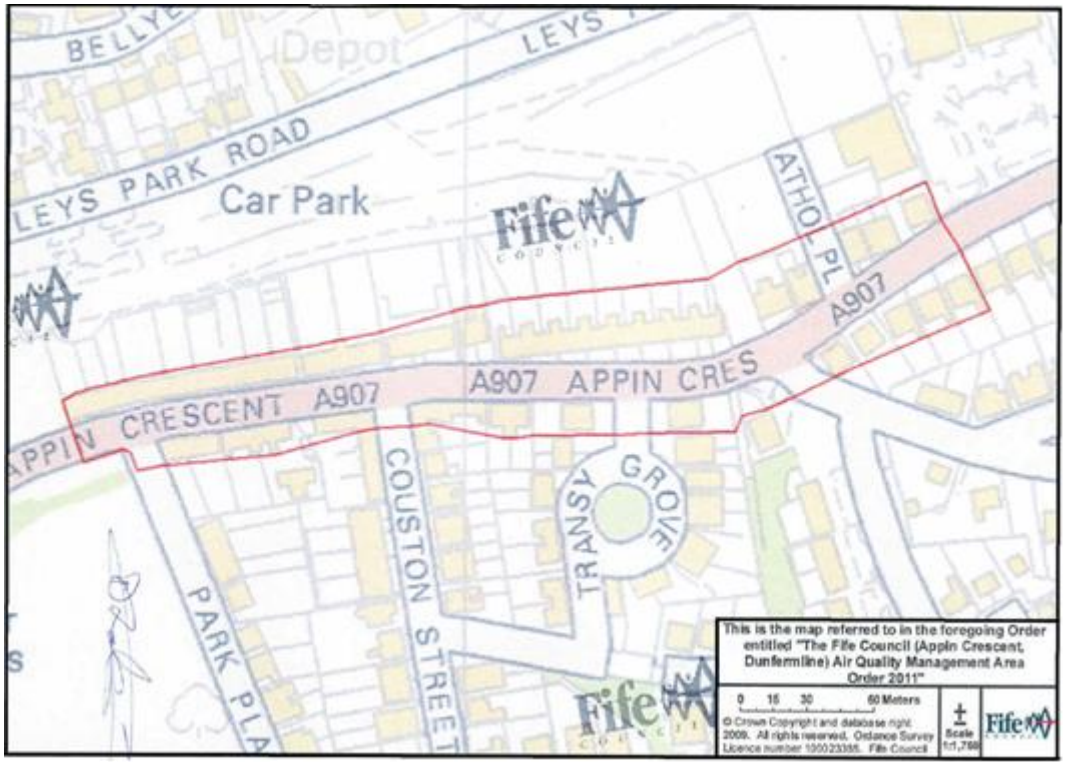


Figure 2.2 Appin Crescent, Dunfermline AQMA Boundary



2.1.1 Bonnygate, Cupar AQMA

The Bonnygate AQAP aims to work towards reducing transport emissions of NOx and PM_{10} in the AQMA by approximately 53% and 33% respectively; using a wide range of measures such as road and traffic signalling improvement combined with other measures, for example behaviour-change. Fife Council has a statutory duty to review and update their Action Plans (LAQM.PG(16)). The Bonnygate, Cupar AQAP was reviewed and updated in 2015. The measures adopted in the latest AQAP and progress against them are outlined in Table 2.2.

NO_2 concentrations within Bonnygate Cupar remained consistent between 2013 and 2015, with a slight increase measured in 2016, this could be a result of variations in meteorological conditions within the Bonnygate street canyon environment. However, NO_2 concentrations at the automatic monitoring station remain well within the NO_2 annual mean objective. The initial drop in NO_2 concentrations between 2011 and 2012 are related to previous action plan measures implemented to alter the traffic signalling and pedestrian crossing within Bonnygate, Cupar. PM_{10} concentrations have steadily declined between 2011 and 2016, with concentrations dropping below the AQS annual mean objective of 18 µg m^{-3}. The automatic monitoring results for NO_2 and PM_{10} are shown in Figure 2.3 and Figure 2.4 respectively.

Figure 2.3 NO_2 Automatic Monitoring Results 2011-2016-Bonnygate, Cupar

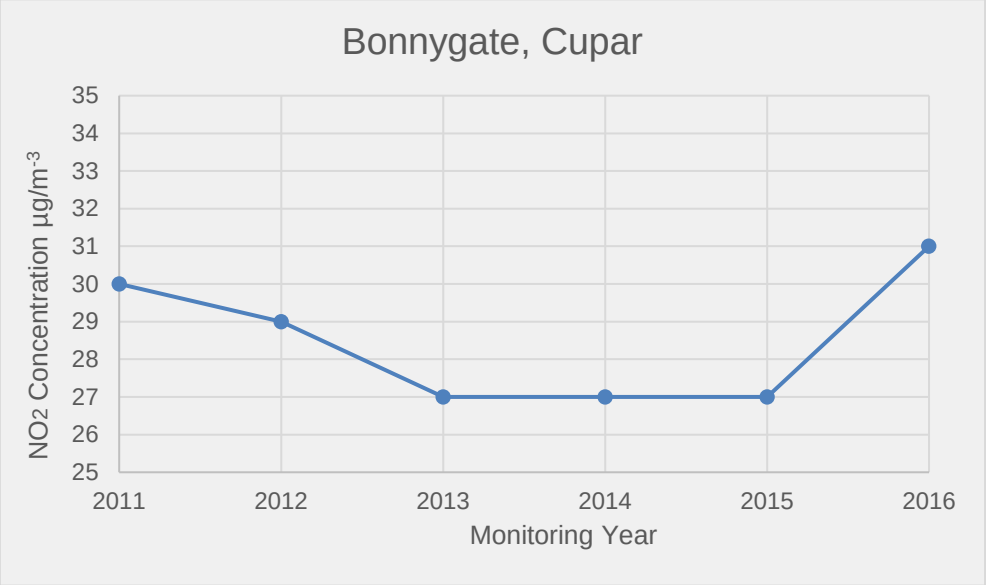
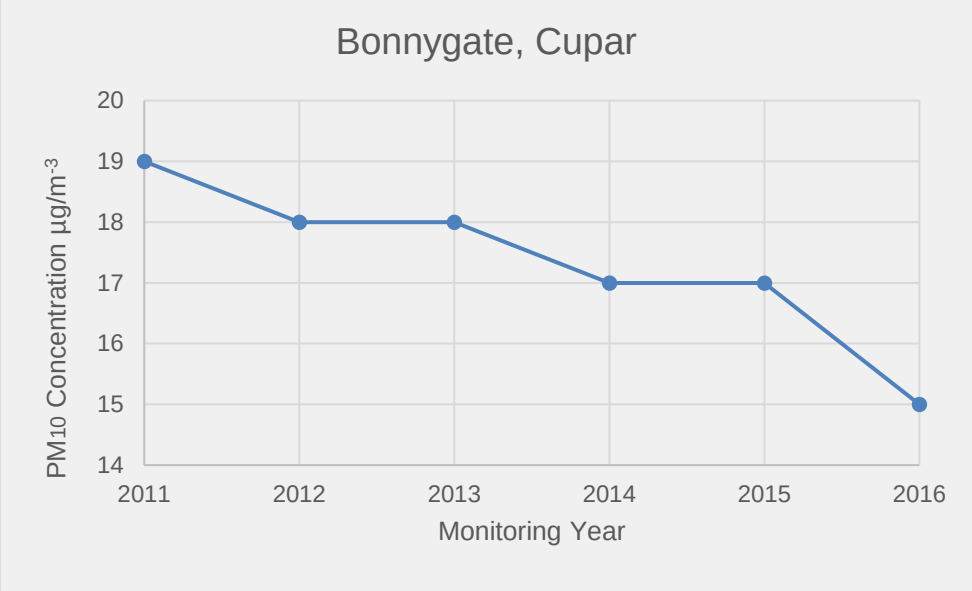


Figure 2.4 PM_{10} Monitoring Results 2011-2016- Bonnygate, Cupar



2.1.2 Appin Crescent AQMA

The Appin Crescent AQAP aims to work towards reducing transport emissions of NOx and PM_{10} in the AQMA by approximately 18% and 40% respectively; and as with the Bonnygate AQAP will involve a combination of road layout and traffic signalling improvements combined with many other measures.

As noted previously, Fife Council has a statutory duty to review and update their Action Plans. The Appin Crescent, Dunfermline AQAP was reviewed and updated in 2015. The measures adopted in the latest AQAP and progress against them are outlined in Table 2.3.

Over the past five years NO_2 concentrations within Appin Crescent have decreased since 2011 as a result of the Action Plan measures being implemented. PM_{10} concentrations remained consistent

between 2011-2015, with annual mean concentrations ranging between 15 µg $m^{-3}$and 16 µg m^{-3}. PM_{10} concentrations continued to reduce in 2016. The automatic monitoring results for NO_2 and PM_{10} are shown in Figure 2.5 and Figure 2.6 respectively.

Figure 2.5 NO_2 Automatic Monitoring Results 2011-2016- Appin Crescent, Dunfermline

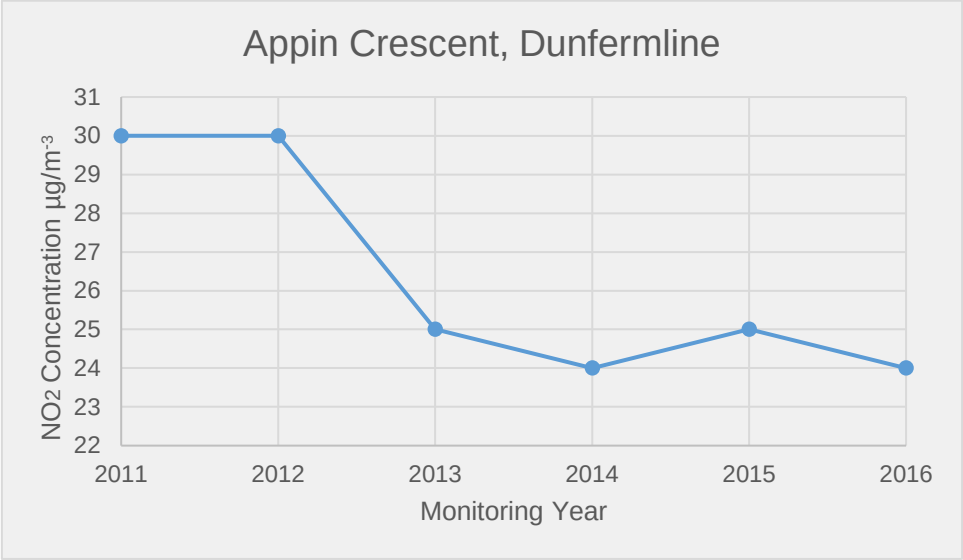


Figure 2.6 PM_{10} Monitoring Results 2011-2016- Appin Crescent, Dunfermline

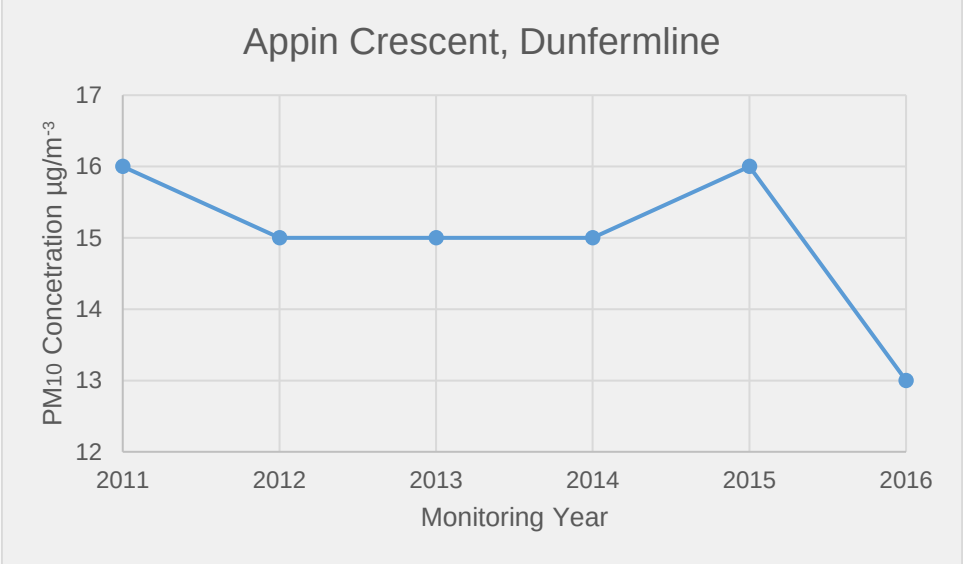


Table 2.1 Declared Air Quality Management Areas

AQMA Name	Pollutants and Air Quality Objectives	City/Town	Description	Action Plan
Cupar, Bonnygate	NO_2 annual mean PM_{10} annual mean	Cupar	An area comprising of Bonnygate (A91), Crossgate (A914) and St Catherine Street (A91). There are a number of residential properties within the area close to the road at1st floor height above commercial properties.	Bonnygate Cupar, AQAP. Can be accessed at: http://publications.fifedirect.org.uk/c64_FifeCouncilBonnygateAQAPUpdate20156.pdf
Appin Crescent, Dunfermline	NO_2 annual mean PM_{10} annual mean	Dunfermline	An area comprising of Appin Crescent, Dunfermline. There are a number of residential properties within the area close to the road at both ground level and 1st floor height.	Appin Crescent, AQAP. Can be accessed at: http://publications.fifedirect.org.uk/c64_FifeCouncilAppinCrescentAQAPUpdate20151.pdf

2.2 Progress and Impact of Action Plan Measures

The statutory obligation to continuously review air quality action plans provides the opportunity for Fife Council to periodically review the progress that has been made in implementing the air quality action plan and assess the significance of improvements in air quality that have been observed since the adoption of the action plan measures. Furthermore, the review and update of the action plan provides the opportunity for Fife Council to identify new or additional measures to help to work towards attainment of the air quality objectives within the designated AQMAs within Dunfermline and Cupar.

In April 2015 a review and update of both the Appin Crescent and Bonnygate Air Quality Action Plans was completed by Fife Council. A brief summary of the additional measures incorporated into both action plans as a result of the AQAP review are provided in Table 2.2 and Table 2.3. Further details of the AQAP's and their progress are detailed in Table 2.6 and Table 2.7.

Table 2.2 New measures included within the Bonnygate Air Quality Action Plan (2015)

No.	Measure	Timescale
1	Fife ECO Stars	Short Term
2	Fife Council Air Quality Strategy 2015-2020	Short Term
3	Air Quality and Planning Toolkit	Short Term

Table 2.3 New measures included within the Appin Crescent Air Quality Action Plan (2015)

No.	Measure	Timescale
1	Fife ECO Stars	Short Term
2	Fife Council Air Quality Strategy 2015-2020	Short Term
3	Air Quality and Planning Toolkit	Short Term
4	Cost-Benefit-Analysis of options to improve air quality within Appin Crescent	Short Term
5	Proposed air dispersion modelling study of the potential Dunfermline Northern Link Road	Short Term

2.2.1 Fife ECO Stars Scheme

The Fife ECO Stars programme was successfully launched by Fife Council in October 2014 and was extended to include Fife ECO Stars Taxis in December 2015. Since its launch two workshop events were held for local fleet operators (March 2015 and March 2016). Further details and pictures from these events are shown in Appendix E. At the workshop event a variety of topics were discussed related to improving fleet efficiency. Currently (June 2017) there are 119 HGV & Bus fleet members (6175 vehicles) and 24 Taxi and private hire members (128 vehicles) signed up to the scheme which seeks to improve air quality in the Fife area; this has increased since the 2016 Annual Progress Report. Fife Council intends to continue with the scheme recruitment process, as well as hosting future workshops and exploring how best to evaluate the impact of this scheme through the use of both qualitative and quantitative performance indicators.

2.2.2 Completed Measures

Fife 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 2.6 for Bonnygate, Cupar and Table 2.7 for Appin Crescent, Dunfermline. The tables summarise progress to date on each of the measures within the AQAP. More details on these measures can be found in the relevant AQAP and Fife Council's Air Quality Strategy 2015-2020.

Key completed measures include the installation of the traffic management system within Bonnygate, Cupar. The traffic management system included a new pedestrian crossing linked at St Catherine Street. The twin mini roundabout system has also been implemented at St Catherine Street/East Bridge to ease the flow of traffic through Cupar, reducing congestion.

Within the Appin Crescent AQMA, revised lane markings and signage were introduced in March 2013. These measures have resulted in a reduction in NO_2 concentrations on the south side of Appin Crescent. The AQAP outlines the consideration of a bypass and a feasibility study was commissioned to determine if this would be an option to reduce pollutant concentrations within Appin Crescent. The feasibility study suggested that the proposed bypass would achieve the reduction required in pollutant concentrations to reach the Air Quality Strategy annual mean objectives. However, no funding is available for this option and Fife Council are considering alternative traffic management (including the outcomes of a recent cost benefit analysis of two traffic management options in 2016) that will result in similar reductions whilst being more cost effective and practicable.

As progress on the action plan measures for Cupar and Dunfermline continues to advance a number of measures have now been completed, these are summarised in Table 2.4. Similarly, as the action plan measures have been advanced, certain measures have been discounted from further consideration. Details on discounted measures are summarised in Table 2.5.

Table 2.4: Completed AQAP Measures

No.	Measure	Comments
	Bonnygate, Cupar	
4	Implementation of new Urban Traffic Management and Control system and changes to pedestrian crossings	New pedestrian crossing linked to the traffic management system has been completed at St Catherine Street and twin mini roundabout scheme has been implemented at St Catherine Street/East Bridge.
	Appin Crescent, Dunfermline	
2	Feasibility study	Feasibility studies (2015 & 2016) and a CBA report in 2016 have been produced and considered by the AQ Steering Group. It has been concluded from these studies that the options considered to date are not cost effective, feasible and acceptable as defined in AQAP evaluation criteria. Focus is now on the delivery of the Northern Link Road to the North of Appin Crescent in terms of seeking air quality improvements in the Appin Crescent AQMA.
6	Traffic Management optimisation (dependent on feasibility study)	
16	Cost-benefit analysis of traffic management options to improve air quality within Appin Crescent AQMA	

2.2.3 Discounted Measures

Table 2.5: Discounted AQAP Measures

No.	Measure	Justification
	Bonnygate, Cupar	
8	AQMA Awareness Signs	Measure has been discounted based on the grounds of cost effectiveness, practicability feasibility and acceptability to members of the public.
	Appin Crescent, Dunfermline	
12	Consideration of development of Appin Crescent bypass (Dependent upon feasibility study)	Based on the findings of the feasibility study, the Air Quality Steering Group considers that this option is not as cost effective, practicable and feasible relative to the introduction of the Northern Link Road in Dunfermline

Table 2.6 Progress on Measures to Improve Air Quality- Bonnygate Cupar

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
1	Improving links with Local Transport Strategy/ Area Transport Plan	Policy guidance and development control	Measures to ensure the air quality in the AQMA is improved where possible and to avoid future problems are implemented via the Local Transport Strategy.	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Ongoing	Reference to Bonnygate AQMA and measures included in Air Quality Action Plan. Integration of plan with Local Transport Strategy.	Low	Fife Council Air Quality Steering Group outputs are contributing to the development of Fife Council Local Transport Strategy/Area Transport Plan and are to be incorporated in future revisions of these strategies/plans.	Ongoing
2	Improving Air Quality Links with local Planning and Development Framework	Policy guidance and development control	Local planning considerations aim to mitigate the cumulative negative air quality impacts of new development Consideration of air quality issues in LDP2.	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Short-Term	Ensure that development proposals with the potential to exert an impact on the Bonnygate AQMA are assessed for air quality impacts and where necessary, appropriate mitigation measures considered.	Medium	Following a delay in finalising the Low Carbon Supplementary Guidance the finalised air quality sections are to be published online as informal guidance for developers. The recommendations from the FIFEplan examination included additional text on Air Quality matters and included a reference	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									to supplementary guidance providing additional information on air quality assessments. The Low Carbon SG needs to be in place by April 2018. GIS Modelling Toolkit for Fife area developed which is assisting in consideration of planning applications with AQ issues	
3	Integrate AQ with other Council Strategies	Policy guidance and development control	Encourage opportunity for contributions towards improving local air quality and minimising negative impacts from existing and future Council strategies. Planning obligations are set out in the Planning Obligations	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Medium Term	Continue and enhance joint working between Council Services & other Partnership Organisations to encourage potential air quality implications of existing and future Council strategies.	Low	Submission of AQ grant application for 2017-2018 includes submissions for climate change measures. Fife ECO stars impact evaluation methodology developed in 2016 which allows for assessment of Fife Council Fleet emissions in terms of air quality improvements including carbon reduction.	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
			framework Guidance Increase awareness of local air quality							
4	Implementation of new Urban Traffic Management and Control system and changes to pedestrian crossings	Policy guidance and development control	Improve efficiency of transit through Cupar Town Centre and reduce emissions from road traffic sources within the Bonnygate street canyon. Installation of traffic management system.	Fife Council	2009	Completed Completed	Pollutant reduction in AQMA AQ monitor will continue to confirm the effectiveness of the measures.	High Decline in NO_2 and PM_{10} concentrations within Bonnygate, monitoring to continue until trend has emerged. Pollutant concentrations can vary annually due to meteorological influences.	New pedestrian crossing linked to the traffic management system has been completed at St Catherine Street and twin mini roundabout scheme has been implemented at St Catherine Street/East Bridge.	Completed, monitoring ongoing
5	Travel Plans for Large Institutions and Businesses	Promoting travel alternatives	To encourage a shift to more sustainable forms of travel, or reducing the need for travel.	Fife Council	2009-2015	Medium term	Results of Council Travel surveys	Low	Travel Plans for Schools being supplemented by “Clear the Air” Training Pack introduced by Scottish Government which is being rolled out across Fife schools.	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
6	Promotion of Travel Choices	Promoting travel alternatives	Discourage long stay commuter parking as part of the Fife Council's Parking Strategy. To increase awareness of travel choices and encourage changes in behaviour that will contribute to improving local air quality.	Fife Council	As outlined in the aims and objectives of Councils Air Quality Strategy 2015-20	Short-term	To improve integration between cycling, walking and public transport.	Low	Resubmitted grant application for further traffic counters in 2017-18. .	Ongoing
7	Target reduced localised emissions from freight.	Freight and delivery management	Improve efficiency of transit through the AQMA and facilitate reduce emissions.	Fife Council	As outlined in the aims and objectives of Councils Air Quality Strategy 2015-20	Short-Term	Continue to make information relating to local air quality management available through the Council website	Medium .	Have through the Fife ECO Stars scheme managed to encourage HDV fleet operators to recognise importance of air quality and climate change issues. Also continuing to assess air quality impacts of Cupar Relief Road in terms of this action plan measure (See also Action Plan Measure 12)	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
8	AQMA Awareness Signs	Public information	To increase awareness of the Bonnygate AQMA and encourage behavioural change.	Fife Council	N/A	N/A	N/A	Low	Measure has been discounted based on the grounds of cost effectiveness, practicability feasibility and acceptability to members of the public.	N/A
9	Provision of Information relating to Air Quality	Public information	To increase awareness of local air quality issues and encourage changes in behaviour that will contribute to improving local air quality.	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Ongoing	Production of booklet- travel pack Publication for LAQM reports Continue to make information relating to local air quality management available through the Council website.	Low	Several media releases including the introduction of latest $PM_{2.5}$ monitors resulting in Fife having one of the most extensive monitoring network for this pollutant in Scotland. "Clear the Air" Training Pack introduced by Scottish Government to be rolled out across Fife schools. Air quality guidance note for developers is to be updated to reflect latest policy and technical guidance.	Ongoing
10	Parking Management and Control	Traffic management	Reduce traffic by	Fife Council	As outlined in the aims and objectives of	Short-Medium Term	Pollutant reduction in AQMA	Low	Continue to evaluate parking management within	2020

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
			discouraging long stay parking and associated commuting movements. Minimise impacts of commercial deliveries on traffic movement.		Council's Air Quality Strategy 2015-20				the Bonnygate AQMA	
11	Promotion pf Cycling and Walking	Promoting travel alternatives	To encourage a shift away from the use of private motor vehicles for travelling to more sustainable forms of transport, or reducing the need for travel.	Fife Council	Ongoing	Medium Term	Number/length of cycling and walking routes developed. Design of new developments provided good links to encourage active travel.	Low	Fife Council has been at the forefront of encouraging people to cycle for over 20 years. A network of over 350 miles of dedicated cycleways, together with extensive 20mph residential zones, has been developed to encourage people to cycle more. Programme of promotional campaigns, route mapping, development and implementation of travel plans and	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									cycle training for all ages and events, has contributed to year on year increases in cycle use in Fife. Increasing participation in all forms of cycling is a key task for Fife Council, working towards the Scottish Government vision for 10% of all journeys by bike by 2020. Since the launch of Cycling Action Plan for Scotland (CAPS) in 2009, Fife has been working hard through multi-agency initiatives (e.g. TRY IT Cupar and Make Your Move Kirkcaldy) to increase numbers of cyclists and walkers. We aim to provide significant new	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									and improved cycle routes and intensive cycle training for all ages in both areas, as well as free bike loan schemes and more cycle racks in a bid to get the whole community cycling. Fife Councils' Bikeability team are working with the Community Police to offer all P7s' within the Bell Baxter Cluster (Cupar) the opportunity to take part in cycle training.	
12	Review and support proposed infrastructure changes that will contribute to delivering improvements in local air quality	Transport planning and infrastructure	Support Council proposals for infrastructure changes that will facilitate improvements in vehicle movements within Cupar.	Fife Council	Ongoing	Long Term	Pollutant Reduction in AQMA	High	Update to modelling study produced in 2017 using latest road vehicle emission factors (see main body of APR 2017 report for summary of findings). In brief, the dispersion modelling study for two future development scenarios for Cupar North Development	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									and associated Relief Road found that whilst there may be no exceedances of NO_2 in the Bonnygate AQMA there may be exceedances of PM_{10} at the South side of the narrower section of the Bonnygate street canyon. Fife Council AQ Steering Group to meet and consider the contents of report in assisting in future strategic deliberations relating to this proposed development. This is to include a submission to Scottish Government for 1 X AQMesh monitor to be installed on the Southern side of the narrow section of Bonnygate canyon for the purposes of monitoring PM_{10} & $PM_{2.5}$ as automatic monitoring station & cabinet cannot be installed at	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									narrowest section of street canyon due to access and health and safety reasons. The outputs of this monitoring are intended to assist in development of further modelling studies of the Cupar North Development and associated Relief Road.	
13	Target reductions in emissions from the Council fleet and contract vehicles (including driver training)	Vehicle fleet efficiency	Target reduced emissions from Council fleet vehicles and Council contract fleet vehicles operating within the Cupar AQMA.	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Ongoing	Fife Council tender specification outlines that all new vehicles must have exhaust trap and filtration systems.	Medium	Fife Council has one of the most extensive electric vehicle charging networks in Scotland and is making good progress with the introduction of cleaner and greener vehicles into its fleet. (1) 2 Mitsubishi Outlanders PHEV Petrol Hybrids now in service. One with Roads Operations and the other with Building Services. (2) Volkswagen eGolfs now in service.	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									(3) 1 Volvo V60 Diesel plugged in hybrid now in service for Building Services. (4) 5 Transit vehicles now converted to dual fuel diesel and hydrogen and now in service including hydrogen re-fuelling station (5) A world first of 2 Refuse Collection Vehicles now converted over to a dual fuel system i.e. as well as the standard euro 6 diesel engine it will now operate on both diesel and hydrogen gas from renewable resources (Locally sourced from Methilhaven Hydrogen Centre) (awaiting hydrogen re-fuelling station) (6) 2 x Nissan Electric Vehicle (Meals on Wheels Service in Cupar)	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									The introduction of dual fuel diesel and hydrogen vehicles to the Council's fleet is a key component of a wider collaborative project – the Levenmouth Community Energy project. This innovative project has recently secured £4.3million funding under the Scottish Government's Local Energy Challenge Fund. The project partners in the Levenmouth Community Energy Project are: Bright Green Hydrogen Ltd (lead partner), Fife Council and Toshiba. The project also includes the introduction of 10 Renault Kangoo vans with a hydrogen range	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									extender, refuelling at both the Hydrogen Office and at Fife Council's vehicle depot at Bankhead in Glenrothes. The decrease in vehicle fuel use has continued, in the year just closed out i.e. 2015/16. **2012/13** 5,168,918 Litres – All Fuels **2013/14** 4,908,042 Litres – All Fuels **2014/15** 4,798,236 Litres – All Fuels **2015/16** 4,193,936 Litres – All Fuels The decrease of litres since 2012 works out at 2,518 tonnes less carbon. Workings – Diesel carbon factor 2.58288kg per	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									litre X 974,982 litres of diesel = 2,518,261 kgs of carbon (2,518 tonnes) Fuel wise this drop – 974,982 litres is a 19% reduction in our overall fuel usage.	
14	Target reductions in emissions from buses	Vehicle fleet efficiency	Target reduced emissions from buses operating within the Bonnygate AQMA.	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Short-Term	Establish a bus quality partnership Increase in fleet using alternative fuels	Medium	Fife ECO Stars scheme managed to encourage bus operators to recognise importance of air quality and climate change issues. Stagecoach Ltd has recently joined the scheme and awarded a five star rating. To explore the potential to set up voluntary bus agreements through interaction with local bus operators through the ongoing Fife ECO stars recruitment process.	Ongoing
15	Fife ECO Stars	Vehicle fleet efficiency	Encourage operators of buses,	Fife Council	As outlined in the aims and objectives of Council's Air	Ongoing	Number of ECO Stars members	Medium	There are as of June 2017, 119 HGV & Bus fleet members (6175	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
			coaches, HGVs and LDVs to sign up to voluntary scheme which encourages and promotes 'clean operators'		Quality Strategy 2015-20				vehicles) and 24 Taxi and private hire members (128 vehicles) already signed up to the scheme which seeks to improve air quality in the Fife area and has one of the highest ECO Stars scheme recruitment rates in the UK. Fife Council intends to continue with the scheme recruitment process, as well as hosting future workshops and exploring how best to evaluate the impact of this scheme through the use of both qualitative and quantitative performance indicators. Fife Council's Fleet Operations is currently the subject of an ECO Stars impact evaluation study by TRL Ltd. The latest outcome of this study	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									comparing Fife Council fleet data collected for two periods (Period 1: 01/04/2014 to 31/03/2015 and Period 2: 01/04/2015 to 31/03/2016 – Fife ECO stars scheme introduced in 2014) are summarised as follows: Particulate Matter (PM expressed as g/PM). Emissions down 11% for 2015-16 relative to 2014-2015 Nitrogen Oxides (NOx expressed as kg/NOx). Emissions down 7% for 2015-16 relative to 2014-2015. Carbon Dioxide (CO_2 expressed as tonnes CO_2). Emissions down 2% for 2015-16	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									relative to 2014-2015. The above study (subject to receiving Scottish Government funding) is to be undertaken for 2016-17 fleet data to allow for year by year comparisons.	
16	Air Quality and Planning Toolkit	Policy guidance and development control	Facilitate the consideration of the potential air quality impacts of developments across Fife, but notably near existing AQMAs	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Phase 1 Study Completed	Develop a GIS based dispersion modelling toolkit to assist planners and other local authority officers in the consideration of the air quality issues in the development management process.	Medium	Phase 1 Study Completed. Phase 2 Study Completed. This report produced in 2016 summarises the development process for the Kingdom wide air dispersion model prepared for Fife Council by Ricardo Energy and Environment. This includes a Fife wide model of NO_2, PM_{10} and $PM_{2.5}$ to Fife Council as a series of GIS data products which are supplemented with extra outputs for viewing in	2020

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									either a web browser or Google Earth. Whilst dispersion modelling has been undertaken by Fife Council in the past to support LAQM and development control, this work represents the first attempt to create a highly resolved air pollution model of the whole Kingdom. This work also represents a first in Scotland in that an area this large has to the best of our knowledge never been modelled at such high resolution. The above outputs are already being used by the Council's LAQT in considering proposed developments with potential air quality issues.	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
17	Air Quality Strategy 2015-2020	Policy guidance and development control	Increase awareness of local air quality issues and promote good practice in reducing emissions of air quality pollutants.	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Ongoing	Develop and adopt an Air Quality Strategy that aims to raise awareness of air quality issues and to promote some of the existing best practice work that the Council has undertaken within existing AQMAs to other parts of Fife.	Pollutant reduction in AQMAs KPIs are currently being developed by the Scottish Government as outlined in the Cleaner Air Quality Strategy for Scotland and are anticipated to be finalised in the First Annual Progress Report for this Strategy. Following the introduction of these KPIS, Fife Council will incorporate these into the action planning process.	See measures 1-16 These are considered to be consistent with aims/objectives of Scottish Government Cleaner Air Quality Strategy for Scotland 2015 including the List of Actions in Chapter 14 of the strategy.	2020

Table 2.7 Progress on measures to Improve Air Quality- Appin Crescent Dunfermline

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
1	Liaise with Scottish Government to encourage the consideration of national measures	Policy guidance and development control	Increase focus on background concentrations of PM and encourage national action	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Ongoing	Maintain contact with the Scottish Government regarding the adoption of national air quality measures	Low KPis to be developed in liaison with Scottish Government	Local Authority provided comments on: • Latest policy & technical guidance circulated by the Scottish Government. • Transport Scotland Rail Infrastructure Strategy Consultation 2017 • Local Authority Bus Operations Survey 2017. Training event for local authority staff on latest air quality policy and technical guidance arranged by Fife Council and held on March 22nd 2017.	Ongoing
2	Feasibility study	Transport planning and infrastructure	To adopt a strategic approach to air	Fife Council	As outlined in the aims and objectives of Council's Air	Medium Term	Undertake a feasibility study to assess the potential impact of local infrastructure	High	Feasibility studies (2015 & 2016) have been completed and considered by AQ	Completed

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
			quality in Appin Crescent and undertake a detailed assessment of the feasibility and impacts of proposed infrastructure and traffic management measures.		Quality Strategy 2015-20		developments and traffic management optimisation on air quality in Appin Crescent		Steering Group. It has been concluded that the options considered to date are not cost effective, feasible and acceptable as defined in AQAP evaluation criteria. Focus is now on the delivery of the Northern Link Road to the North of Appin Crescent in terms of seeking air quality improvements in the Appin Crescent AQMA.	
3	Improving links with Local Transport Strategy/ Area Transport Plan	Transport planning and infrastructure	Measures to ensure the current poor air quality in the AQMA is improved where possible and to avoid future problems are implemented via the Local Transport Strategy.	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Ongoing	Reference to Appin Crescent AQMA and measures included in Air Quality Action Plan. Integration of plan with Local Transport Strategy.	Low	Fife Council Air Quality Steering Group outputs are contributing to the development of Fife Council Local Transport Strategy/Area Transport Plan and are to be incorporated in future revisions of these strategies/plans.	Ongoing
4	Improving Air Quality links with Local Planning and	Policy guidance and development control	Local planning considerations aim to mitigate the cumulative negative air	Fife Council	As outlined in the aims and objectives of Council's Air Quality	Short-Term	Integration of Appin Crescent AQAP with future versions of Local Plan.	Medium	Following a delay in finalising the Low Carbon Supplementary Guidance the	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
	Development Framework		quality impacts of new development		Strategy 2015-20		Maintain and make available - air quality guidance note for developers.		finalised air quality sections are to be published online as informal guidance for developers. The recommendations from the FIFEplan examination included additional text on Air Quality matters and included a reference to supplementary guidance providing additional information on air quality assessments. The Low Carbon SG needs to be in place by April 2018. GIS Modelling Toolkit for Fife area developed which is assisting in consideration of planning applications with AQ issues	
5	Integrate AQ with other	Policy guidance	Encourage opportunity for	Fife Council	As outlined in the aims and	Medium Term	Continue and enhance joint	Low	Submission of AQ grant application for	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
	Council Strategies	and development control	contributions towards improving local air quality and minimising negative impacts from existing and future Council strategies. Planning obligations are set out in the Planning Obligations framework Guidance – this is to be reviewed in the near future. Increase awareness of local air quality.		objectives of Council's Air Quality Strategy 2015-20		working between Council Services & other Partnership Organisations to encourage potential air quality implications of existing and future Council strategies		2017-2018 includes submissions for the delivery of air quality and climate change measures. Fife ECO stars impact evaluation methodology developed in 2016 which allows for assessment of Fife Council Fleet emissions in terms of air quality improvements including carbon reduction.	
6	Traffic Management optimization (dependant on feasibility study)	Traffic management	Reduce traffic queuing within the AQMA through the optimisation of the Traffic management system.	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Medium Term	Optimisation of the traffic management system at Appin Crescent and the surrounding network. Progress of this action is dependent on the	High	Feasibility studies (2015 & 2016) have been completed and considered by AQ Steering Group. It has been concluded that the options considered to date are not cost effective, feasible and acceptable as	Completed

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
							conclusions of the feasibility study.		defined in AQAP evaluation criteria. Focus is now on the delivery of the Northern Link Road to the North of Appin Crescent in terms of seeking air quality improvements in the Appin Crescent AQMA.	
7	Travel Plans for large Institutions and Businesses	Transport planning and infrastructure	To encourage a shift to more sustainable forms of travel, or reducing the need for travel.	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Medium Term	Continue the implementation of Fife Council's travel plan Undertake Council travel surveys	Low	Travel Plans for Schools being supplemented by "Clear the Air" Training Pack introduced by Scottish Government which is being rolled out across Fife schools.	Ongoing
8	Provision of Information and promotion of travel options	Promoting travel alternatives	To increase awareness of travel choices and encourage changes in behaviour that will contribute to improving local air quality.	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Ongoing	To improve integration between cycling, walking and public transport. Produce Travel Choices facility for Dunfermline.	Low	Resubmitted grant application for further traffic counters in 2017-18	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
							Undertaking Travel Marketing in Dunfermline.			
9	Provision of information relating to Air Quality	Public information	To increase awareness of local air quality issues and encourage changes in behaviour that will contribute to improving local air quality.	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Ongoing	Continue to make information relating to local air quality management available through the Council website.	Low	Presentations to NHS, FPH and Green Fleet Scotland and STEP. Reports available at Fife direct web pages for AQAP and Annual LAQM reports. "Clear the Air" Training Pack introduced by Scottish Government to be rolled out across Fife schools. Air quality guidance note for developers is to be updated to reflect latest policy and technical guidance.	Ongoing
10	Target reductions in emissions	Vehicle fleet efficiency	Target reduced emissions from	Fife Council	As outlined in the aims and	Ongoing	Monitor and assess viable	Medium	Fife Council has one of the most extensive electric	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
	from the Council fleet and contract vehicles (including driver training)		Council fleet vehicles and Council contract fleet vehicles.		objectives of Council's Air Quality Strategy 2015-20		options for alternative Fuels, technologies and fuel additives. Fife Council tender specification outlines that all new vehicles must meet Euro 6 Engine Emission's or an equivalent emission reduction system.		vehicle charging networks in Scotland and is making good progress with the introduction of cleaner and greener vehicles into its fleet. (1) 2 Mitsubishi Outlanders PHEV Petrol Hybrids now in service. One with Roads Operations and the other with Building Services. (2) Volkswagen eGolfs now in service. (3) 1 Volvo V60 Diesel plugged in hybrid now in service for Building Services. (4) 5 Transit vehicles now converted to dual fuel diesel and hydrogen and now in service (awaiting	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									hydrogen re-fuelling station) (5) A world first of 2 Refuse Collection Vehicles now converted over to a dual fuel system i.e. as well as the standard euro 6 diesel engine it will now operate on hydrogen gas from renewable resources (Locally sourced from Methilhaven Hydrogen Centre) (awaiting hydrogen re-fuelling station) (6) 1 x Nissan Electric Vehicle (Meals on Wheels Service in Cupar) The introduction of dual fuel diesel and hydrogen vehicles to the Council's fleet is a key component of a wider collaborative project - the Levenmouth Community	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									Energy project. This innovative project has recently secured £4.3million funding under the Scottish Government's Local Energy Challenge Fund. The project partners in the Levenmouth Community Energy Project are: Bright Green Hydrogen Ltd (lead partner), Fife Council and Toshiba. The project also includes the introduction of 10 Renault Kangoo vans with a hydrogen range extender, refuelling at both the Hydrogen Office and at Fife Council's vehicle depot at Bankhead in Glenrothes. The decrease in vehicle fuel use has continued, in	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									the year just closed out i.e. 2015/16. **2012/13** 5,168,918 Litres – All Fuels **2013/14** 4,908,042 Litres – All Fuels **2014/15** 4,798,236 Litres – All Fuels **2015/16** 4,193,936 Litres – All Fuels The decrease of litres since 2012 works out at 2,518 tonnes less carbon. Fuel wise this drop – 974,982 litres is a 19% reduction in our overall fuel usage.	
11	Investigate the potential for establishing voluntary bus agreements	Promoting travel alternatives	Target reduced emissions from buses	Fife Council	As outlined in the aims and objectives of Council's Air Quality	Ongoing	Liaise with bus operators regarding emissions from the bus fleet and	Medium	The Fife ECO Stars scheme has encouraged bus operators to recognise the	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
			operating within the Appin Crescent AQMA.		Strategy 2015-20		improvements to bus service infrastructure. Bus quality agreement similar to P&R at Ferrytoll, link to forth Road Bridge Replacement crossing. ECO stars scheme may facilitate such agreements as Stagecoach joined ECO Stars in 2015.		importance of fuel efficiency, air quality and climate change issues. Stagecoach Ltd has recently joined the scheme and awarded a five-star rating. To explore the potential to set up voluntary bus agreements through interaction with local bus operators through the ongoing Fife ECO stars recruitment process.	
12	Consideration of development of Appin Crescent bypass (Dependent upon feasibility study)	Transport planning and infrastructure n	If determined to be feasible, the development of a bypass at Appin Crescent may be a potential option to facilitate a reduction the traffic volume passing through the AQMA and consequently contribute to lower emissions.	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Ongoing	Development of an Appin Crescent bypass	High but is not considered cost effective, practicable and feasible in relation to other traffic management measures that are currently being considered including the proposed Dunfermline Northern Link Road.	Air Quality Steering Group considers that this option is not as cost effective, and feasible relative to the introduction of the Northern Link Road in Dunfermline	Discoumted

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
13	Fife ECO Stars	Vehicle Fleet Efficiency in HGV & Taxi Fleets	Encouraging local fleet operators to introduce fleet management systems that improve air quality	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Ongoing	Number of ECO Stars members	Medium	There are as of June 2017, 119 HGV & Bus fleet members (6175 vehicles) and 24 Taxi and private hire members (128 vehicles) already signed up to the scheme which seeks to improve air quality in the Fife area and has one of the highest ECO Stars scheme recruitment rates in the UK. Fife Council intends to continue with the scheme recruitment process, as well as hosting future workshops and exploring how best to evaluate the impact of this scheme through the use of both qualitative and quantitative performance indicators. Fife Council's Fleet Operations is	Ongoing

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									currently the subject of an ECO Stars impact evaluation study by TRL Ltd. The latest outcomes of this study comparing Fife Council fleet data collected for two periods: (Period 1: 01/04/2014 to 31/03/2015 and Period 2: 01/04/2015 to 31/03/2016 – Fife ECO stars scheme introduced in 2014) are summarised as follows: Particulate Matter (PM expressed as g/PM). Emissions down 11% for 2015-16 relative to 2014-2015. Nitrogen Oxides (NOx expressed as kg/NOx). Emissions down 7% for 2015-16	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									relative to 2014-2015. Carbon Dioxide (CO_2 expressed as tonnes CO_2). Emissions down 2% for 2015-16 relative to 2014-2015. The above study (subject to receiving Scottish Government funding) is to be undertaken for 2016-17 fleet data to allow for year by year comparisons.	
14	Air Quality and Planning Toolkit	Development Control	Ensure future development does not compromise achievement of statutory air quality objectives	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Phase 1 Study Completed	Develop a GIS based dispersion modelling toolkit to assist planners and other local authority officers in the consideration of the air quality issues in the development management process.	Medium	Phase 1 Study Completed. Phase 2 Study Completed. This report produced in 2016 summarises the development process for the Kingdom wide air dispersion model prepared for Fife Council by Ricardo Energy and Environment. This includes a Fife wide	2020

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									model of NO_2, PM_{10} and $PM_{2.5}$ to Fife Council as a series of GIS data products which are supplemented with extra outputs for viewing in either a web browser or Google Earth. Whilst dispersion modelling has been undertaken by Fife Council in the past to support LAQM and development control, this work represents the first attempt to create a highly resolved air pollution model of the whole Kingdom. This work also represents a first in Scotland in that an area this large has to the best of our knowledge never been modelled at such high resolution. The above outputs are	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									already being used by the Council's LAQT in considering proposed developments with potential air quality issues.	
15	Cost-benefit analysis of traffic management options to improve air quality within Appin Crescent	Traffic Management	Evaluation of short to medium term traffic management measures to improve air quality	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Completed	CBA analysis Outcomes of two traffic management options	High	Feasibility studies (2015 & 2016) and a CBA report in 2016 have been produced and considered by FC AQ Steering Group. It has been concluded from these studies that the options considered to date are not cost effective, feasible and acceptable as defined in AQAP evaluation criteria. Focus is now on the delivery of the Northern Link Road to the North of Appin Crescent in terms of seeking air quality improvements in the Appin Crescent AQMA.	Completed

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
16	Air Dispersion modelling Study of the potential Dunfermline Northern Link Road	Traffic Management	Estimate the impact of the proposed northern link road and the proposed Dunfermline strategic land allocation (SLA) zones	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Long Term. Report indicates that that neither the NO_2 or PM_{10} annual mean objectives are expected to be exceeded in 2029 with the North Link Road being fully operational.	Carry out Air Quality dispersion modelling to quantify the impacts of the proposed Northern Link.	High	Northern Link Road dispersion modelling report 2016 has been updated to include latest road vehicle emission factors in 2017. The model results, although based on fairly uncertain estimates of future traffic growth indicate that the NO_2 annual mean objective may be achieved at Appin Crescent in 2020 or 2021. For PM_{10}, annual mean concentrations are not predicted to be compliant with the 18 $\mu g.m^{-3}$ Scottish objective at a number of receptors locations up to, and likely beyond, 2029. The receptors affected are all at locations on the south side of Appin Crescent where canyon effects/recirculation limits dispersion of	2020

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									road traffic emissions. Due to the uncertainties in traffic growth estimates, projected emission rates and background concentration, these results should be considered as purely indicative when considering how NO_2 and PM_{10} concentration may change in future years. Given the above uncertainties, Fife Council has applied for Scottish Government Air Quality Grant for 2017-18 to include the introduction of two AQMesh monitoring pods for PM_{10} & $PM_{2.5}$ at the South side of Appin Crescent. This recent monitoring technology allows for monitoring at the South side of	

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
									Appin Crescent as the narrow width of pavement on the South side does not allow for installation of automatic continuous monitoring equipment and associated cabinet. This monitoring data will be used to inform future modelling studies in seeking to provide more accurate and reliable modelling outputs in in terms of evaluating the air quality impacts of the Northern Link Road on the Appin Crescent AQMA.	
17	Air Quality Strategy for Fife	Strategy	As outlined in the aims/objectives contained in the Air Quality Strategy Report 2015-2020	Fife Council	As outlined in the aims and objectives of Council's Air Quality Strategy 2015-20	Ongoing	Pollutant reduction in AQMAs KPIs are currently being developed by the Scottish Government as outlined in the Cleaner Air Quality Strategy for Scotland and are anticipated to	High	See measures 1-16. These are considered to be consistent with aims/objectives of Scottish Government Cleaner Air Quality Strategy for Scotland 2015 including the List of Actions in Chapter 14 of the Strategy.	2020

Measure No.	Measure	Category	Focus	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date (February 2017)	Estimated Completion Date
							be finalised in the First Annual Progress Report for this Strategy. Following the introduction of these KPIS, Fife Council will incorporate these into the action planning process.		Partnership working has been demonstrated through action planning initiatives. This includes traffic management, Fife ECO Stars, detailed JHHP 2016-18 and behavioural change initiatives.	

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 Fife Council against relevant actions within this strategy is demonstrated below.

2.3.1 Transport-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." **(CAFS T1 2015)**

Fife Council was the first Local Authority in Scotland to write a travel plan back in 1999 and to monitor how things are changing, we do an Employee Travel Survey every two years.

The Fife Council Travel Plan[36] promotes sustainable travel with a hierarchy of walking, cycling, public transport, car share which is consistent with key aims and objectives of Fife Council's Air Quality Strategy 20150-20 and Appin Crescent (Dunfermline) and Bonnygate (Cupar) Air Quality Action Plans (updated 2015).

Fife Council have a travel planning team which works with the office rationalisation team and as more staff are moved to new offices they advise on travel choices to their new location.

We also have initiatives such as:

- TripshareFife.com - allowing you to find people travelling to similar locations to car share with http://publications.fifedirect.org.uk/c64_LoveYourCar-Shareit.pdf
- Cycle to Work Scheme – providing you an opportunity to purchase a new bike and/or safety accessories and pay direct from your salary, saving money and spreading the cost.
- Working with Schools to assist them in producing school travel plans.

Fife Council also have initiatives such as:

- Bikeability – providing cycle training to primary school children P4 -7
- WOW (Walk Once a Week)

2.3.2 Climate Change-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." **(CAFS CC2 2015)**

The Fife Council Air Quality Strategy 2015-2020 acknowledges the need to integrate closer the links between the Council's air quality and climate change strategies and this is being developed through initiatives such as the encouraging a move towards more sustainable modes of transport including dedicated Council walking/cycling schemes and the introduction of cycling infrastructure, reducing the number of Council fleet vehicles, increasing the uptake of cleaner and more sustainable forms of transport such as electric and hydrogen powered vehicles.

The Fife ECO Stars scheme is also being rolled out with associated air quality and climate change benefits. Fife Council's Fleet Operations is currently the subject of an ECO Stars impact evaluation

[36] Fife Council Travel Plan- https://www.fifedirect.org.uk/topics/index.cfm?fuseaction=service.display&p2sid=B8C89CE9-65BF-00F7-DD59C1DCB19187F5&themeid=568AF4CE-B036-4E67-93AB-36B1E13DFA11

study by TRL Ltd. The latest outcomes of this study comparing Fife Council fleet data collected for two periods (Period 1: 01/04/2014 to 31/03/2015 and Period 2: 01/04/2015 to 31/03/2016 – Fife ECO stars scheme introduced in 2014) are summarised as follows:

- Particulate Matter (PM expressed as g/PM) emissions down 11% for 2015-16 relative to 2014-2015.
- Nitrogen Oxides (NOx expressed as kg/NOx) emissions down 7% for 2015-16 relative to 2014-2015.
- Carbon Dioxide (CO_2 expressed as tonnes CO_2) emissions down 2% for 2015-16 relative to 2014-2015.

Fife Councils Land & Air Quality Team is also working closely with the Council's Climate Change team on the development of a Sustainable Energy Climate Action Plan (SECAP) for the Fife region. As part of that process the need to create local energy plans and integrate them into local planning has been identified. There are key objectives within the Fife Community Plan including the need to tackle climate change, reduce carbon emissions and create a healthier fairer Fife for all. Reducing carbon emissions and adapting to climate change are also the key outcomes of the Fife Environmental Partnership and Fife's Climate Change Strategy. The Land & Air Quality Team is currently assisting the Council's Climate Change Team in the development of a Community Energy Masterplan for Burntisland which will help the local community to understand their energy needs and how it could be supplied locally in a low carbon manner, in the future. The document will then be used within the local planning process to help determine development within Burntisland, and to ensure that it meets the community's priorities and wishes and that it will enable Burntisland to becoming a low carbon, high resilience settlement. Fundamental to this will be engagement with communities around their energy consumption and supply.

The underlying strategy within Fife's SECAP (Sustainable Energy and Climate Action Plan) looks to create local community energy islands across Fife. Each community would develop their own energy masterplan tailor-made for each area's energy demand and energy generation potential, with particular focus on low carbon heat and reducing fuel and mobility poverty. This pilot Energy Masterplan is the first of what we hope will be many to cover all of Fife. This pilot project worked in partnership with the local community in Burntisland, Fife, with the aim of reducing fuel and mobility poverty and reducing carbon emissions. Through a series of consultation meetings and workshops together we mapped the 'whole energy system' for Burntisland looking at heat, electricity and transport options including storage opportunities. The project brought in external expertise to enable the community to understand their energy demands. The priorities and ideas contained within this Community Energy Masterplan were developed by the local community. The main output from this project is the creation of a local Energy Masterplan for Burntisland to support the development of a locally planned sustainable energy system.

Fife Council are currently preparing a Sustainable Energy and Climate Action plan to provide an overreaching framework for our climate change mitigation and adaptation activities within Fife and to identify priorities for action. The process is still in the early stages and we envisage effective co-ordination of climate change and air quality polices to deliver co-benefits as an integral part of this strategy.

2.3.3 NHS Boards and their Local Authority Partners will include reference to air quality and health in JHPP-H2

"NHS boards and their local authority partners will include reference to air quality and health in the next revision of their Joint Health Protection Plans, which should identify and address specific local priority issues." **(CAFS H2 2015)**

Fife Council has in partnership with NHS Fife updated its Joint Health Protection Plan 2016-18 to include specific reference to local priority issues in particular the Bonnygate AQMA/AQAP and Appin Crescent AQMA/AQAP. Fife Council are also exploring with NHS Fife the potential to develop the PHOF data tool (referred to in the Defra/PHE Briefing for Directors on Public Health produced in March 2017) in terms of the potential derivation of health related statistics for the Fife area.

2.3.4 Planning Authorities – Planning authorities to review the Local Development Plan-P2

"Expect planning authorities to review the Local Development Plan and revise at the next scheduled update to ensure policies are consistent with CAFS objectives and any local authority air quality action plans." **(CAFS P2 2015)**

On 28 February 2017 Fife Council's Executive Committee agreed to adopt the Local Development Plan (FIFEplan) subject to consultation with Scottish Ministers. The recommendations from the FIFEplan examination included additional text on Air Quality matters and included a reference to supplementary guidance (Low Carbon SG) providing additional information on air quality assessments. The Low Carbon SG needs to be in place by April 2018.

2.3.5 Cycling Action Plan -T3

"We will work with partners to deliver our shared vision in the Cycling Action Plan for Scotland that by 2020, 10% of everyday journeys will be made by bike." **(CAFS T3 2015)**

Fife has one of the UK's most comprehensive cycling networks. Over 350 miles of sign posted cycle network includes a variety of leisure and commuting routes. Terrain varies from off road disused railway tracks to routes in forests and from networks in towns and networks in quiet country lanes. In relation to the Appin Crescent Air Quality Action Plan (AQAP), new cycle routes have been developed to link the Public Park with Pittencrieff Park. The Lyne Burn Corridor project from Rex Park to Duloch has numerous purpose-built cycle routes connecting to two High Schools, Queen Margaret Station and the Queen Margaret Hospital.

2.3.6 Work with key partners to investigate the use of hydrogen as a transport fuel-T10

"Work with key partners to investigate the use of hydrogen as a transport fuel, as well as exploring wider environmental and economic opportunities of using hydrogen for energy applications – especially in promoting renewables, energy balancing and storage." **(CAFS T10 2015)**

Green hydrogen power is becoming widely recognised as a key catalyst to driving forward transport and associated infrastructure for generations to come. One of Scotland's leading forces behind making this a reality is Fife through its pioneering Levenmouth Community Energy Project, a collaborative initiative which is being led by Bright Green Hydrogen and supported by a number of partners including Fife Council and Toshiba. Part of this involves Levenmouth becoming home to one of Europe's largest fleet of hydrogen dual-fuel vehicles (up to 25 vehicles), some of which will be operated by Fife Council.

The fleet includes 10 electric-powered Renault Kangoo vans with H2 fuel cell range extender which will be 100% zero emissions if charged using The Hydrogen Office's 100% green electric vehicle charging station. The project also includes 10 Ford Transit vehicles that are converted to run on a diesel and hydrogen mixture as well as two refuse collection vehicles (RCVs), as such, are believed to be a world-first of their kind. The hydrogen range extender doubles the range of an electric van, allowing it to travel up to 200 miles before charging is required. The vans are to be leased out under the Levenmouth scheme to local businesses, allowing them to improve their green credentials by operating a vehicle that runs on green energy. In early 2016, the importance of the Levenmouth development was recognised after the Scottish Government awarded £4million from its Local Energy Challenge Fund to help kick start the project while in May 2016, the scheme marked a major milestone after Fife Council awarded local company, Heil Farid, a contract worth around £1.5 million for the supply of nine RCVs, two of which are ear marked for the Levenmouth project.

2.3.7 Freight Quality Partnerships-T12

"Encourage each local authority with an AQMA to create a Freight Quality Partnership (or utilise an existing RTP Freight Quality Partnership) and consider appropriate measures for local air quality improvement by 2017." **(CAFS T12 2015)**

Fife Council is exploring the potential to develop Freight Quality Partnerships through the ongoing implementation of the Fife ECO Stars scheme which includes the running of future workshops with key stakeholders**.**

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 the monitoring that has taken place within Fife and how local concentrations of the main air pollutants compare with the relevant objectives. Fife Council undertook automatic (continuous) monitoring at 4 sites during 2016. NO_2, PM_{10} and $PM_{2.5}$ concentrations are measured at each site.

PM_{10} measured at Cupar, Dunfermline and Kirkcaldy measured using Tapered Element Oscillating Microbalance - Filter Dynamics Measurement System (TEOM-FDMS) instruments for part of 2016, however all PM_{10} analysers were upgraded to FIDAS during 2016 and included monitoring of $PM_{2.5}$, PM_1 and TSP. Both FIDAS and TEOM-FDMS analysers have been assessed as equivalent to the EU reference method. Rosyth measures PM_{10}, $PM_{2.5}$, PM_1 and TSP using a FIDAS instrument during 2016 which has been certified as equivalence, previously Rosyth monitored PM_{10} using TEOM-FDMS until July 2015. As the Cupar FIDAS analyser was only installed in December 2016, $PM_{2.5}$ was not reported within this Annual Progress Report and will be included in future Annual Progress Reports. Table A.1 in Appendix A shows the details of the sites. National monitoring results are available at: http://www.scottishairquality.co.uk/data/data-selector.

Maps showing the location of the monitoring sites in 2016 are provided in Figures 3.1-3.4. Further details on the QA/QC of the automatic monitoring sites are included in Appendix C. Automatic SO_2 data are available from Scottish Power Generation Ltd from a monitoring site close to Longannet Power Station, however Longannet Power Station ceased operation in March 2016.

Short-period CO monitoring has also been undertaken by Fife Council's Transportation Department. A summary of the INEOS Grangemouth oil refinery in their Annual Community Air Monitoring Report[37] for 2016 is also provided in this report. The report assesses concentrations of 1,3 butadiene, benzene, nitrogen dioxide and sulphur dioxide.

3.1.2 Non-Automatic Monitoring Sites

Fife Council operates an extensive NO_2 diffusion tube monitoring survey with sites in East, West and Central Fife. In total there are 59 NO_2 diffusion tube sites throughout the Fife area. Of these, eight sites are triplicate sites, with four of these triplicate sites being co-located with the automatic analysers at Cupar, Kirkcaldy, Rosyth and Dunfermline.

During 2016 monitoring at Pittencrieff Street, Dunfermline ceased monitoring (concentrations were well within Air Quality Objectives) and was replaced by monitoring at 42 Chalmers Street in Dunfermline (busy road with street canyon as defined in TG.16). Two additional diffusion tube sites commenced in Cupar at Balgarvie Road as a result of local public concerns regarding air quality issues. Additional monitoring was undertaken in St Andrews due to public concerns of road traffic emissions in St Andrews town centre with 7 new diffusion tubes installed within the town centre at City Road, St Mary's Street and Lamond Drive. Table A.2 in Appendix A shows the details of these additional sites and the existing monitoring locations.

Maps showing the location of the monitoring sites are provided in Figures 3.1-3.5. Further details on Quality Assurance/Quality Control (QA/QC) and bias adjustment for the diffusion tubes are included in Appendix C. The additional monitoring undertaken in St Andrews commenced during 2016 and therefore required to be annualised in accordance with TG.16, details are provided in Appendix D.

[37] Community Air Quality Monitoring Report, Ambient Atmospheric Survey in the Vicinity of Grangemouth – 2016, INEOS February 2017

NPL on the behalf of BP Exploration North Sea Region monitored hydrocarbon levels on the Forth coastline during 2014 (29/12/2015-06/01/2017). Samples were collected over 2 week periods using passive samplers at 12 locations between the Forth Bridges and West Wemyss. Ambient concentrations of volatile organic hydrocarbons, iso-butane, n-butane, iso-pentane, n-pentane, n-hexane, n-heptane, benzene, toluene and xylenes were monitored during the survey period. These hydrocarbons are emitted from a variety of sources around the Forth, including operations at Hound Point, but also traffic and other industrial sites such as the operations of ExxonMobil and Shell at Braefoot Bay and Mossmorran.

The results of this monitoring indicate that concentrations of benzene over the 12-month period were low (annual means range from 0.2-0.3 ppb) and well within the air quality standard. Concentrations of other hydrocarbons were also low, but there are no air quality standards for these substances. The substance present in the greatest concentrations at most locations, as in 2014 and 2015, was n-butane for which annual mean concentrations ranged from 1.4 ppb to 9 ppb. Annual mean concentrations of other individual substances ranged from <0.3 ppb to 2.6 ppb. Annual mean concentrations of total hydrocarbons at different locations ranged from 10-28 ppb.

BP have commissioned monitoring along the Fife coastline for many years and there has been an overall reduction in the levels of hydrocarbons, including benzene, present in air over the last decade. The measurements made in 2016 indicate that concentrations of most of the monitored substances were lower than 2015 at most locations, with the exception of toluene which showed a slight increase in value.

Figure 3.1 Monitoring Locations- Cupar AQMA

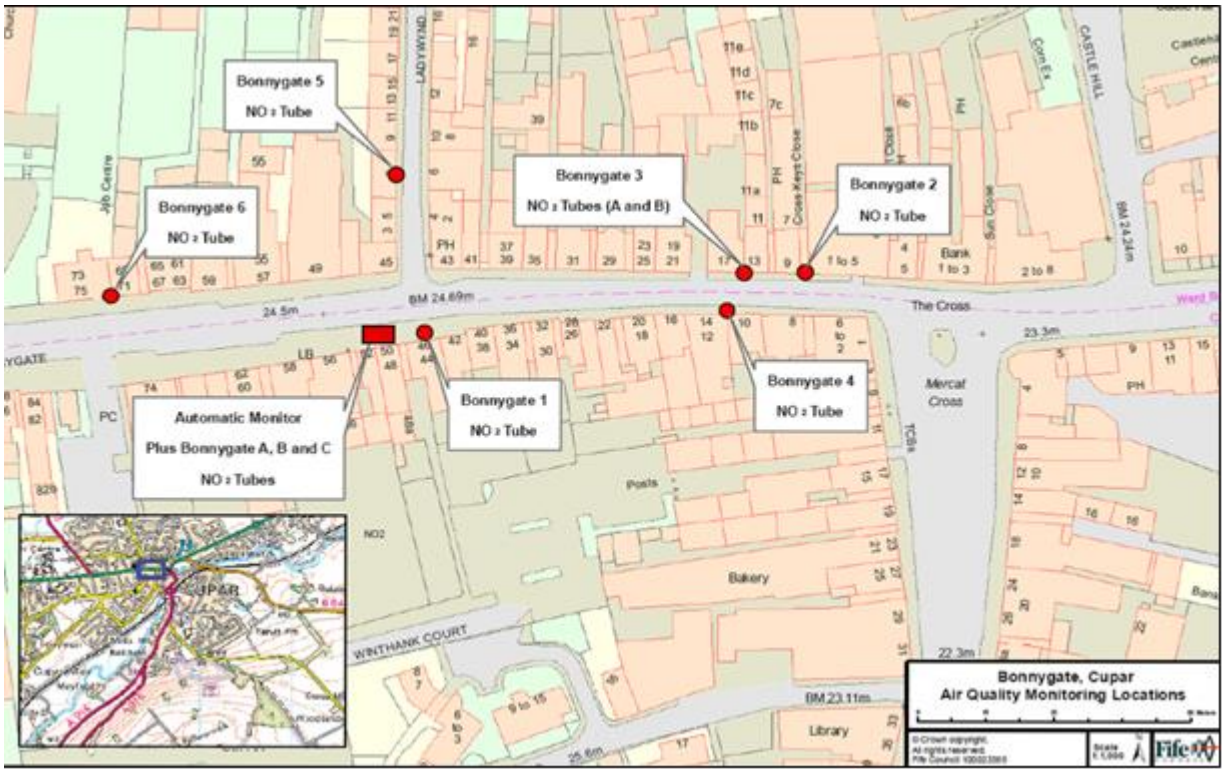


Figure 3.2 Monitoring Locations- Appin Crescent, Dunfermline AQMA

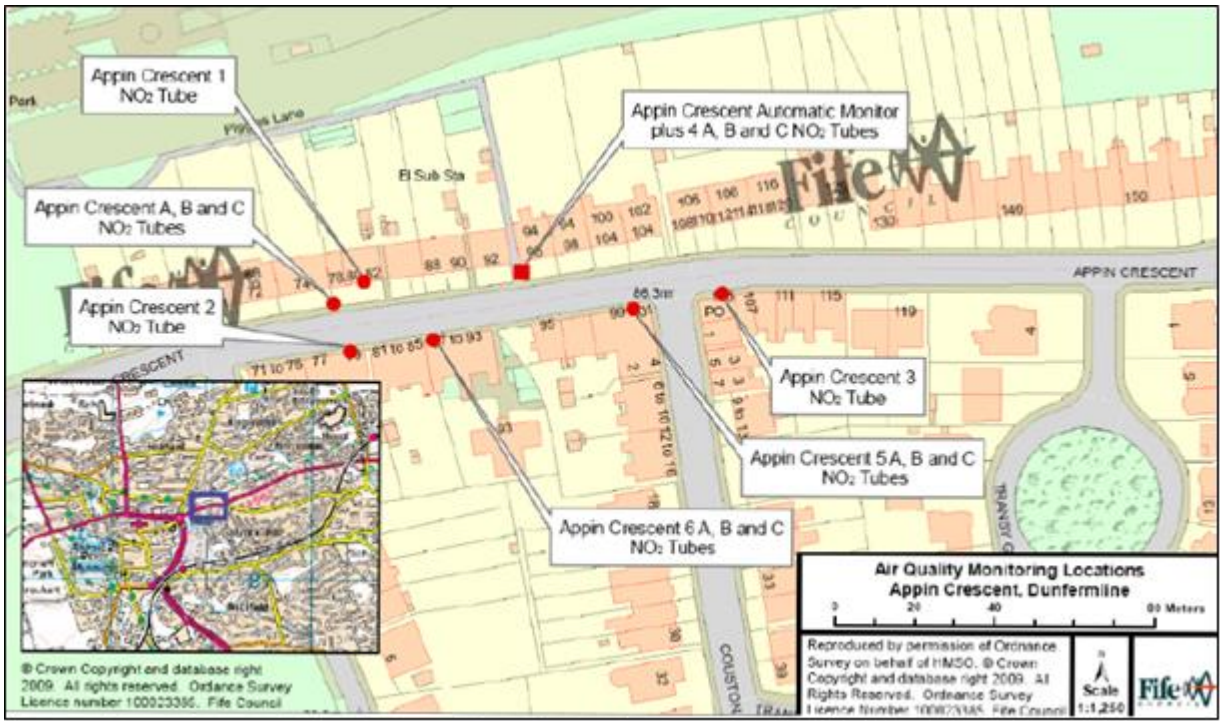


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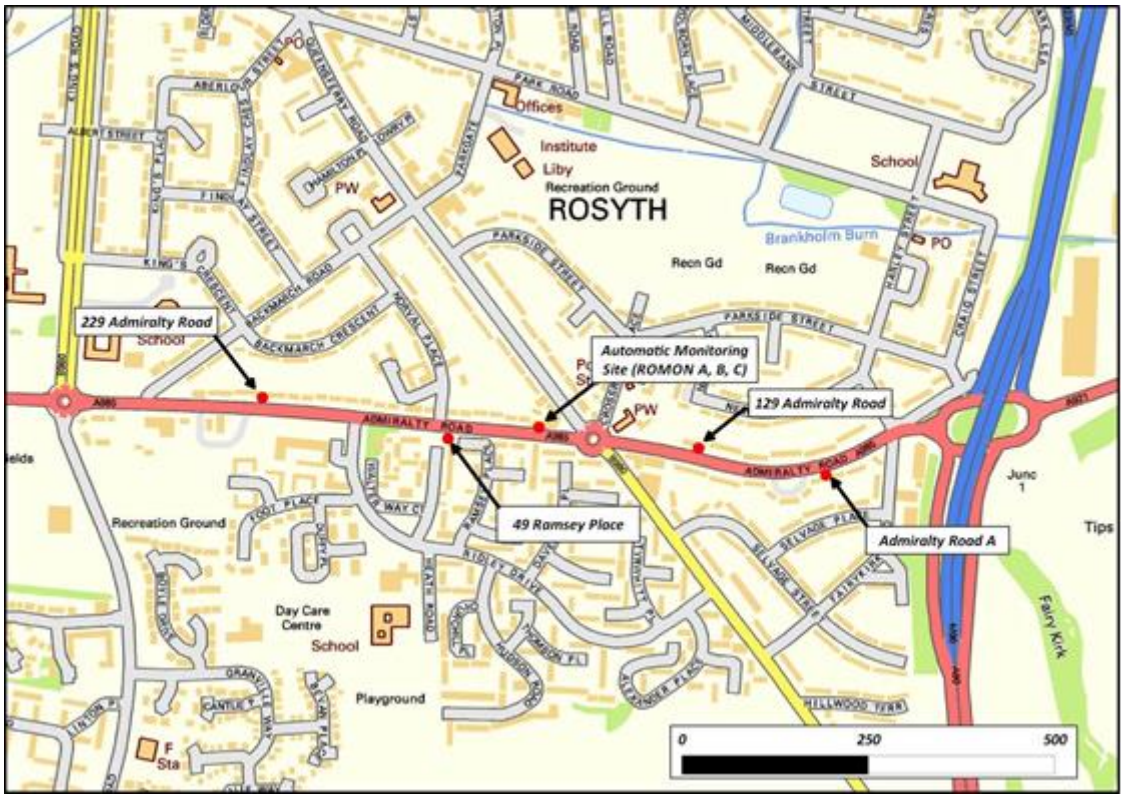
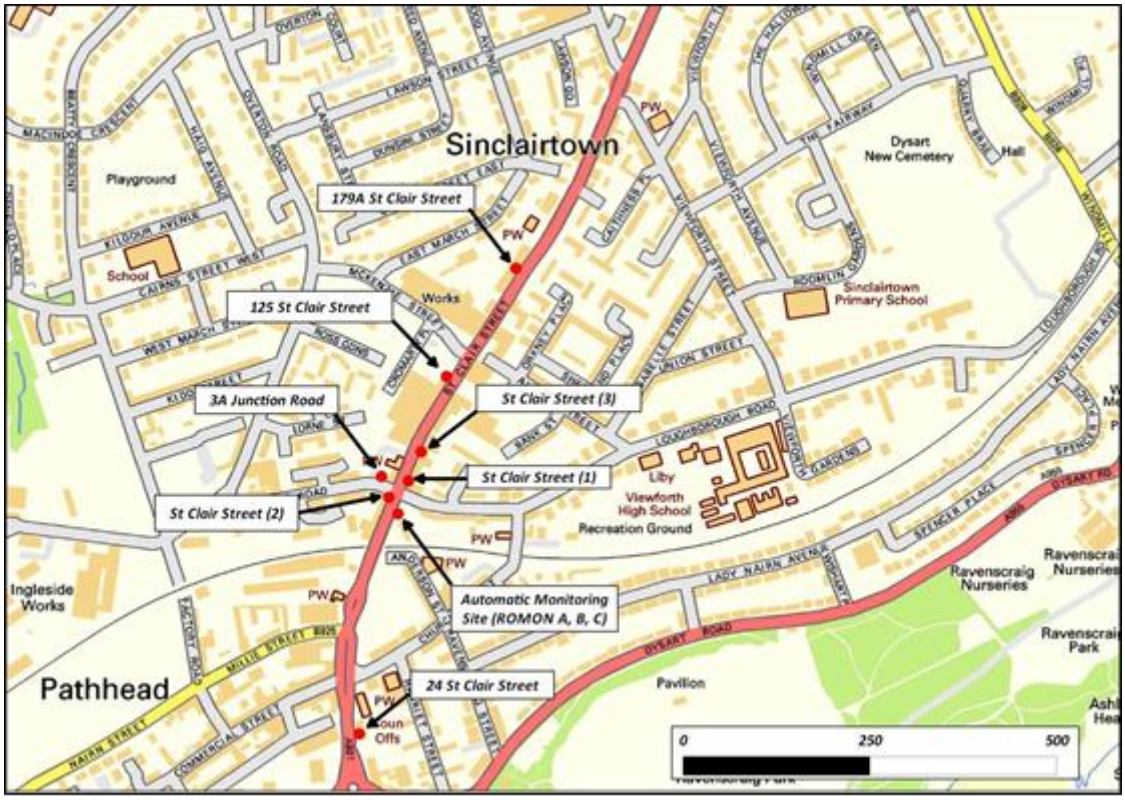
Figure 3.3 Monitoring Locations- Rosyth



Contains Ordnance Survey data © Crown copyright and database right 2011

Figure 3.4 Monitoring Locations – Kirkcaldy



Contains Ordnance Survey data © Crown copyright and database right 2011

Figure 3.5 St Andrews City Road and Bell Street Monitoring Locations

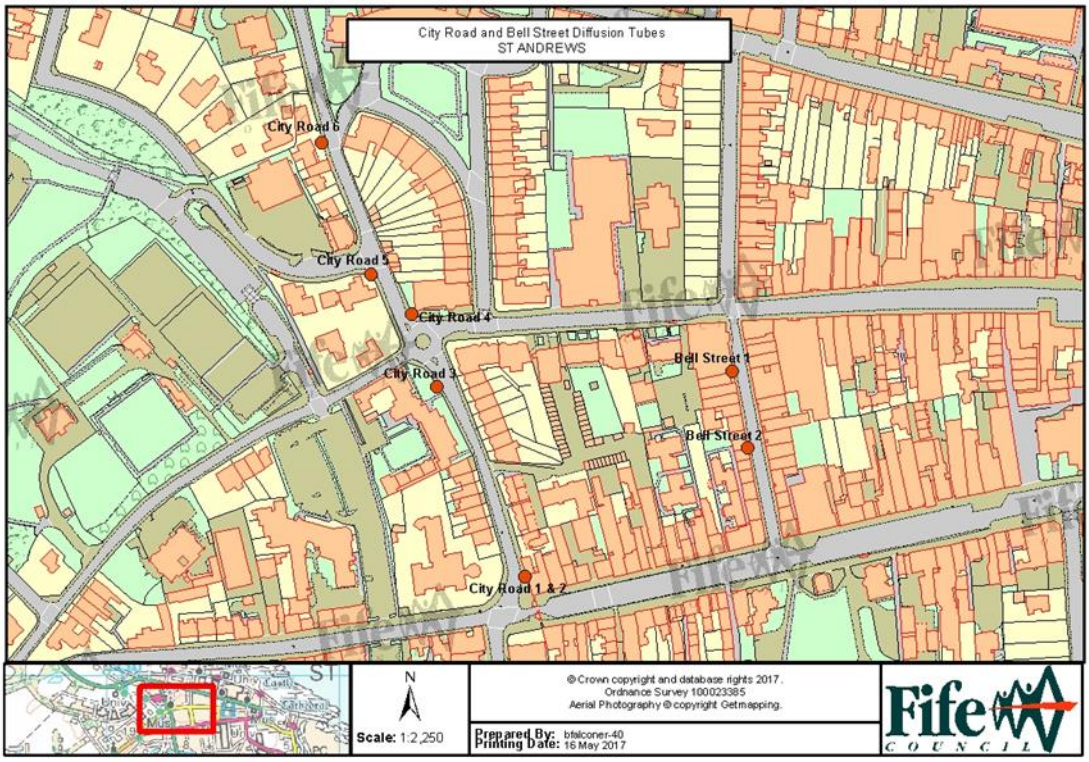
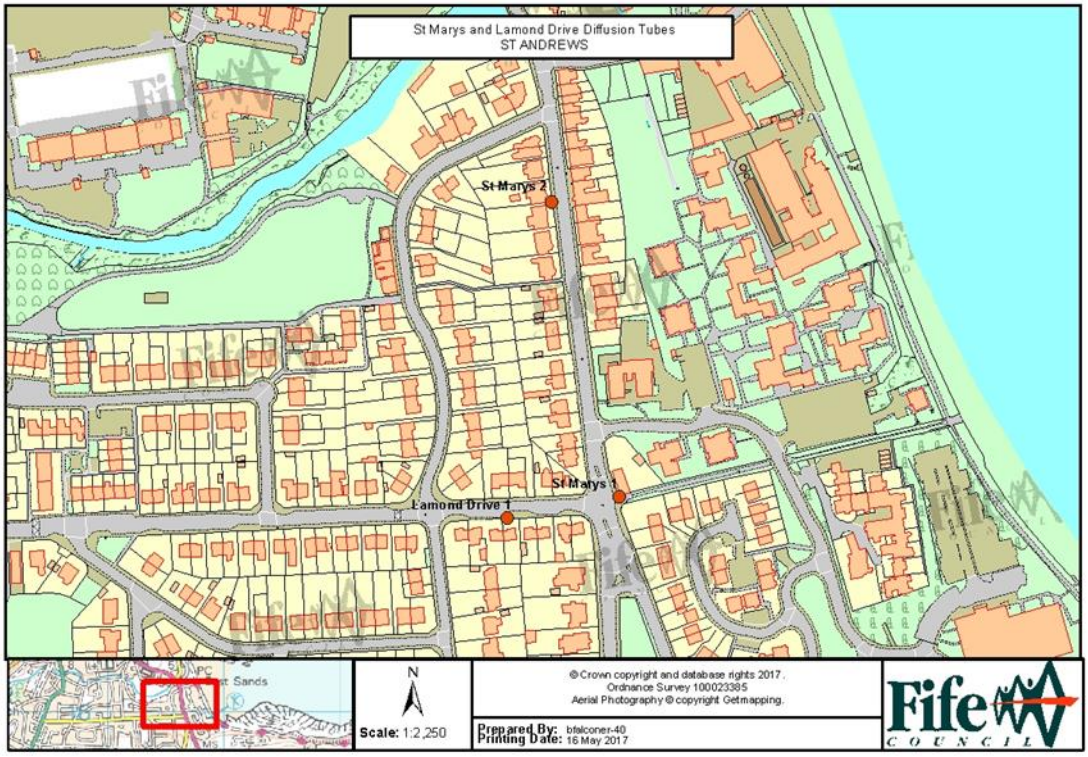


Figure 3.6 St Andrews St Marys and Lamond Drive Monitoring Locations



3.2 Individual Pollutants

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

3.2.1 Nitrogen Dioxide (NO_2)

Automatic Monitoring Data

Appendix A presents the monitoring results for 2016. The automatic sites at Cupar, Kirkcaldy, Rosyth and Dunfermline did not record any exceedances of the AQS NO_2 annual mean (Table A.3) or 1- hour mean objectives (Table A.5) during 2016.

The trend of decreasing concentrations seen at Appin Crescent, Dunfermline suggests that the action plan measures introduced have had a positive impact. During 2016 concentrations increased in Cupar and Rosyth but remained within the AQS annual mean objective of 40 µg m^{-3}. The annual mean NO_2 concentrations from 2011-2016 are displayed in Figure 2.3 for Bonnygate, Cupar and Figure 2.5 for Appin Crescent, Dunfermline (provided in Section 2.1 of this report). The graph demonstrates that NO_2 concentrations are generally declining in both AQMAs, however there was a marginal increase in NO_2 concentrations at Bonnygate, Cupar during 2016 but concentrations were still well within the NO_2 annual mean objective.

Overall concentrations have improved within Cupar following the completion of the traffic management measures as outlined in the AQAP. The traffic management measures included the pedestrian crossing linked to the traffic management system at St Catherine Street and the twin mini roundabout scheme at St Catherine Street/East Bridge.

Fife Council is seeking to install an AQ Mesh unit for gas and particulates at the façade of buildings on southern side of Bonnygate, Cupar street canyon to attempt to further understand NO_2 concentrations in the Bonnygate street canyon.

It is anticipated that future and ongoing action plan measures being carried out in Cupar will help reduce concentrations further.

Diffusion Tube Monitoring Data

The annual diffusion tube data is presented in Appendix A, Table A.4. The Data has been bias corrected using both the national adjustment factor of 0.77 and the average of the local adjustment factors (0.78). The following local bias adjustment were calculated - further details are provided in Appendix C:

- Kirkcaldy = 0.72
- Cupar = 0.87
- Rosyth = 0.81
- Dunfermline = 0.76

The combined factor of the local and national bias adjustment of 0.78 was applied to all diffusion tubes for consistency. The local BIAS calculations are outlined in the data QA/QC in Appendix C. The full 2016 dataset of monthly mean values is provided in Appendix B.

Details of the diffusion tube bias adjustment are found within Appendix C of this report. Diffusion tube results from 2011 to 2016 are presented in Appendix A, Table A.4. The 2016 diffusion tube results indicate that there were no exceedance of the AQS annual mean objective within Dunfermline and that those locations which had previously exceedance were now marginally below 40 µg m^{-3}. During 2016 a marginal exceedance was measured within the Bonnygate Cupar AQMA at Bonnygate B4 measuring 41 µg m^{-3}. This location is within the existing AQMA.

The additional monitoring deployed within St Andrews Town Centre indicated a marginal exceedance at City Road 6 of 42 µg m^{-3}. This location was annualised using the data collected between June 2016

and December 2016. However, following distance correction this concentration is below the AQS annual mean objective (33 µg m^{-3}) at the nearest residential receptor.

3.2.2 Particulate Matter (PM_{10})

Table A.6 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations between 2011 and 2016 with the air quality objective of 18 µg m^{-3}. Table A.7, Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations between 2011 and 2016 with the air quality objective of 50 µg m^{-3}, not to be exceeded more than 7 times per year.

PM_{10} concentrations are monitored at automatic monitoring sites in Bonnygate in Cupar, Admiralty Road in Rosyth, St Clair Street in Kirkcaldy and Appin Crescent in Dunfermline. Details of these sites are given in Table A.1, Appendix A.

Data collected for 2016 shows that all the Fife monitoring sites meet the annual mean objective with concentrations lower than 18 µg m^{-3}.

- Admiralty Road, Rosyth - 10 µg m^{-3}
- Appin Crescent in Dunfermline - 13 µg m^{-3}
- Bonnygate, Cupar - 15 µg m^{-3}
- St Clair Street, Kirkcaldy -10 µg m^{-3}

A summary of the number of exceedances of the PM_{10} daily-mean objective of 50 µg m^{-3} between 2011 and 2016 are presented in Appendix A, Table A.7. The 2016 monitoring results indicate that the daily-mean objective of 50 µg m^{-3} (not to be exceeded more than 7 times in a year) was not exceeded at any of the PM_{10} monitoring sites in Fife.

PM_{10} concentrations within the Bonnygate, Cupar AQMA for PM_{10} have steadily decreased from 19 µg m^{-3} in 2011 to 15 µg m^{-3} in 2016. It is believed that the decrease in PM_{10} is a result of the implemented measures for traffic management outlined in the AQAP. It is hoped that future and ongoing action plan measures being carried out in Cupar will help reduce concentrations further.

The 2016 annual mean PM_{10} concentration at Admiralty Road, Rosyth (10 µg m^{-3}) was below the annual mean PM_{10} objective, continuing to decrease. Appendix A, Figure A.2 shows the change in PM_{10} concentrations at Bonnygate, Cupar and Appin Crescent, Dunfermline from 2011 to 2016 and highlights that action plans can be effective in reducing concentrations of pollutants in AQMA's.

The annual mean PM_{10} concentration at Appin Crescent, Dunfermline (13 µg m^{-3}) was below the AQS annual mean PM_{10} objective. The Further Assessment of Air Quality in Appin Crescent (2012) indicated that the relevant PM_{10} objectives may be compromised and the Air Quality Management Area Order should be amended to include this pollutant. The Appin Crescent AQMA Declaration Order was amended to include PM_{10} in November 2012.

The annual mean PM_{10} concentration for St Clair Street, Kirkcaldy in 2016 continued to be below the PM_{10} annual mean objective with a measured concentration of 10 µg m^{-3}. As shown in Table A.2, Appendix A, the PM_{10} concentrations at St Clair Street Kirkcaldy have been consistently well below the air quality objective.

3.2.3 Particulate Matter ($PM_{2.5}$)

During 2016 $PM_{2.5}$ was measured at the Admiralty Road, Rosyth. $PM_{2.5}$ monitoring was installed at the remaining Fife sites throughout 2016. As the monitoring commenced during 2016, annual mean results for Kirkcaldy and Dunfermline have been annualised in accordance with TG(16) and are presented in Appendix A. Measured 2016 concentrations were below the $PM_{2.5}$ annual mean objective at all sites.

3.2.4 Sulphur Dioxide (SO_2)

Fife Council does not undertake any SO_2 monitoring.

3.2.4.1 SO_2 Automatic Monitoring

SO_2 monitoring was undertaken on behalf of Longannet Power Station at Blair Mains, Fife (Grid Reference NS972864) to the north east of the power station. The SEPA Stirling Team have advised Fife Council that: *"Scottish Power PPC Permit PPC/A/1008873 for the operation of the coal-fired power station is likely to be formally surrendered before the end of 2016 although this is still to be confirmed because the site need to undertake a period of decommissioning and site investigation first to support their surrender application. However, emissions to air from the Power Station ceased on 24 March 2016 at 12:00 midday."*

As the operations at Longannet have now ceased there has been no annual report produced for 2016. Results for 2015 for this site are provided along with 2006 to 2015 data, as summarised in Table 3.1.

Table 3.1 SO_2 Monitoring - Longannet Power Station

Period	Valid Data Capture%	Max 15 Minute Mean (µg m^{-3})	Max 1 Hour Mean (µg m^{-3})	Max 24 Hour Mean (µg m^{-3})
2006	N/A	166	88	N/A
2007	N/A	138	N/A	N/A
2008	N/A	423	N/A	N/A
2009	99.9	150 (0)	70 (0)	N/A (0)
2010	99.8	239 (0)	165 (0)	23 (0)
2011	96.6	248 (0)	152 (0)	38 (0)
2012	97.4	201 (0)	93 (0)	17 (0)
2013	97.6	178 (0)	133 (0)	21 (0)
2014	97.8	192 (0)	152 (0)	36 (0)
2015	97.6	167 (0)	77 (0)	23 (0)

3.2.5 Benzene

There are currently two benzene monitoring programmes carried out within the Fife Council boundary:

- Monitoring in the area of the Grangemouth oil refinery on behalf of INEOS,
- Monitoring along the Fife coastline on behalf of BP.

INEOS Grangemouth Benzene Monitoring

Benzene monitoring is presented for INEOS Grangemouth oil refinery in their annual monitoring report for 2016[38]. This report concludes that the annual average concentrations of Benzene are below the Air Quality (Scotland) Regulations 2000 air quality objective of 3.25 µg m^{-3} (1ppb).

BP Benzene Monitoring

NPL on the behalf of BP Exploration North Sea Region monitored hydrocarbon levels on the Forth coastline during 2014 (29/12/2015-06/01/2017). Samples were collected over 2 week periods using passive samplers at 12 locations between the Forth Bridges and West Wemyss. Ambient concentrations of volatile organic hydrocarbons, iso-butane, n-butane, iso-pentane, n-pentane, n-hexane, n-heptane, benzene, toluene and xylenes were monitored during the survey period. These hydrocarbons are emitted from a variety of sources around the Forth, including operations at Hound Point, but also traffic and other industrial sites such as the operations of ExxonMobil and Shell at Braefoot Bay and Mossmorran.

The results of this monitoring indicate that concentrations of benzene over the 12-month period were low (annual means range from 0.2-0.3 ppb) and well within the air quality standard. Concentrations of other hydrocarbons were also low, but there are no air quality standards for these substances. The substance present in the greatest concentrations at most locations, as in 2014 and 2015, was n-

[38] Community Air Quality Monitoring Report, Ambient Atmospheric Survey in the Vicinity of Grangemouth – 2016, INEOS February 2016

butane for which annual mean concentrations ranged from 1.4 ppb to 9 ppb. Annual mean concentrations of other individual substances ranged from <0.3 ppb to 2.6 ppb. Annual mean concentrations of total hydrocarbons at different locations ranged from 10-28 ppb.

BP have commissioned monitoring along the Fife coastline for many years and there has been an overall reduction in the levels of hydrocarbons, including benzene, present in air over the last decade. The measurements made in 2016 indicate that concentrations of most of the monitored substances were lower than 2015 at most locations, with the exception of toluene which showed a slight increase in value.

3.2.6 Carbon Monoxide, Lead and 1,3-Butadiene

As in previous years, short periods of CO monitoring have been undertaken by Fife Council's Transportation Services at a number of roadside locations. Measurements were undertaken with Marksman 660 street monitors. The results are summarised in Table 3.2. The results have been converted from ppm into mass units at 20°C and 1 atmosphere.

Whilst none of these monitoring periods are sufficiently long to permit full assessment of CO concentrations over a full annual period for 2016, they all indicate that concentrations are likely to be below the Air Quality Strategy objective of 10 mg m^{-3} for the running 8-hour mean concentration.

Table 3.2 CO Monitoring Fife Transportation Services

Site Number/Location	Monitoring Period	Max 8-Hour Concentration (mg m^{-3})
Dunfermline, Bothwell Gardens (Site 3)	07/4/16-13/4/16	0.41
	15/7/16-21/7/16	0.58
	6/10/16-12/10/16	0.20
Dunfermline, Carnegie Drive/Pilmuir Street (Site 13)	07/4/16-13/4/16	0.80
	15/7/16-21/7/16	1.23
	6/10/16-12/10/16	0.65
Dunfermline, Appin Crescent	07/4/16-13/4/16	0.69
	15/7/16-21/7/16	0.76
	6/10/16-12/10/16	1.11
Leven, Glenlyon Road/ Windygates Road	14/5/15-20/5/15	0.78
	12/8/16-18/8/16	2.41
	3/2/17-9/2/17	0.21
Cupar, Bonnygate	11/5/16-17/5/16	0.29
	12/8/16-18/8/16	1.64
	3/2/17-9/2/17	0.60
Kirkcaldy, Dunnikier Road/Victoria Road (Site 16)	16/6/16-22/6/16	0.65
	14/9/16-20/9/16	0.68
	1/3/17-7/3/17	0.43
Kirkcaldy, St Clair Street/Junction Road (Site 36)	16/6/16-22/6/16	0.29
	14/9/16-20/9/16	0.65
	1/3/17-7/3/17	0.31
Rosyth, Admiralty Road/ Queensferry Road (Site 24)	17/6/16-23/6/16	0.58
	14/9/16-20/9/16	0.28
	1/3/17-7/3/17	2.83
A909 Mossmorran (Site 37)	20/4/16-26/4/16	0.10
	1/8/16-7/8/16	0.61
	19/10/16-25/10/16	0.60

Other hydrocarbons:

Monitored concentrations of propane, n-butane, iso-butane, n-pentane, hexane, heptane, octane, nonane, decane, propylene, toluene, o-xylene, m & p-xylene, styrene and total C4 to C10 hydrocarbons are measured at both the INEOS Grangemouth oil refinery and BP Production and Exploration as part of their annual reporting for 2016[39]. Annual average concentrations are low, but there are no air quality standards for these substances. The INEOS Grangemouth annual community air monitoring report for 2016 states that there were no significant changes in the annual average concentrations for all hydrocarbon components across all locations, when compared with historical data.

A summary of the monitoring data from BP Production and Exploration, Houndpoint, 2016 states that concentrations of most of the monitored substances in 2016 were lower than 2015 at most locations. BP have commissioned monitoring along the Fife coastline for many years and there has been an overall reduction in the levels of hydrocarbons, including benzene, present in air over the last decade. Concentrations at any one locality are highly dependent on meteorological influences.

The Mossmorran & Braefoot Bay Independent Air Quality Monitoring Review Group 2016 Annual Report (July 2017)[40] states that emissions from regulated sources within the Shell and ExxonMobil Plants in 2016 remained within the limit values set by SEPA for the protection of public health and the environment. The report concluded that emissions from the Shell and ExxonMobil Plants at Mossmorran and Braefoot Bay continue to pose no significant risk to the health of members of the local community.

3.2.7 Summary of Compliance with AQS Objectives

New monitoring data measured in 2016 identified marginal exceedances of the AQS annual mean objective for NO_2 in Bonnygate, Cupar at one diffusion tube location (Bonnygate B4). This location is within the existing AQMA.

Exceedances of the NO_2 annual mean objective of 40 µg m^{-3} were measured within St Andrews town centre at City Road 6 (42 µg m^{-3}) during 2016. This monitoring location was not a location of relevant exposure, therefore distance drop off was calculated to nearest building façade where residential receptors were present, this resulted in a concentration below the annual mean objective of 40 µg m^{-3}.

All the automatic monitoring sites in Fife measured PM_{10} concentrations below the annual and daily mean objectives during 2016. Bonnygate, Cupar and Appin Crescent, Dunfermline have both already been declared AQMAs for NO_2 and PM_{10}. PM_{10} concentrations within these locations have remained below the annual mean objective consistently since 2014.

Fife Council has examined the results from monitoring in the Fife Council Area. Concentrations within the Appin Crescent, Dunfermline AQMA are within the air quality objectives. There was a marginal exceedance of NO_2 within the Bonnygate Cupar AQMA during 2016. As a result, the existing AQMAs should remain.

In light of the distance corrected exceedance within St Andrews town centre, Fife should not proceed to a Detailed Assessment of St Andrews Town Centre at this stage. The monitoring data for 2017 will be reported in the next Annual Progress Report which will evaluate the most recent monitoring data for this site and re-evaluate whether a Detailed Assessment will be necessary.

[39] Community Air Quality Monitoring Report, Ambient Atmospheric Survey in the Vicinity of Grangemouth – 2016, INEOS February 2017
[40] Mossmorran & Braefoot Bay Air Quality Review Group, 2016 Annual report, Final Report, July 2017

4 New Local Developments

4.1 Road Traffic Sources

Fife Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

4.2 Other Transport Sources

Fife Council confirms that there are no new Transportation sources that have not been adequately considered in previous rounds of Review and Assessment.

4.3 Industrial Sources

Fife Council confirms that there are no new Industrial sources that have not been adequately considered in previous rounds of Review and Assessment.

4.4 Poultry Farms

Fife Council confirms that there are no new poultry farms that have not been adequately considered in previous rounds of Review and Assessment.

4.5 Commercial and Domestic Sources

Fife Council confirms there is no requirement to proceed to a Detailed Assessment for the following sources:

- Biomass combustion- Individual installations;
- Biomass combustion- Combined Impacts;
- Domestic Solid Fuel Burning and
- Proposed Residual and Commercial Installations.

4.6 New Developments with Fugitive or Uncontrolled Sources

SEPA have advised that the following amendments to Part A and Part B processes have been made during 2016:

- EPR Scotland Ltd (Westfield Biomass Plant) are carrying out a trial where they are increasing the ratio of RCF (recycled chip fibre): poultry litter being incinerated for a period of between 12 – 16 weeks. The RCF is a permitted fuel source for the plant. Spot sampling of emissions will be carried out twice during trial period, no negative impact is expected. EPR replaced all filter bags in October 2016 which should have appositive impact on particulates.
- Cameronbridge distillery biomass plant is now in its final stages of commissioning and should be fully operational in 2017.
- RWE Markinch CHP – The auxiliary package boiler No. 3 was put into preservation, i.e. it is no longer operational although it is still permitted (1 &2 have been in preservation since May 2015 when Tullis Russell closed). It probably won't make a significant difference because the CHP is the key stack for emissions on the site.
- Kirkcaldy peaking gas plant, Dunnikier (again David Fisher has been involved for TSU). Reviewed by Fife Council, information provided generally satisfactory.

During 2016 Longannet Power Station ceased operation on 24/03/2016.

Forth Replacement Crossing

During the construction of the Forth Replacement Crossing and associated road network, air quality monitoring has been undertaken by the Forth Crossing Bridge Constructors (FCBC)[41]. Air quality is being monitored using automatic light scatter dust meters and Frisbee gauge dust deposition monitoring. Seven automatic light scatter meters were installed at various sensitive locations to measure real time particulate matter (PM_{10}) concentrations and the Total Suspended Particle (TSP) concentrations. Thirteen Frisbee gauges were also set up at sensitive locations across the site to measure dust deposition rates. Of all the sites currently monitored by FCBC, only the Whinny Hill light scatter meter and dust deposition Frisbee are within the Fife local authority area.

Additionally, a daily dust log for both the North and South sites was kept by the FCBC Environmental Department. This daily dust inspection was used to identify any dust occurring as a result of construction works and any actions that were required. Also included in this log was a visual record of weather conditions which included conditions that may have affected readings, such as fog.

The 2016 monitoring results for Whinny Hill indicated that there were no exceedances of the thresholds set out in the FRC air quality management plan. Exceedances occurred at other sites during 2016 including Scotstoun, Linn Mill and Inchgarvie.

All the Forth Replacement Crossing air quality monitoring reports are publically available at the project website:
www.transport.gov.scot/road/forth-replacement-crossing/frc-air-quality-documents

[41] Forth Replacement Crossing: Air Quality Monitoring Report March 2016, Forth Crossing Bridge Constructors

5 Planning Applications

5.1 Applications

The following planning applications were submitted during 2016, they were required to demonstrate that the AQS objectives would not be exceeded:

April 2016

Planning Ref. 16/00793/SCO Request for scoping opinion for restoration and development of former opencast site including power generation/storage; waste recovery/recycling; employment uses and ancillary operations at Westfield OCCS, Site. It was noted that an air quality impact assessment would not be undertaken and that the above mentioned Scoping Report specifies that there are no Air Quality Management Areas (AQMAs) in Fife. The applicant was advised that this statement is incorrect as there are currently two designated AQMAs in Fife (Bonnygate, Cupar and Appin Crescent, Dunfermline) and the Scoping Report should be updated accordingly.

May 2016

Planning Ref. 16/01360/SCO EIA Scoping for land raising (landfilling with inert material) topping with a biological growth medium for the cultivation of bio-crops at Old Landfill Site, Balbie Farm, Auchtertool. It was noted from section 5.6 Air Quality of the EIA Scoping Report that an assessment of air emissions from traffic is not considered necessary by Golder Associates.

Planning Ref. 15/04188/FULL Erection of 5 Class 1 retail units with associated access, servicing, car parking and ancillary works at Reekie Group Garage, South Road, Cupar. Energised Environments' Air Quality Impact Assessment, dated 2 May 2016 has been reviewed, and their conclusions noted. With the provision that the applicant employs the mitigation measures detailed in Section 5 Mitigation of the above report, there are no further comments regarding air quality issues.

Planning Ref. 16/01705/FULL Erection of biomass boiler and associated plant (Section 42 application to amend condition 3 of 13/00842/FULL) | Uthrogle Mills Carslogie Cupar. It was requested that relevant technical information and an appropriate Air Quality Impact Assessment should be submitted.

June 2016

Planning Ref. 16/01743/SCO Request for Scoping opinion for mixed use development comprising approx 2000 homes, employment land, community and commercial facilities, roads, open space and landscaping at Broomhall Site, Land Adjacent to Pitreavie Business Park, Grange Road, Dunfermline. AQIA requested

Planning Ref. 16/01558/FULL Alterations to existing building including replacement windows and roof repairs, erection of boiler house and relocation of existing cycle storage, erection of new bin storage and associated works at 3 Gregory Place, St Andrews. Applicant confirmed that no biomass boiler will be installed.

Planning Ref. 16/02065/FULL Change of use from agricultural land to shrimp farm including installation of 9 containers incorporating re-circulation aquaculture system, office/staff facilities, biomass boiler, water tanks, pellet store and associated parking area and SUDS at Hatton Farm, Hatton Farm Cottages, Pilmuir, Lundin Links, Fife. Further Information was requested regarding biomass boiler.

July 2016

Planning Ref.16/02237/FULL Erection of biomass energy generation centre associated with combined heat and power (CHAP), including building to contain fuel store, turbine hall and ancillary facilities, adjacent cooling units, boiler flues, silos and chimney, hardstanding / parking, fencing and new access (Renewal of planning permission 11/01054/FULL) at Bowhill Colliery, Auchterderran, Cardenden. The applicant should complete the Biomass Information Request Form and submit it for

comment. A suitable air quality impact assessment is required to ensure the proposed development will not compromise the achievement of local and national air quality objectives.

August 2016

Planning Ref.16/02345/FULL Construction of 118 residential units, SUDS and ancillary infrastructure at land to east of Old Duloch House, Aberdour Road, Dunfermline, Fife.
Given the nature and scale of the proposed development (including 16/02341/FULL adjacent to the site) it is advised that an air quality impact assessment may be required to ensure the relevant air quality objectives are not jeopardised.

Planning Ref.16/02341/FULL Construction of 90 residential units, SUDS and ancillary infrastructure at land to east of Old Duloch House, Aberdour Road, Dunfermline, Fife. Given the nature and scale of the proposed development (including 16/02345/FULL adjacent to the site) it is advised that an air quality impact assessment may be required to ensure the relevant air quality objectives are not jeopardised.

September 2016

Planning Ref. 16/02784/PREAPP Pre-app for residential development at Land to the West of High Street (former College building), Kirkcaldy. Given the potential scale of the proposed development it was advised that a suitable air quality impact assessment may be required.

November 2016

Planning Ref. 16/03664/PREAPP Change of use from shuttle and bobbin mill to form fish farm with associated works at Gateside Mills, Main Road, Gateside, Cupar. The application makes reference to a chimney / boiler section of the Main Mill Building. If a biomass boiler is proposed then the applicant will need to submit the Biomass Boiler Information Request Form, this information will assess whether or not any proposed biomass boiler will compromise the achievement of statutory air quality objectives.

Planning Ref. 16/03765/PREAPP Erection of university dwellings and associated roads, car parking and amenity space at Land to West of Grange Road, St Andrews. Given the scale of the proposed development it was advised that a suitable air quality impact assessment may be required.

Planning Ref. 16/03661/EIA Planning permission in principle for restoration and development of former opencast site including power generation/storage, waste recovery/recycling, employment uses (Class 4) with ancillary office space (Class 5 & 6), rail off-loading facility, glass houses and other associated infrastructure at Westfield OCCS, Fife. It is noted that the implementation of the proposed mitigation measures relating to the construction and operation of the proposed development are not anticipated to result in any likely significant environmental effects.

Planning Ref. 16/02341/FULL Construction of 90 residential units, SuDS and ancillary infrastructure at land to east of Old Duloch House, Aberdour Road, Dunfermline, Fife. Following a review of the RSK 'Screening Level Air Quality Assessment' dated 3rd November 2016, the information received was deemed to be generally satisfactory.

Planning Ref. AS 0516 Proposed Mixed Use Development Halbeath Dunfermline. A suitable AQ impact assessment was requested.

December 2016

Planning Ref. 16/03348/ARC Approval of matters required by condition 2 of 14/01933/PPP for the installation of roads, drainage, landscaping and services and the demolition of former paper mill building at Curtis Fine Papers Ltd., Main Street, Guardbridge. Referring to the University of St Andrews' Design Statement & Planning Condition Report Ref. 14/01933/PPP, dated August 2016. It is noted from Section 3.8 Air Quality that "*the installation of the biomass centre will create a new point emission to the air but this will not have a significant environmental impact and does not impact on the proposed GDF. There are no significant air quality emission sources suggested on the current GDF. During the construction of the site there will be short term low significance air quality emissions linked to dust. The draft CEMP (Construction Environmental Management Plan, report dated May 2016) has measures in place to minimise and mitigate any short term air quality emissions*."

Planning Ref. 16/04040/PREAPP Pre-application for phased delivery of approximately 1650 new homes, community facilities, park and play area provision, structural landscaping, footpath and cycle routes, SUDS, access/junction and transport corridor upgrades, recycling facilities, CHP/renewable energy provision and Primary School including remediation of former mine workings beneath the site at Land to East of Percival Road, Buckhaven. Given the nature and scale of the proposed development it was advised that a suitable air quality impact assessment should be undertaken to ensure the proposed development does not jeopardise the achievement of Scottish air quality objectives.

February 2017

Planning Ref. 17/00219/FULL Erection of biomass building and water storage tank (demolition of existing garages) (part retrospective), Falkland House School, West Port, Falkland. With the provision that the proposed biomass plant, maintenance and servicing schedules have not altered from those detailed in application reference 15/02449/FULL, the Land & Air Quality Team has no comment to make.

Planning Ref. 16/04155/EIA Application for Planning Permission in Principle for a residential led mixed-use development comprising a minimum of 2,150 residential units, employment / commercial land, landscape framework (landscaping, parks, green space), community facilities, healthcare, local retail, new primary school(s), roads and drainage infrastructure and associated development at Broomhall Site at Land Adjacent to Pitreavie Business Park, Grange Road, Dunfermline.
Air Quality Consultants Ltd.'s air quality impact assessment, discussed in Chapter 10 Air Quality of Ironside Farrar's Environmental Statement (December 2016), has been reviewed by our contracted air quality consultants, a number of points were raised following this which have been put to the applicant.

Planning Ref. 16/03491/FULL Erection of 134 residential units including SUDS, open space, access and associated services at Land to North of 25 Dalbeath Gardens, Hill of Beath. Referring to EnviroCentre's report, "Hill of Beath Air Quality Assessment", dated January 2017. While the conclusions made by EnviroCentre would appear to be generally satisfactory, it is noted that the assessment only considers the air quality impact from traffic associated with the completed development. The assessment does not consider the potential impact on local air quality from dust and road traffic emissions generated during the construction phase. Further information is therefore required.

5.2 Air Quality Considerations

The following air quality assessments were either carried out or requested in 2016 through the planning consultation process:

16/01927/FULL | Extension to retail park involving the construction of 9 no. Class 1 and Class 3 (with takeaway and drive through facility) units, car parking, servicing, landscaping and ancillary works including retention and regrading works with new substation | Land To The North Of Halbeath Retail Park Dunfermline Fife

AQIA included – Satisfactory.

16/00823/FULL | Erection of 133 residential units (including 20 affordable units), formation of access, car parking, SUDs and associated works | Land At Former Lochside Works Grangehill Kinghorn Fife

Requested AQIA

16/01511/FULL | Change of use of current agricultural land within Dunnikier Business Park for the installation of a Gas Peaking Plant with an installed capacity up to 19.8MW with a 20MW battery storage plant and associated infrastructure including a Research and Development Centre | Plot 10 Dunnikier Business Park Midfield Drive Mitchelston Industrial Estate Kirkcaldy Fife.

AQIA included – Satisfactory.

16/01971/SCO | Request for EIA Scoping for proposed mixed-use development | Land To South Of 159 Cocklaw Street Kelty Fife

AQIA – to be included in future EIA/Environmental Statement

16/01856/EIA | Extension to rock quarry, together with associated landscape works, with the extracted stone being processed at the existing plant at Goathill Quarry | Goathill Quarry Easter Bucklyvie Donibristle Cowdenbeath Fife KY4 8ES

AQIA included – Satisfactory. Ongoing controls re fugitive dusts etc.

16/01572/FULL | Installation of 19.8 MW Biomass Plan and associated infrastructure, including storage yard - Whitworth Road site at currently vacant Greenfield land located within Southfield Industrial Estate, Glenrothes | This Site Address Is Still To Be Recorded On Our Property Database (Temporary Address Used) Fife

Requested AQIA.

16/02372/SCO | EIA Scoping Opinion for proposed remediation works [Site: Land to the east of The Wynd, Dalgety Bay] | This Site Address Is Still To Be Recorded On Our Property Database (Temporary Address Used) Fife

AQIA – to be included in future EIA/Environmental Statement

16/02803/FULL | Infrastructure enhancements consisting of provision of standby boiler facilities on the site. No change of use. | Victoria Hospital Hayfield Road Kirkcaldy Fife KY2 5AH

Requested AQIA.

16/03554/ARC | Application for erection of 295 No residential development with associated access road and infrastructure. | Land At Spencerfield The Avenue Inverkeithing Fife

Requested AQIA.

17/00022/FULL | Installation of flue (retrospective) | 22 Gleneagles Gardens Kirkcaldy Fife KY2 6SX

Requested Further Information – Re Specification

6 Conclusions and Proposed Actions

6.1 Conclusions from New Monitoring data

Nitrogen Dioxide

The 2017 APR has considered the available monitoring data measured during 2016. During 2016 non-automatic, diffusion tube monitoring was undertaken at 59 locations within Fife. The new monitoring data highlighted exceedances of the AQS annual mean objective at two diffusion tube locations at:

- Bonnygate B4, Cupar (41 µg m^{-3})
- City Road 6, St Andrews (42 µg m^{-3})

The marginal exceedance measured within St Andrews is the result of new monitoring deployed within the town centre which commenced in 2016. This monitoring location is however some distance from the kerbside (just over 2m) from the kerbside and accordingly the result was therefore corrected for NO_2 drop off using the LAQM NO_2 fall off with distance calculator[42]. This results in an annual mean concentration of 33 µg m^{-3} at the nearest receptor which is below the objective. Further details of the drop off calculations are provided in Appendix C.

During 2016 monitoring at Pittencrieff Street, Dunfermline ceased monitoring (concentrations were well within Air Quality Objectives) and was replaced by monitoring at 42 Chalmers Street in Dunfermline (busy road with street canyon as defined in TG.16). Two additional diffusion tube sites commenced in Cupar at Balgarvie Road as a result of local public concerns regarding air quality issues. Additional monitoring was undertaken in St Andrews due to public concerns of road traffic emissions in St Andrews town centre with 7 new diffusion tubes installed within the town centre at City Road, St Mary's Street and Lamond Drive. Table A.2 in Appendix A shows the details of these additional sites and the existing monitoring locations.

Particulate Matter

PM_{10} concentrations are measured at four locations in Fife at Bonnygate, Cupar; Appin Crescent, Dunfermline; Admiralty Road, Rosyth and St Clair Street, Kirkcaldy. Measured 2016 concentrations were below the PM_{10} annual mean objective with no exceedances of the annual mean or daily mean objective at all sites.

$PM_{2.5}$ concentrations have been measured at Rosyth since July 2015. $PM_{2.5}$ monitoring commenced at Kirkcaldy and Dunfermline during 2016, these concentrations have been annualised in accordance with TG (16). $PM_{2.5}$ monitoring commenced in Cupar in December 2016 and will be reported in the 2018 Annual progress Report. Measured 2016 concentrations were below the $PM_{2.5}$ annual mean objective at all sites.

Sulphur Dioxide

Longannet Power Station ceased operation in March 2016, therefore no 2016 annual report was published. The last results reported were the 2015 monitoring results.

Carbon Monoxide

Short-term monitoring undertaken by Fife Council's Transportation Services department during 2016 indicates that the AQS objective for CO is unlikely to have been exceeded during 2016. There are no new industrial processes, roads or other developments that require detailed assessment with respect to this pollutant.

[42] NO_2 fall off with distance, available at: https://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html

1,3 Butadiene and Benzene

Benzene and 1,3 Butadiene monitoring carried out in the area of the Grangemouth refinery show that it is unlikely that the Air Quality Strategy objective for these pollutants have been exceeded within the Fife Council boundary.

A summary of the monitoring data from BP Production and Exploration, Houndpoint, 2016 states that concentrations of most of the monitored substances in 2016 were lower than 2015 at most locations.

The Mossmorran & Braefoot Bay Independent Air Quality Monitoring Review Group 2016 Annual Report (July 2017)[43] states that emissions from regulated sources within the Shell and ExxonMobil Plants in 2016 remained within the limit values set by SEPA for the protection of public health and the environment.

6.2 Conclusions Relating to New Developments

Fife Council have not identified any New Local Developments out with the applications previously considered and assessed by Fife Council where there may be a risk of the air quality objectives being exceeded. Therefore, no additional air quality assessment is recommended at this time.

6.3 Proposed Actions

Following the review of all available data it is recommended that Fife Council carry out the following actions:

1. Consider extending the additional monitoring for NO_2 which commenced in 2016 within St Andrews Town Centre for at least another calendar year (2017) to ensure ongoing compliance with Air Quality Objectives. Consider relocating or extending monitoring within St Andrews to locations where relevant exposure is present.

2. Submit the next Air Quality Progress Report in June 2018.

3. Maintain the current monitoring programme.

4. Continue to implement the measures outlined in the action plans for Appin Crescent, Dunfermline and Bonnygate, Cupar.

Fife Council confirms it will undertake these recommended actions.

[43] Mossmorran & Braefoot Bay Air Quality Review Group, 2016 Annual report, Final Report, July 2017

Appendices

Appendix A: Monitoring Results
Appendix B: Full Monthly Diffusion Tube Results for 2016
Appendix C: Data QA/QC
Appendix D: Annualisation of Data
Appendix E: ECO Stars Scheme
Appendix F: Technical Specification of Automatic Monitoring Equipment

Appendix A – Monitoring Results

Table A. 1 - Details of Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)
Bonnygate, Cupar	Kerbside	337403	714571	NO_2, PM_{10}, $PM_{2.5}$	Y	NO_x Analyser (Chemiluminescence), TEOM-FDMS (until December 2016), FIDAS since December 2016)	N (1m)	<0.5m
Appin Crescent, Dunfermline	Roadside	309926	687722	NO_2, PM_{10}, $PM_{2.5}$	Y	NO_x Analyser (Chemiluminescence), TEOM-FDMS (until September 2016), FIDAS since September 2016)	Y (1m)	4m
Admiralty Road, Rosyth	Roadside	311755	683503	NO_2, PM_{10} $PM_{2.5}$	N	NO_x Analyser (Chemiluminescence) TEOM-FDMS (until July 2015), FIDAS (since July 2015)	Y (1.5m)	6m
St Clair Street, Kirkcaldy	Roadside	329143	692986	NO_2, PM_{10} $PM_{2.5}$	N	NO_x Analyser (Chemiluminescence), TEOM-FDMS (until April 2016), FIDAS since April 2016)	N (10m)	5m

Table A. 2 - Details of Non-automatic Monitoring

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Relevant Exposure? (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?
West Area								
St Leonards Primary School, Dunfermline	R(F)	309787	686549	NO_2	N	Y	10.6	N
Carnegie Drive (A,B,C), Dunfermline*	R(F)	309023	687632	NO_2*	N	Y	2.3	N
Rumblingwell, Dunfermline (5N)	R	307898	688224	NO_2	N	N (6.3)	1.7	N
Appin Crescent (A)(B)(C), Dunfermline (9N)*	R	309900	687716	NO_2	Y	N (5.1)	1.6	N
Appin Crescent (1) Dunfermline	R(F)	309888	687719	NO_2	Y	Y	6.5	N
Appin Crescent (2) Dunfermline	R(F)	309883	687701	NO_2	Y	Y	1.5	N
Appin Crescent (3) Dunfermline	R(F)	309975	687716	NO_2	Y	Y	1.8	N
Appin Crescent 4(A)(B)(C) Dunfermline*	R(F)	309926	687722	NO_2*	Y	Y	3.9	Y
Appin Crescent 5(A)(B)(C)*	R(F)	309957	687714	NO_2	Y	Y	1.5	N
Appin Crescent 6(A)(B)(C)*	R(F)	309904	687704	NO_2	Y	Y	1.5	N
High Street, Cowdenbeath	K	316527	691742	NO_2	N	N (3.5)	0.5	N

North Approach Road (A, B) Kincardine	K	293182	687527	NO_2	N	N (11.0)	0.5	N
Pittencrieff St, Dunfermline	R(F)	308787	687556	NO_2	N	Y	0.5	N
11 Halbeath RD1, Dunfermline	R (F)	310245	687784	NO_2	N	Y	14	N
57 Halbeath RD2, Dunfermline	R (F)	310488	687873	NO_2	N	Y	6	N
Admiralty Road A, Rosyth	R(F)	312069	683431	NO_2	N	Y	9	N
Admiralty Road (A,B,C) ROMON*	R(F)	311755	683503	NO_2^*	N	Y	6.5	Y
229 Admiralty Road, Rosyth	R (F)	311384	683543	NO_2	N	Y	11	N
49 Ramsay Place, Rosyth	R (F)	311633	683488	NO_2	N	Y	14	N
129 Admiralty Road, Rosyth	R (F)	311960	683477	NO_2	N	Y	12	N
Pilmuir Road, Dunfermline	R	309143	687774	NO_2	N	Y	2	N
Mill Street, Dunfermline	R	308888	687968	NO_2	N	Y	2	N
42 Chalmers Street, Dunfermline- to replace Pittencrief Street	R	308808	687555	NO_2	N	Y	1.8	N
				Central Area				
St Clair Street (1) , Kirkcaldy	R	329157	693030	NO_2	N	N (2)	1.3	N
St Clair Street (2) , Kirkcaldy	R	329131	693008	NO_2	N	N (2)	1.8	N

St Clair Street (3), Kirkcaldy	R(F)	329174	693069	NO_2	N	Y	2	N
St Clair Street ROMON (A,B,C,)* Kirkcaldy	R	329143	692986	NO_2	N	N(10.0m)	5	Y
Dunnikier Rd, Kirkcaldy	R(F)	328152	692352	NO_2	N	Y	3.4	N
Victoria Rd, Kirkcaldy	R(F)	328144	692315	NO_2	N	Y	2.5	N
Glenlyon Road, Levenmouth	K	337357	701318	NO_2	N	N (26.8)	1	N
Leslie High St	R(F)	325111	701806	NO_2	N	Y	3	N
Queensway, Glenrothes	K	327849	701114	NO_2	N	N (17.0)	1	N
Adsa Roundabout, Kirkcaldy	K	328742	694045	NO_2	N	N (28.0)	1	N
125 St Clair Street, Kirkcaldy	R(F)	329208	693163	NO_2	N	Y	1.5	N
179A St Clair Street, Kirkcaldy	R(F)	329310	693326	NO_2	N	Y	1.5	N
3A Junction Road, Kirkcaldy	R(F)	329123	693029	NO_2	N	Y	1.5	N
24 St Clair Street, Kirkcaldy	R(F)	329091	692682	NO_2	N	Y	1.5	N
				East Area				
City Road (1,2), St Andrews	R	350590	716570	NO_2	N	N (1.0)	1.5	Y
Bell Street (1,), St Andrews	R(F)	350712	716691	NO_2	N	Y	1.6	N
Bell Street (2) St Andrews	R(F)	350721	716646	NO_2	N	Y	2.1	N
Crossgate, Cupar	K	337536	714537	NO_2	Y	N (3.0)	0.5	N

South Road, Cupar	R	337513	713616	NO_2	N	N (17.0)	1.8	N
Cupar Road, Auchtermuchty	R(F)	324186	711800	NO_2	N	Y	1.8	N
Bonnygate, Cupar (1N), Bonnygate 1	R(F)	337409	714570	NO_2	Y	Y	5.3	N
Bonnygate, Cupar, Bonnygate 2	R(F)	337507	714584	NO_2	Y	Y	1.7	N
Bonnygate, Cupar, Bonnygate 3 (A, B)	R(F)	337480	714586	NO_2	Y	Y	1.6	Y
Bonnygate, Cupar, Bonnygate B4	R(F)	337671	714575	NO_2	Y	Y	1.9	N
Ladywynd, Cupar, Ladywynd B5	R(F)	337405	714596	NO_2	Y	Y	1	N
Bonnygate West, Cupar, Bonnygate B6	R(F)	337342	714579	NO_2	Y	Y	3.2	N
Bonnygate, Cupar, Monitor BA, BB, BC *	K	337403	714571	NO_2^*	Y	N (4.8)	0.6	Y
4 East Road, Cupar	R(F)	337915	714721	NO_2	Y	Y	14	N
City Rd. (3), St Andrews	R	350538	716682	NO_2	N	N (14m)	1.5	N
City Rd. (4) St Andrews	R	350523	716725	NO_2	N	N (26m)	2.2	N
City Rd. (5) St Andrews	R	350499	716748	NO_2	N	N (5m)	1.9	N
City Rd. (6) St Andrews	R	350470	716826	NO_2	N	N (5m)	2.2	N
St Marys St. (1) St Andrews	R	351667	715969	NO_2	N	Y	3.5	N
St Mary's St. (2) St Andrews	R	351627	716143	NO_2	N	N (4m)	1.8	N

Lamond Dr. (1) St Andrews	R	351601	715956	NO_2	N	N (7m)	1.8	N
8 Balgarvie Rd , Cupar	R(F)	336669	714719	NO_2	N	Y	10	N
The Orchard, Balgarvie Rd, Cupar	R	336826	714506	NO_2	N	N (18m)	2	N

Y= if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).
*Triplicate sites
K = Kerbside, 0-1, from the kerb of a busy road.
R =Roadside,1-5m from the kerb. R (F) = Façade of buildings on street
UB = Urban background, >50m from any busy road.

Table A. 3- Annual Mean NO_2 Monitoring Results (µg m^{-3})

Site Name	Site Type	Valid Data Capture 2016 (%) (2)	2011	2012	2013	2014	2015	2016
Appin Crescent, Dunfermline	Roadside	90	30	30	25	24	25	24
Bonnygate, Cupar	Kerbside	95	30	29	27	27	27	31
Admiralty Road, Rosyth	Roadside	90	28	28	25	25	23	25
St Clair Street, Kirkcaldy	Roadside	83	19*	32	20	18	18	17

Notes: Exceedances of the NO_2 annual mean objective of 40 µg m^{-3} are shown in bold.
NO_2 annual means exceeding 60 µg m^{-3}, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in bold and underlined.
(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%).
* St Clair Street, Kirkcaldy started monitoring February 2011

NO_2 Annual Mean concentrations are presented in Figure A.1. Over the past 5 years NO_2 concentrations have declined and have generally stabilised between 2014 and 2015. In 2016 there was an increased in NO_2 concentrations within Cupar and Rosyth.

Figure A. 1 NO_2 annual mean 2011-2016 (µg m^{-3})

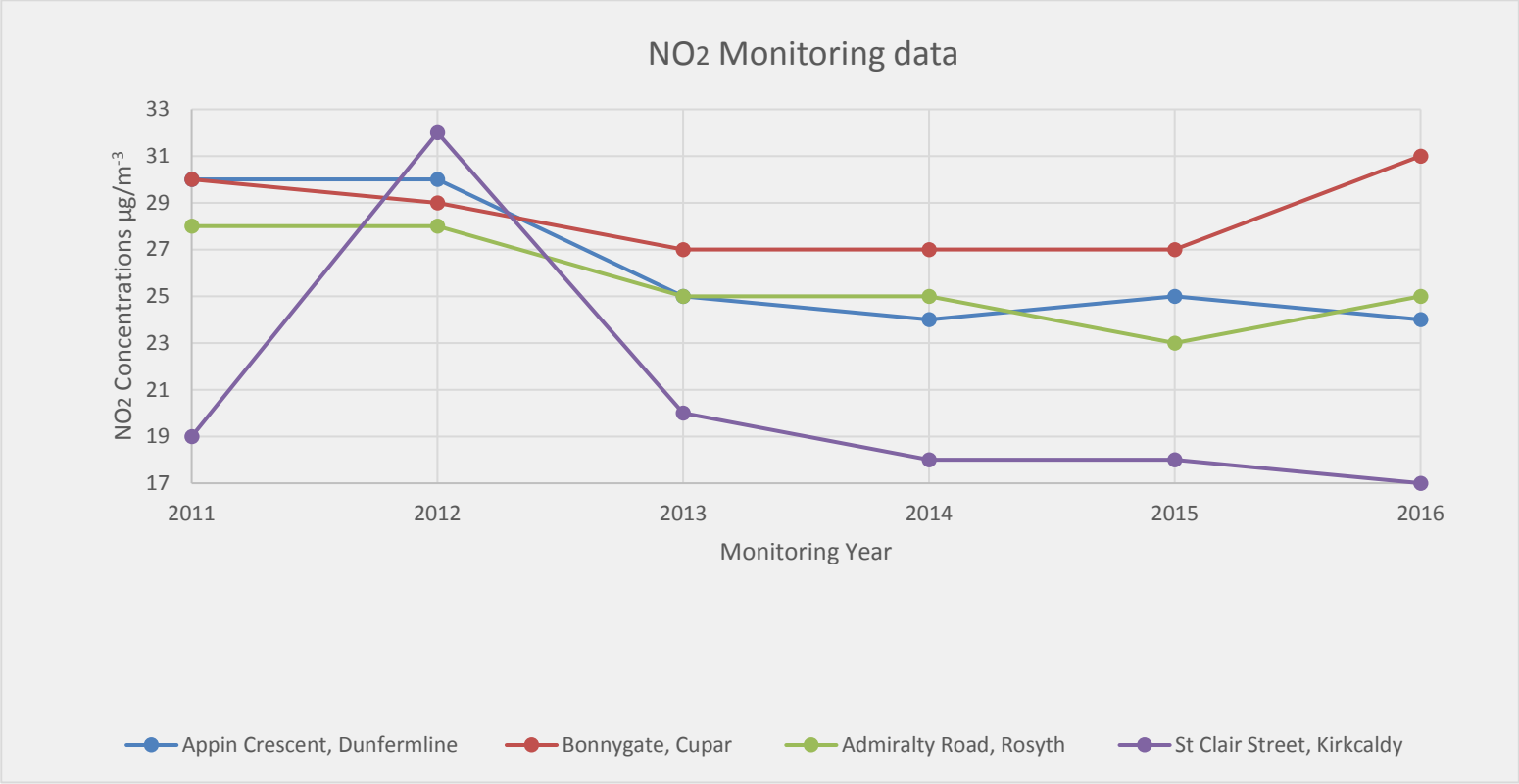


Table A. 4 - Annual mean NO_2 Monitoring Results- Non-Automatic sites (µg m^{-3})

Site Name	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	2011	2012	2013	2014	2015	2016
Diffusion Tubes- West Area									
St Leonards Primary School, Dunfermline	R(F)	N/A	91.7	21 (20)	17	14	14	14	15
Carnegie Drive (A,B,C), Dunfermline	R(F)	N/A	100	38 (35)	35	31	32	30	30
Rumblingwell, Dunfermline (5N)	R	N/A	100	27 (21)	25	21	21	22	22
Appin Crescent (A)(B)(C), Dunfermline (9N)	R	N/A	100	36 (34)	34	31	31	32	31
Appin Crescent (1) Dunfermline	R(F)	N/A	100	29 (28)	27	25	26	27	25
Appin Crescent (2) Dunfermline	R(F)	N/A	100	**46 (44)**	**41**	39	39	**40**	38
Appin Crescent (3) Dunfermline	R(F)	N/A	100	**41 (39)**	39	33	33	35	32
Appin Crescent 4(A)(B)(C) Dunfermline	R(F)	N/A	100	32 (30)	28	25	25	25	24
Appin Crescent 5(A)(B)(C)	R(F)	N/A	100	**46 (43)**	**42**	36	36	39	35

Appin Crescent 6(A)(B)(C)	R(F)	N/A	91.7	**56 (47)**	**46**	**40**	**40**	**43**	39
High Street, Cowdenbeath	K	N/A	100	22	24	21	22	19	21
North Approach Road (A, B) Kincardine	K	N/A	100	19	19	17	16	16	16
Pittencrieff St, Dunfermline	R(F)	N/A	-	24 (22)	19	18	26	20	-
11 Halbeath RD1, Dunfermline	R (F)	N/A	100	22* (20*)	21	18	17	18	17
57 Halbeath RD2, Dunfermline	R (F)	N/A	100	26* (25*)	20	18	17	18	18
Admiralty Road A, Rosyth	R(F)	N/A	100	36 (31)	33	32	31	28	29
Admiralty Road (A,B,C) ROMON	R(F)	N/A	91.7	29** (25**)	28	26	25	23	25
229 Admiralty Road, Rosyth	R (F)	N/A	100	24	24	22	22^	20	21
49 Ramsay Place, Rosyth	R (F)	N/A	100	17	19	18	17	14.6	16
129 Admiralty Road, Rosyth	R (F)	N/A	100	27** (23.5**)	27	25	24	22	24
Pilmuir Road, Dunfermline	R	N/A	100	N/A	N/A	N/A	N/A	24	26
Mill Street, Dunfermline	R	N/A	100	N/A	N/A	N/A	N/A	28	30
42 Chalmers Street	R	91.7	91.7	N/A	N/A	N/A	N/A	N/A	21
Diffusion Tubes – Central Area									
St Clair Street (1) , Kirkcaldy	R(F)	N/A	100	**42 (40)**	**45**	34	35	31	32

St Clair Street (2) , Kirkcaldy	R(F)	N/A	100	36 (35)	**41**	36	36	37	37
St Clair Street (3), Kirkcaldy	R(F)	N/A	100	32 (31)	34	30	31	27	28
St Clair Street ROMON (A,B,C,)Kirkcaldy	R	N/A	91.7	19 (19)	25	20	18	19	20
Dunnikier Rd, Kirkcaldy	R(F)	N/A	100	30 (29)	32	27	27	25	26
Victoria Rd, Kirkcaldy	R(F)	N/A	100	32 (31)	34	29	29	26	25
Glenlyon Road, Levenmouth	K	N/A	91.7	27	28	24	26	25	26
Leslie High St	R(F)	N/A	100	22	25	21	20	19	20
Queensway, Glenrothes	K	N/A	100	22	25	20	20	18	20
Adsa Roundabout, Kirkcaldy	K	N/A	100	34 (33)	33	30	28	26	28
125 St Clair Street, Kirkcaldy	R(F)	N/A	100	-	N/A	31	31	32	32
179A St Clair Street, Kirkcaldy	R(F)	N/A	100	-	N/A	27	26	27	28
3A Junction Road, Kirkcaldy	R(F)	N/A	100	-	N/A	27	27	26	27
24 St Clair Street, Kirkcaldy	R(F)	N/A	83.3	-	N/A	19	20	20	20
Diffusion Tubes - East Area									
City Road (1,2), St Andrews	R	N/A	100	36	30	27	25	23	24
Bell Street (1,), St Andrews	R(F)	N/A	100	36	39	35	32	32	30

Bell Street (2) St Andrews	R(F)	N/A	100	39	36	25	28	21^^	26
Crossgate, Cupar	K	N/A	100	22 (24)	24	26	21	21	20
South Road, Cupar	R	N/A	100	12 (12)	14	12	11	12	12
Cupar Road, Auchtermuchty	R(F)	N/A	83.3	24	28	25	22	22	25
Bonnygate, Cupar (1N), Bonnygate 1	R(F)	N/A	100	28 (30)	29	22***	26	27	25
Bonnygate, Cupar, Bonnygate 2	R(F)	N/A	100	35 (38)	36	32	26	29	32
Bonnygate, Cupar, Bonnygate 3 (A, B)	R(F)	N/A	100	36 (39) ((41))	37	31	34	39	37
Bonnygate, Cupar, Bonnygate B4	R(F)	N/A	100	31 (33)	34	35	32	36	**41**
Ladywynd, Cupar, Ladywynd B5	R(F)	N/A	91.7	18 (19)	18	18	16	16	15
Bonnygate West, Cupar, Bonnygate B6	R(F)	N/A	83.3	19 (20)	21	19	19	18	18
Bonnygate, Cupar, Monitor BA, BB, BC	K	N/A	100	30 (32)	30	30	28	27	27
4 East Road, Cupar	R(F)	N/A	100	13 (14)	14	15	13	12	12
City Rd. (3), St Andrews	R	83.3	83.3	N/A	N/A	N/A	N/A	N/A	25
City Rd. (4) St Andrews	R	83.3	41.7	N/A	N/A	N/A	N/A	N/A	23^^^

City Rd. (5) St Andrews	R	83.3	41.7	N/A	N/A	N/A	N/A	N/A	29^^^
City Rd. (6) St Andrews	R	66.7	33.3	N/A	N/A	N/A	N/A	N/A	**42**^^^ ((33))
St Marys St. (1) St Andrews	R	100	50	N/A	N/A	N/A	N/A	N/A	19^^^
St Mary's St. (2) St Andrews	R	100	50	N/A	N/A	N/A	N/A	N/A	15^^^
Lamond Dr. (1) St Andrews	R	100	50	N/A	N/A	N/A	N/A	N/A	13 ^^^
8 Balgarvie Rd , Cupar	R(F)	-	16.7	N/A	N/A	N/A	N/A	N/A	*Not reported due to low DC
The Orchard, Balgarvie Rd, Cupar	R	-	8.3	N/A	N/A	N/A	N/A	N/A	*Not reported due to low DC

Notes: Exceedances of the NO_2 annual mean objective of 40 µg m^{-3} are shown in **bold**.

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

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

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

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per LAQM.TG(16) if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

* 2011 data has been Period Mean Adjustment of 1.21 applied to non bias corrected data to compensate for January to September missing data
** 2011 data has been Period Mean Adjustment of 1.06 applied to non bias corrected data to compensate for January to April missing data
*** Data capture <75%
^ Data annualised (R_a of 0.986 applied to Bias corrected data) to compensate for May to December missing data
^^ 2015 data annualised, adjustment factor of 0.99 to calculate annual mean from period mean concentrations as described in TG(16)
( ) Highest concentrations using highest bias correction factor.
^^^ Data BIAS adjusted as described in TG.16-details provided in Appendix D
(( )) Data distance corrected to nearest receptor, using LAQM NO_2 fall off calculator

Table A. 5 - 1-Hour Mean NO_2 Monitoring Results (NO_2 1-Hour Means > 200 µg m^{-3})

Site Name	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	2011(3)	2012(3)	2013(3)	2014(3)	2015(3)	2016(3)
Appin Crescent, Dunfermline	Automatic	n/a	99	0	0	0	0	0	0
Bonnygate, Cupar	Automatic	n/a	97	0 (120)	0	0 (117)	0 (115)	0	0
Admiralty Road, Rosyth	Automatic	n/a	93	0	0	0	0 (105)	0	0
St Clair Street, Kirkcaldy	Automatic	n/a	100	0 (71)*	0	0	0	0	0

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

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

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

(3) If the period of valid data is less than 90%, the 99.8th percentile of 1-hour means is provided in brackets.

*St Clair Street, Kirkcaldy started monitoring February 2011

Table A. 6- Annual Mean PM_{10} Monitoring Results (µg m^{-3})

Site Name	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	2011(3)	2012(3)	2013(3)	2014(3)	2015(3)	2016(3)
Appin Crescent, Dunfermline	n/a	82	(16) 16*	15	15	15	16	13
Bonnygate, Cupar	n/a	91	**19**	**18**	**(18)** **18**	17	17	15
Admiralty Road, Rosyth	n/a	90	**20**	17	14	15	14	10
St Clair Street, Kirkcaldy	n/a	83	13**	11	12	11	13	10

Notes: Exceedances of the PM_{10} annual mean objective of 18 µg m^{-3} are shown in **bold.**

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

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

(3) All means have been "annualised" as per LAQM.TG(16), valid data capture for the full calendar year is less than 75%. See Appendix C for details

* Appin Crescent, Dunfermline started monitoring PM_{10} March 2011, Period Mean Adjustment of 1.03 applied.

**St Clair Street, Kirkcaldy started monitoring February 2011

( ) Data in brackets are Measurements without a period mean adjustment calculated

PM_{10} Annual Mean concentrations are presented in Figure A.2. Over the past 5 years PM_{10} concentrations have declined. The decline in concentrations coincide with implementation of certain AQAP measures.

Figure A. 2 PM_{10} Annual Mean Concentrations 2011-2016 (µg m^{-3})

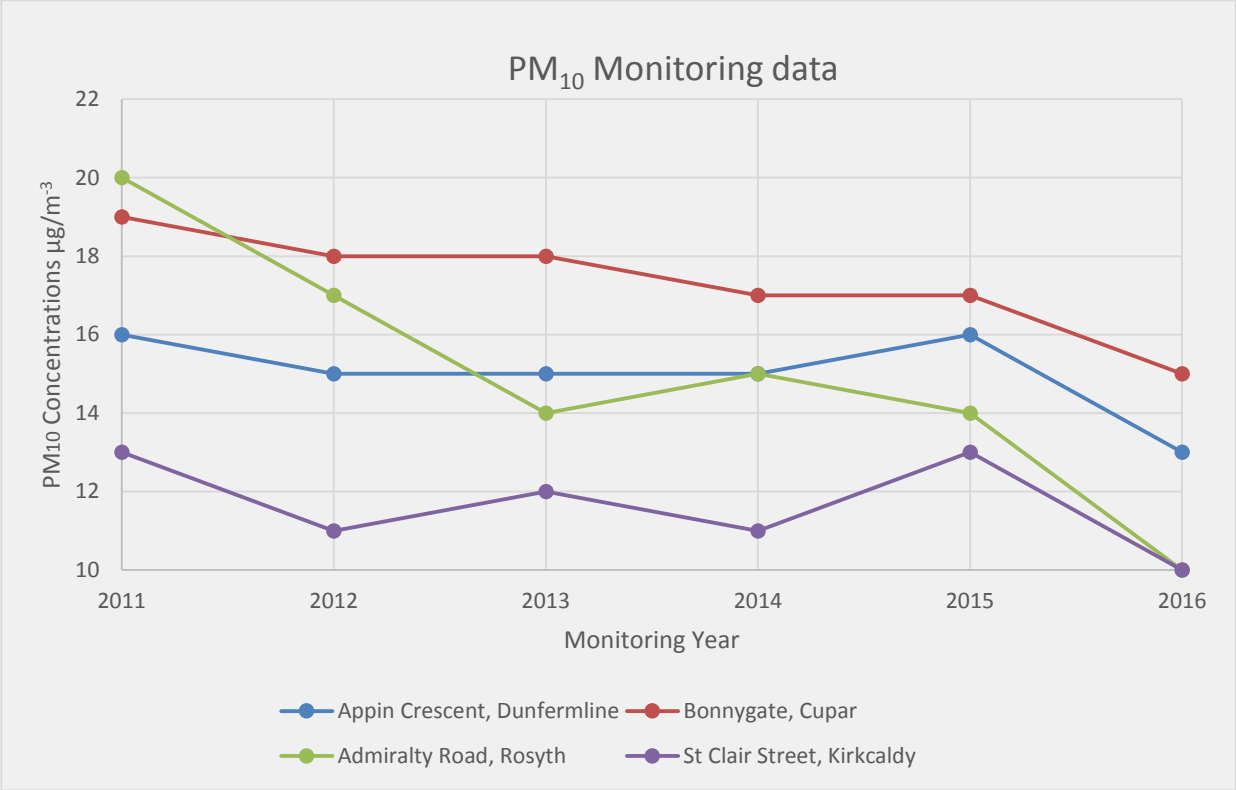


Table A. 7- 24- Hour Mean PM_{10} Monitoring Results (PM_{10} 24-Hour Means > 50 µg m^{-3})

Site Name	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2015 (%) (2)	2011(3)	2012(3)	2013(3)	2014(3)	2015(3)	2016(3)
Appin Crescent, Dunfermline	n/a	87	0 (38)*	4	2	0	2 (25)	1
Bonnygate, Cupar	n/a	80	0 (44)	4	4 (45)	0 (39)	2 (27)	0
Admiralty Road, Rosyth	n/a	90	3	1	2	0 (37)	3 (24)	1
St Clair Street, Kirkcaldy	n/a	100	0 (33)**	1	1	1 (25)	2	0

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

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

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

(3) If the period of valid data is less than 90%, the 98.1th percentile of 24-hour means is provided in brackets.

* Appin Crescent, Dunfermline started monitoring PM_{10} March 2011, Period Mean Adjustment of 1.03 applied.

**St Clair Street, Kirkcaldy started monitoring February 2011

Table A. 8- Annual Mean $PM_{2.5}$ Monitoring Results (µg m^{-3})

Site Name	Valid Data Capture 2016 (%) (2)	2011(3)	2012(3)	2013(3)	2014(3)	2015(3)	2016(3)
Admiralty Road, Rosyth	90%	n/a	n/a	n/a	n/a	7^^	6
Appin Crescent, Dunfermline	32%	n/a	n/a	n/a	n/a	n/a	6^^^
St Clair St, Kirkcaldy	74%	n/a	n/a	n/a	n/a	n/a	5.1^^^^

Notes:

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

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

(3) All means have been "annualised" as per LAQM.TG(16), valid data capture for the full calendar year is less than 75%. See Appendix D for details.

^^ Data annualised as detailed in 2016 Annual Progress Report

^^^ Data annualised as outlined in Appendix D

^^^^ Data annualised as outlined in Appendix D

$PM_{2.5}$ is now measured at Bonnygate, Cupar (commenced December 2016) and results will be reported in the 2018 Annual Progress Report.

Appendix B - Full Monthly Diffusion Tube Results for 2016

Table B. 1- NO_2 Monthly Diffusion Tube Results for 2016 (µg m^{-3})

Site Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual mean Raw	Annual Mean Bias Adjusted (1)
Diffusion Tubes-West Area														
St Leonards Primary School, Dunfermline	24.3	25.1	21.1	17.5	13.0	13.1	11.5	-	13.0	20.8	26.9	21.7	18.9	15
Carnegie Drive (A), Dunfermline	41.2	42.1	38.7	36.1	34.5	43	30.9	32.5	37.7	38.9	40.4	41.7		
Carnegie Drive (B), Dunfermline	38.1	40.4	36.6	37.2	34.5	40.1	31.1	32.3	37.7	45.7	43.8	39.6	38	29
Carnegie Drive (C), Dunfermline	40.2	36.6	38.9	35.6	32.9	40.4	30.9	31.7	38.7	44	43.7	39.1		
Rumblingwell, Dunfermline (5N)	34.9	37.7	29.9	25.3	22.0	22.0	22.3	22.8	28.3	27.0	40.1	33.7	28.8	22
Appin Crescent (A), Dunfermline (9N)	49.2	53.6	41	37	31.4	29.9	31.7	29.5	36	41.5	67.6	55.2		
Appin Crescent (B), Dunfermline (9N)	41.7	52.1	44.6	35.8	33.3	30.2	33.4	29.7	35.1	36.7	58.4	53	39.3	31
Appin Crescent (C), Dunfermline (9N)	46.7	41.1	36.8	32.9	29.7	28.2	28.3	28.9	32	35.4	43.8	44.5		
Appin Crescent (1) Dunfermline	37.5	35.5	35.4	30.8	25.3	24	25.1	25.2	27.8	32.3	45.5	38.5	31.9	25
Appin Crescent (2) Dunfermline	48.8	57.7	51.5	40.7	40.2	41.7	40	38.6	50.6	49.5	64.3	59	48.6	38
Appin Crescent (3) Dunfermline	49.6	48.5	43.3	36.5	32.7	34.3	31.9	28.5	37.4	43.1	52.5	52.7	40.9	32
Appin Crescent 4(A) Dunfermline	39.1	42.8	34.7	27.3	24.3	22.3	23.6	24.8	29.2	25.2	43.3	38.1		
Appin Crescent 4(B) Dunfermline	40.2	44.3	34.7	30.6	23.4	23.6	23.4	24.6	28.6	25.2	41.9	38.8	31.5	24
Appin Crescent 4(C) Dunfermline	38.7	44.5	37.2	28.7	24.1	21.8	26	24.2	29.3	25	41.2	38.5		
Appin Crescent 5(A)	52.9	51.9	48.4	39.1	33.9	31	36.4	35.9	42.5	42.2	64	61.9		

Appin Crescent 5 (B)	47.3	56.4	52.1	41.4	31.4	33.2	39.8	35.7	42.9	40.2	67.3	63.2	45.2	35
Appin Crescent 5(C)	48.3	51.3	51.9	36.3	37.2	32.3	40.2	35.5	43.2	40.9	62.4	57.5		
Appin Crescent 6(A)	57.3	60.9	56.3	44.4	43.5	44.5	42.6	39.2	54.3	47.3	54.5	66.1		
Appin Crescent 6(B)	63.2	62.3	57.3	46.2	40.6	43.7	45.1	36.8	43.2	-	64.7	67.7	50.6	39
Appin Crescent 6(C)	54.4	56.6	51.5	42.7	39.1	41.7	42.3	38.4	50.6	49.7	62	59.4		
High Street, Cowdenbeath	30.8	30.4	27.4	26	22.6	27.6	14.5	21.2	21.3	35.1	35	31.1	26.9	21
North Approach Road (A) Kincardine	27.6	28.5	22	17.2	13.6	14.1	14.9	13.5	17.7	18.1	31	26.8	20.5	16
North Approach Road (B) Kincardine	27.2	29.4	21.6	14	14.4	13.8	15.3	14.1	18.5	18.3	31.7	27.3		
Pittencrieff St, Dunfermline	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Halbeath RD1, Dunfermline	28.5	30.0	23.0	17.9	11.7	14.6	16.2	15.7	18.9	21.4	31.4	26.2	21.3	17
57 Halbeath RD2, Dunfermline	28.5	31.1	25.1	17.2	15.7	17.2	16.0	14.7	18.6	20.1	32.2	34.6	22.6	18
Admiralty Road A, Rosyth	47.3	48.1	36	37.7	31.6	30.5	28.9	32.1	31.8	43.8	45.6	40.2	37.8	29
Admiralty Road (A) ROMON	41.9	43.2	32.7	28.7	27	25.3	20.6	25.6	27.6	34	44.2	33		
Admiralty Road (B) ROMON	-	43.2	36.2	28.7	25.9	26.9	23.4	25	25.5	34.9	41.9	34.6	31.6	25
Admiralty Road (C) ROMON	41.2	36.2	33.9	30.1	22.6	26.9	21.7	25.8	22.5	35.6	42.3	35.6		
229 Admiralty Road, Rosyth	36.4	37.4	31.8	25.5	19.7	20.5	20.9	20.8	23.3	26.3	38.2	29.5	27.5	21
49 Ramsay Place, Rosyth	27.4	26.4	23.2	17.5	13.4	18.4	11.7	16.2	18.9	25.6	25.9	22.2	20.6	16
129 Admiralty Road, Rosyth	39.4	38.1	33.1	26.2	24.3	25.9	21.5	25.2	25.9	33.4	40.2	33.7	30.6	24
Pilmuir Road, Dunfermline	39.4	38.9	36.2	31.0	26.4	29.1	26.2	25.4	30.1	31.6	44.0	40.2	33.2	26
Mill Street, Dunfermline	44.8	44.9	41.7	33.3	29.7	33.6	29.2	32.9	33.1	42.2	52.2	44.0	38.5	30
42 Chalmers St	-	32.3	28.3	26.0	22.4	21.3	19.6	20.8	23.6	28.3	34.8	33.0	26.4	21
Diffusion Tubes- Central Area														
St Clair Street (1) , Kirkcaldy	42.5	44.1	46.0	44.2	41.2	45.8	32.2	35.9	39.2	36.3	45.5	45.0	41.5	32
St Clair Street (2) , Kirkcaldy	52.1	66.5	51.1	40.6	**37.8**	33.5	45.3	42.1	46.9	36.3	62.7	61.0	48.0	37
St Clair Street (3), Kirkcaldy	36.5	38.6	42.1	34.3	34.9	40.5	29.1	30.4	35.6	39.8	39.1	39.3	36.7	28

St Clair Street ROMON (A)Kirkcaldy	31.6	35.5	29.2	-	17.2	14.9	18.7	18.1	20.2	22.2	36.1	34.9	25.3	20
St Clair Street ROMON (B) Kirkcaldy	33.0	34.7	30.9	-	17.9	14.0	18.5	19.3	20.2	19.5	37.1	35.3		
St Clair Street ROMON (C) Kirkcaldy	34.1	29.5	29.2	-	17.4	14.9	20.7	18.3	21.5	21.1	36.6	34.0		
Dunnikier Rd, Kirkcaldy	36.3	35.9	37.0	33.1	34.5	37.3	22.8	27.5	28.2	34.9	37.4	34.6	33.3	26
Victoria Rd, Kirkcaldy	30.8	36.7	36.8	33.1	26.9	35.0	25.9	29.5	31.0	33.0	40.1	31.4	32.5	25
Glenlyon Road, Levenmouth	33.6	-	39.4	36.1	26.1	25.9	27.9	29.8	29.7	37.8	45.0	36.5	33.4	26
Leslie High St	30.0	30.8	30.6	24.8	21.3	25.4	17.0	19.9	21.2	25.9	31.0	29.4	25.6	20
Queensway, Glenrothes	29.1	33.2	27.0	25.2	22.4	22.3	15.2	18.5	19.9	31.6	25.8	29.0	25.8	20
Asda Roundabout, Kirkcaldy	36.5	39.0	43.0	31.3	35.3	35.1	26.1	28.5	34.5	37.3	44.2	40.7	36.0	28
125 St Clair Street, Kirkcaldy	47.2	51.9	46.2	35.7	32.4	27.7	37.8	32.8	40.9	32.0	58.8	53.0	41.4	32
179A St Clair Street, Kirkcaldy	39.2	48.4	42.8	31.3	23.6	24.8	31.8	28.9	31.7	30.8	56.5	45.6	36.3	28
3A Junction Road, Kirkcaldy	27.9	38.4	40.6	37.0	33.2	35.3	25.4	28.1	31.8	34.5	40.4	37.0	34.1	27
24 St Clair Street, Kirkcaldy	30.4	31.2	27.9	21.8	19.5	19.5	19.1	-	22.3	-	34.6	32.2	25.9	20
Diffusion Tube – East Area														
City Road (1), St Andrews	32.1	35.5	33.2	35.5	29.8	35.3	18.8	28.5	26.8	42.7	35.6	27.7	31.5	24
City Road (2), St Andrews	26.4	33.4	30.4	34.3	31.8	35.4	19.8	27.4	28.1	42.9	35.9	27.7		
Bell Street (1,), St Andrews	36.8	44.9	44.7	39.4	35.5	32.4	30.7	30.7	39.2	40.2	44.3	43.2	38.5	30
Bell Street (2) St Andrews	36.4	45.3	36.1	38.0	28.3	24.3	27.3	28.7	32.0	29.8	41.5	38.4	33.8	26
Crossgate, Cupar	29.2	30.2	26.3	29.1	26.7	29.8	15.3	19.0	16.7	31.0	30.9	24.6	25.7	20
South Road, Cupar	19.6	22.1	15.8	13.7	10.7	8.0	9.3	9.5	12.5	14.0	22.8	19.4	14.8	12
Cupar Road, Auchtermuchty	33.0	38.9	32.6	-	-	26.0	26.1	25.4	29.4	31.6	45.3	34.6	32.3	25
Bonnygate, Cupar (1N), Bonnygate 1	39.6	41.3	35.9	32.2	28.1	30.0	22.0	27.4	30.5	24.0	38.6	36.7	32.2	25

Bonnygate, Cupar, Bonnygate 2	47.2	61.7	44.7	36.1	37.5	38.1	27.9	31.2	35.5	39.0	53.2	44.1	41.4	32
Bonnygate, Cupar, Bonnygate 3 (A)	92.3	77.5	50.9	51.9	43.9	45.2	32.5	38.2	37.3	45.5	55.8	40.5	47.4	37
Bonnygate, Cupar, Bonnygate 3 (B)	48.3	54.0	46.6	46.8	42.9	43.1	30.1	36.5	35.5	47.2	53.5	40.5		
Bonnygate, Cupar, Bonnygate B4	52.3	51.3	60.3	51.3	49..4	52.0	45.6	44.4	53.2	54.2	63.7	59.0	53.1	**41**
Ladywynd, Cupar, Ladywynd B5	27.2	27.2	20.1	18.5	15.2	15.5	13.3	8.4	18.1	-	27.9	24.3	19.6	15
Bonnygate West, Cupar, Bonnygate B6	28.1	30.4	25.6	24.2	21.5	21.9	14.1	17.7	19.2	25.9	-	-	22.9	18
Bonnygate, Cupar, Monitor BA	38.1	43.4	37.5	31.6	28.3	33.8	25.2	29.2	32.5	42.5	42.3	36.4	35.1	27
Bonnygate, Cupar, Monitor BB	39.4	44.7	37.3	34.5	29.8	3..5	25.4	29.6	31.8	39.8	43.8	38.9		
Bonnygate, Cupar, Monitor BC	43.8	41.1	34.7	32.0	29.5	33.2	22.4	28.1	29.5	41.0	39.6	38.7		
4 East Road, Cupar	18.5	23.0	16.6	13.5	10.9	10.1	11.5	10.6	13.1	15.6	24.8	20.1	15.7	12
City Rd. (3), St Andrews	-	-	33.4	31.8	28.3	23.6	27.1	29.6	31.8	34.3	45.5	36.4	32.2	25
City Rd. (4) St Andrews	-	-	-	-	-	-	19.8	-	26.8	29.3	30.2	25.7	26.4	23^^
City Rd. (5) St Andrews	-	-	-	-	-	-	27.5	31.8	-	35.1	36.6	34.6	33.1	29^^
City Rd. (6) St Andrews	-	-	-	-	-	-	38.6	-	48.3	-	57.8	50.2	48.7	**42^^** (33)
St Marys St. (1) St Andrews	-	-	-	-	-	-	17.0	17.0	19.5	18.3	30.5	25.6	21.3	19^^
St Mary's St. (2) St Andrews	-	-	-	-	-	-	13.9	13.3	14.8	13.1	23.3	20.3	16.5	15^^
Lamond Dr. (1) St Andrews	-	-	-	-	-	-	9.3	10.6	12.3	15.4	20.7	16.3	14.1	13^^
8 Balgarvie Rd , Cupar	-	-	-	-	-	-	-	-	-	-	17.4	14.8	-	-
The Orchard, Balgarvie Rd, Cupar	-	-	-	-	-	-	-	-	-	-	-	21.2	-	-

(1) See Appendix C for details on bias adjustment

(2) ^^2016 data annualised, from period mean concentrations as described in TG(16)

(3) Exceedances of the NO_2 annual mean objective of 40 µg m^{-3} are shown in bold.

(4) ( ) Data distance corrected to nearest receptor, using LAQM NO_2 fall off calculator

Appendix C - Data QA/QC

Diffusion Tube Bias Adjustment Factors

Diffusion tubes may over or under predict NO_2 concentrations when compared to the reference method chemiluminescent analyser. This difference in measurement is described as bias. Accuracy in results can be adjusted in order to account or this. Results are adjusted using a calculated bias adjustment factor.

The diffusion tubes deployed by Fife Council are supplied and analysed by Tayside Scientific Services using a preparation mixture of 20% triethanolamine (TEA) in water. The bias adjustment factor of 0.77 was reported in the national diffusion tube bias adjustment factor spreadsheet (version 03/17) shown below, used diffusion tubes prepared and analysed by Tayside Scientific Services during 2016.

Figures C2 – C5 show the locally derived adjustment factors. Overall the locally derived adjustment factor was 0.79, with a combined factor of 0.78 using both local and national adjustment. The combined adjustment factor of 0.78 has been used to bias correct the diffusion tube results within this report.

Figure C. 1 National BIAS Adjustment

National Diffusion Tube Bias Adjustment Factor Spreadsheet — Spreadsheet Version Number: 03/17 V2

Follow the steps below in the correct order to show the results of relevant co-location studies
Data only apply to tubes exposed monthly and are not suitable for correcting individual short-term monitoring periods
Whenever presenting adjusted data, you should state the adjustment factor used and the version of the spreadsheet
This spreadhseet will be updated every few months: the factors may therefore be subject to change. This should not discourage their immediate use.

This spreadsheet will be updated at the end of June 2017
LAQM Helpdesk Website

The LAQM Helpdesk is operated on behalf of Defra and the Devolved Administrations by Bureau Veritas, in conjunction with contract partners AECOM and the National Physical Laboratory.

Spreadsheet maintained by the National Physical Laboratory. Original compiled by Air Quality Consultants Ltd.

Step 1: Select the Laboratory that Analyses Your Tubes from the Drop-Down List

If a laboratory is not shown, we have no data for this laboratory.

Step 2: Select a Preparation Method from the Drop-Down List

If a preparation method is not shown, we have no data for this method at this laboratory.

Step 3: Select a Year from the Drop-Down List

If a year is not shown, we have no data[2]

Step 4: Where there is only one study for a chosen combination, you should use the adjustment factor shown with caution. Where there is more than one study, use the overall factor[3] shown in blue at the foot of the final column.

If you have your own co-location study then see footnote[4]. If uncertain what to do then contact the Local Air Quality Management Helpdesk at LAQMHelpdesk@uk.bureauveritas.com or 0800 0327953

Analysed By[1]	Method	Year[2]	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) (µg/m³)	Automatic Monitor Mean Conc. (Cm) (µg/m³)	Bias (B)	Tube Precision[4]	Bias Adjustment Factor (A) (Cm/Dm)
Tayside Scientific Services	20% TEA in water	2016	KS	Marylebone Road Intercomparison	12	103	79	30.0%	G	0.77
Tayside Scientific Services	20% TEA in water	2016		**Overall Factor[3] (1 study)**					Use	0.77

Figure C. 2 Local Bias adjustment spreadsheet- Cupar

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm⁻³	Tube 2 µgm⁻³	Tube 3 µgm⁻³	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	06/01/2016	02/02/2016	38.1	39.4	43.8	40	3.0	7	7.4
2	02/02/2016	29/02/2016	43.4	44.7	41.1	43	1.8	4	4.5
3	29/02/2016	28/03/2016	37.5	37.3	34.7	37	1.6	4	3.9
4	28/03/2016	25/04/2016	31.6	34.5	32.0	33	1.6	5	3.9
5	25/04/2016	23/05/2016	28.3	29.8	29.5	29	0.8	3	2.0
6	23/05/2016	28/06/2016	33.8	33.5	33.2	34	0.3	1	0.7
7	28/06/2016	27/07/2016	25.2	25.4	22.4	24	1.7	7	4.2
8	27/07/2016	22/08/2016	29.2	29.6	28.1	29	0.8	3	1.9
9	22/08/2016	26/09/2016	32.5	31.8	29.5	31	1.6	5	3.9
10	26/09/2016	24/10/2016	42.5	39.8	41.0	41	1.4	3	3.4
11	24/10/2016	28/11/2016	42.3	43.8	39.6	42	2.1	5	5.3
12	28/11/2016	05/01/2017	36.4	38.9	38.7	38	1.4	4	3.5
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period	Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
1	33	98	Good	Good
2	34	99	Good	Good
3	29	100	Good	Good
4	24	99	Good	Good
5	24	99	Good	Good
6	28	99	Good	Good
7			Good	
8	37	87	Good	Good
9	35	100	Good	Good
10	39	100	Good	Good
11	34	100	Good	Good
12	28	95	Good	Good
13				
		Overall survey -->	Good precision	Good Overall

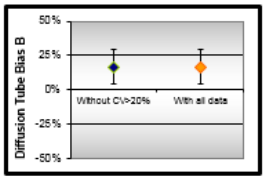
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Cupar

Precision: 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 11 periods of data
Bias factor A: 0.87 (0.79 - 0.97)
Bias B: 15% (3% - 27%)
Diffusion Tubes Mean: 36 µgm⁻³
Mean CV (Precision): 4
Automatic Mean: 31 µgm⁻³
Data Capture for periods used: 98%
Adjusted Tubes Mean: 31 (28 - 35) µgm⁻³

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 11 periods of data
Bias factor A: 0.87 (0.79 - 0.97)
Bias B: 15% (3% - 27%)
Diffusion Tubes Mean: 36 µgm⁻³
Mean CV (Precision): 4
Automatic Mean: 31 µgm⁻³
Data Capture for periods used: 98%
Adjusted Tubes Mean: 31 (28 - 35) µgm⁻³



Jaume Targa, for AEA
Version 04 - February 2011

Figure C. 3 Local Bias Adjustment Factor spreadsheet- Dunfermline

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	04/01/2016	03/02/2016	39.1	40.2	38.7	39	0.8	2	1.9
2	03/02/2016	01/03/2016	42.8	44.3	44.5	44	0.9	2	2.3
3	01/03/2016	31/03/2016	34.7	34.7	37.2	36	1.4	4	3.6
4	31/03/2016	25/04/2016	27.3	30.6	28.7	29	1.7	6	4.1
5	25/04/2016	25/05/2016	24.3	23.4	24.1	24	0.5	2	1.2
6	25/05/2016	29/06/2016	22.3	23.6	21.8	23	0.9	4	2.3
7	29/06/2016	26/07/2016	23.6	23.4	26.0	24	1.4	6	3.6
8	26/07/2016	24/08/2016	24.8	24.6	24.2	25	0.3	1	0.8
9	24/08/2016	30/09/2016	29.2	28.6	29.3	29	0.4	1	0.9
10	30/09/2016	26/10/2016	25.2	25.2	25.0	25	0.1	0	0.3
11	26/10/2016	30/11/2016	43.3	41.9	41.2	42	1.1	3	2.7
12	30/11/2016	05/01/2017	38.1	38.8	38.5	38	0.4	1	0.9
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
27	100	Good	Good
33	100	Good	Good
29	100	Good	Good
21	100	Good	Good
19	100	Good	Good
17	93	Good	Good
13	100	Good	Good
		Good	
19	83	Good	Good
22	99	Good	Good
35	98	Good	Good
32	99	Good	Good
Overall survey -->		Good precision	Good Overall

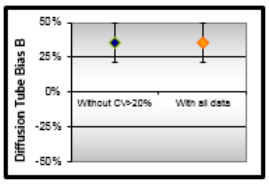
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Dunfermline

Precision 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 11 periods of data
Bias factor A 0.76 (0.68 - 0.84)
Bias B 32% (18% - 46%)
Diffusion Tubes Mean: 32 µgm^{-3}
Mean CV (Precision): 3
Automatic Mean: 24 µgm^{-3}
Data Capture for periods used: 97%
Adjusted Tubes Mean: 24 (22 - 27) µgm^{-3}

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 11 periods of data
Bias factor A 0.76 (0.68 - 0.84)
Bias B 32% (18% - 46%)
Diffusion Tubes Mean: 32 µgm^{-3}
Mean CV (Precision): 3
Automatic Mean: 24 µgm^{-3}
Data Capture for periods used: 97%
Adjusted Tubes Mean: 24 (22 - 27) µgm^{-3}



Jaume Targa, for AEA
Version 04 - February 2011

Figure C. 4 Local Bias Adjustment Factor spreadsheet- Kirkcaldy

Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	06/01/2016	03/02/2016	31.6	33.0	34.1	33	1.3	4	3.1
2	0302/2016	02/03/2016	35.5	34.7	29.5	33	3.3	10	8.1
3	02/03/2016	29/03/2016	29.2	30.9	29.2	30	1.0	3	2.4
4	29/03/2016	27/04/2016	n/a	n/a	n/a				
5	27/04/2016	25/05/2016	17.2	17.9	17.4	18	0.4	2	0.9
6	25/05/2016	29/06/2016	14.9	14.0	14.9	15	0.5	4	1.3
7	29/06/2016	27/07/2016	18.7	18.5	20.7	19	1.2	6	3.0
8	27/07/2016	24/08/2016	18.1	19.3	18.3	19	0.6	3	1.6
9	24/08/2016	28/09/2016	20.2	20.2	21.5	21	0.8	4	1.9
10	28/09/2016	26/10/2016	22.2	19.5	21.1	21	1.4	6	3.4
11	26/10/2016	30/11/2016	36.1	37.1	36.6	37	0.5	1	1.2
12	30/11/2016	05/01/2017	34.9	35.3	34.0	35	0.7	2	1.7
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
21	100	Good	Good
		Good	
		Good	
18	81		Good
12	99	Good	Good
10	100	Good	Good
12	100	Good	Good
12	100	Good	Good
15	100	Good	Good
17	100	Good	Good
31	100	Good	Good
26	100	Good	Good
Overall survey -->		Good precision	Good Overall

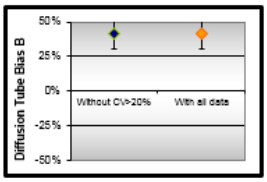
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Kirkcaldy

Precision 11 out of 11 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 9 periods of data
Bias factor A 0.72 (0.67 - 0.79)
Bias B 38% (27% - 50%)
Diffusion Tubes Mean: 24 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 17 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 17 (16 - 19) µgm^{-3}

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 9 periods of data
Bias factor A 0.72 (0.67 - 0.79)
Bias B 38% (27% - 50%)
Diffusion Tubes Mean: 24 µgm^{-3}
Mean CV (Precision): 4
Automatic Mean: 17 µgm^{-3}
Data Capture for periods used: 100%
Adjusted Tubes Mean: 17 (16 - 19) µgm^{-3}



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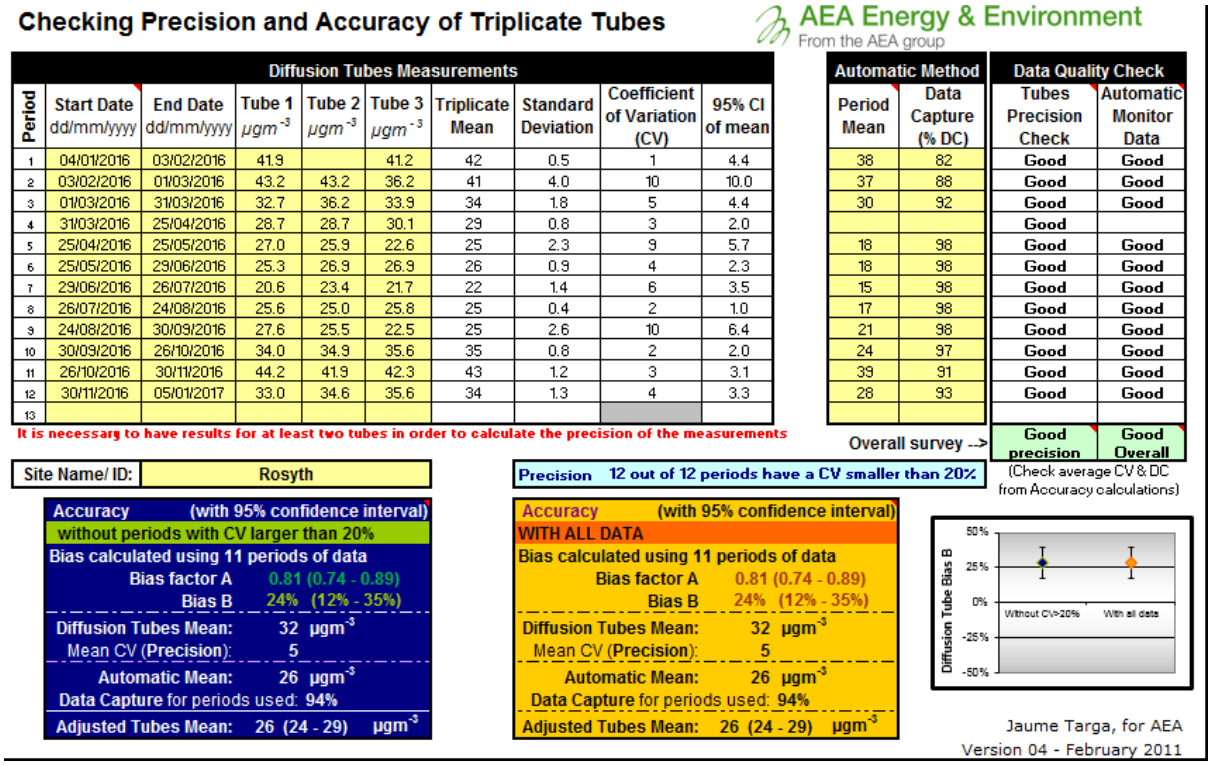
Version 04 - February 2011

Figure C. 5 Local Bias Adjustment Factor Spreadsheet – Rosyth



Checking Precision and Accuracy of Triplicate Tubes

AEA Energy & Environment
From the AEA group

Diffusion Tubes Measurements

Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm^{-3}	Tube 2 µgm^{-3}	Tube 3 µgm^{-3}	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	04/01/2016	03/02/2016	41.9		41.2	42	0.5	1	4.4
2	03/02/2016	01/03/2016	43.2	43.2	36.2	41	4.0	10	10.0
3	01/03/2016	31/03/2016	32.7	36.2	33.9	34	1.8	5	4.4
4	31/03/2016	25/04/2016	28.7	28.7	30.1	29	0.8	3	2.0
5	25/04/2016	25/05/2016	27.0	25.9	22.6	25	2.3	9	5.7
6	25/05/2016	29/06/2016	25.3	26.9	26.9	26	0.9	4	2.3
7	29/06/2016	26/07/2016	20.6	23.4	21.7	22	1.4	6	3.5
8	26/07/2016	24/08/2016	25.6	25.0	25.8	25	0.4	2	1.0
9	24/08/2016	30/09/2016	27.6	25.5	22.5	25	2.6	10	6.4
10	30/09/2016	26/10/2016	34.0	34.9	35.6	35	0.8	2	2.0
11	26/10/2016	30/11/2016	44.2	41.9	42.3	43	1.2	3	3.1
12	30/11/2016	05/01/2017	33.0	34.6	35.6	34	1.3	4	3.3
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
38	82	Good	Good
37	88	Good	Good
30	92	Good	Good
		Good	
18	98	Good	Good
18	98	Good	Good
15	98	Good	Good
17	98	Good	Good
21	98	Good	Good
24	97	Good	Good
39	91	Good	Good
28	93	Good	Good
Overall survey -->		Good precision	Good Overall

(Check average CV & DC from Accuracy calculations)

Site Name/ ID: Rosyth

Precision 12 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)
without periods with CV larger than 20%
Bias calculated using 11 periods of data
Bias factor A 0.81 (0.74 - 0.89)
Bias B 24% (12% - 35%)
Diffusion Tubes Mean: 32 µgm^{-3}
Mean CV (Precision): 5
Automatic Mean: 26 µgm^{-3}
Data Capture for periods used: 94%
Adjusted Tubes Mean: 26 (24 - 29) µgm^{-3}

Accuracy (with 95% confidence interval)
WITH ALL DATA
Bias calculated using 11 periods of data
Bias factor A 0.81 (0.74 - 0.89)
Bias B 24% (12% - 35%)
Diffusion Tubes Mean: 32 µgm^{-3}
Mean CV (Precision): 5
Automatic Mean: 26 µgm^{-3}
Data Capture for periods used: 94%
Adjusted Tubes Mean: 26 (24 - 29) µgm^{-3}

Jaume Targa, for AEA
Version 04 - February 2011

QA/QC of Automatic Monitoring

The QA/QC procedures follow the requirements of the Technical Guidance (TG.16) and are equivalent to those used at UK level for the National Network (AURN) monitoring sites. This gives a high degree of confidence in the data obtained, both for measured concentrations at the automatic sites and for establishing robust bias correction factors for diffusion tubes.

In order to satisfy the requirement outlined in the Technical Guidance (TG.16), the following QA/QC procedures were implemented:

- 3-weekly calibrations of the NOx analyser;
- 6-monthly audits and servicing of the monitoring site;
- Data ratification.

Calibrations of the NOx analyser were carried out using certified compressed gas standards (ISO17025). This ensured that the calibration gas was traceable to national and international standards. In addition to the calibration, sample filters were changed for NOx and TEOM FDMS analysers and any faults were identified thus minimising data loss. FIDAS diagnostics were recorded and cal dust performed.

Audits of the monitoring sites consisted of a number of performance checks to identify any faults with the equipment. The calibration cylinder was also checked against another gas standard in order to confirm the gas concentration. Any identified faults during the audit were forwarded on to the service unit for repair.

The final stage of the QA/QC process was to ratify the data. During ratification, all calibration, audit and service data are collated and the data are scaled appropriately. Any suspect data identified are deleted therefore ensuring that the data are of a high quality.

Diffusion Tube QA/QC Process

Diffusion tubes used by Fife Council are supplied and analysed by Tayside Scientific Services (formerly Dundee City Council Scientific Services). The tube preparation method is 20% TEA in water. The laboratory participates in three schemes which ensure that the NO_2 tube results meet acceptable standards:

1. The WASP scheme is run by the Health and Safety Laboratory. Each month one tube is sent for testing. Results are compared with other participating labs and feedback on performance provided.

2. Every three months three tubes and a blank (for analysis) are supplied for exposure at an intercomparison site operated as part of the Support to Local Authorities for Air Quality Management contract funded by the Scottish Government, Defra and the other Devolved Authorities. Again, results are compared with other participating labs and feedback on performance provided.

3. Each month a QC NO_2 solution is also provided via this contract. This solution is run as an internal check for NO2 tubes in the laboratory. The solution is tested after every 21 NO_2 tube samples.

Bias Correction for Diffusion Tubes

Diffusion tube samplers are a simple and cost effective method of measuring NO_2. However, they are classed as an indicative method and are known to have a systematic bias compared to more accurate results obtained from calibrated automatic analysers.

The local bias factor is calculated using sites where a triplicate set of diffusion tubes are co-located with a chemiluminescence analyser. The national bias adjustment factor is derived using the national database co-location studies.

Fife Council has four co-location sites that have been used to calculate the local bias adjustment factor. The local bias adjustment factor for each individual location was calculated using the "LAQM Tool" described in LAQM TG (16). The results are shown in Table C.1 below. The average of the bias adjustment factors is 0.78. The nationally derived bias adjustment factor was calculated as 0.77; however, this has been calculated using only one study from the up-to-date National Bias Adjustment Factor Spreadsheet (version number 03/17). A further bias adjustment factor has been calculated by combining both the locally and nationally derived factors.

For this report, in order to keep results comparable, the combined bias correction factor has been applied to all diffusion tubes.TG16 outlines that a combined approach should be used when:

Where the survey consists of tubes exposed over a range of settings, which differ from the co-location site, e.g. the co-location site is in a very exposed setting and the tubes being assessed are on building façade in a canyon-like street. As Cupar is situated in a street canyon the combined local and national bias adjusted factors have been applied across the entire dataset.

Table C. 1 Local BIAS adjustment factors

Source	Bias Adjustment Factors 2016
Appin Crescent, Dunfermline	0.76
Bonnygate, Cupar	0.87
Admiralty Road, Rosyth	0.81
St Clair Street, Kirkcaldy	0.72
Nationally Derived	0.77
Combined Bias factor (national and local)	**0.78**

Distance drop off:

The exceedance measured at City Road 6 diffusion tube location at St Andrews of 42µg m^{-3} is not in a location of relevant exposure. In order to predict the impact at the nearest receptor location, the LAQM NO_2 drop off calculator was used. This resulted in the measurement being below the AQS annual mean objective at the nearest location of relevant exposure. The distance corrected concentration for 2016 was 33 µg m^{-3}.

The NO_2 drop off input values are presented below. Steps 1 to 4 were input values to calculate the result.

BUREAU VERITAS

Air Quality CONSULTANTS

Enter data into the red cells

Step 1	How far from the KERB was your measurement made (in metres)?	2.2	metres
Step 2	How far from the KERB is your receptor (in metres)?	6.2	metres
Step 3	What is the local annual mean background NO_2 concentration (in µg/m^3)?	6.31	µg/m^3
Step 4	What is your measured annual mean NO_2 concentration (in µg/m^3)?	42	µg/m^3
Result	The predicted annual mean NO_2 concentration (in µg/m^3) at your receptor	33.1	µg/m^3

Appendix D- Annualisation of Data

Data capture for the following sites was less than 75%, therefore the data was annualised in accordance with TG(16) as per Box 7.9. Monitoring of $PM_{2.5}$ commenced at Cupar in December 2016.

Table D. 1 - Annualisation of $PM_{2.5}$ Data

Background Site	Annual mean 2016 (Am)	Period Mean 2016 - Dunfermline(Pm)	Period Mean 2016 -Kirkcaldy (Pm)	Ratio (Am/Pm) Dunfermline	Ratio (Am/Pm) Kirkcaldy
Edinburgh St Leonards	6.4	6.7	6.5	0.95	0.98
Auchencorth Moss	2.5	2.6	2.7	0.96	0.95
Average (Ra)- Dunfermline				0.95	
Average (Ra)- Kirkcaldy				0.96	
Dunfermline Period Mean (µg m^{-3})				6.3	
Dunfermline Annual Mean (µg m^{-3})				**6.0**	
Kirkcaldy Period Mean (µg m^{-3})				5.3	
Kirkcaldy Annual Mean (µg m^{-3})				**5.1**	

Table D. 2 Annualisation of NO_2 Diffusion Tubes

Diffusion Tubes	Annual mean 2016 (Am)	Period Mean 2016 (Pm) - City Rd 4	Period Mean 2016 (Pm)- City Rd 5	Period Mean 2016 (Pm)-City Rd 6	Period Mean 2016 (Pm)- Lamond dr /Mary St
Bush Estate	6.4	5.8	5.6	5.8	5.5
Average Ratio (Am/Pm)-City Rd 4					1.10
Average Ratio (Am/Pm)-City Rd 5					1.14
Average Ratio (Am/Pm)-City Rd 6					1.11
Average Ratio (Am/Pm)- Lamond Dr/Mary st					1.16
City Rd 4- Annual Mean (µg m^{-3})					28.9
City Rd 4- Annual Mean (µg m^{-3}) – BIAS Adjusted					**23**
City Rd 5- Annual Mean (µg m^{-3})					37.7
City Rd 5- Annual Mean (µg m^{-3}) – BIAS Adjusted					**30**
City Rd 6- Annual Mean (µg m^{-3})					53.9
City Rd 6- Annual Mean (µg m^{-3}) – BIAS Adjusted					**42**
Lamond dr - Annual Mean (µg m^{-3})					16.3
Lamond dr - Annual Mean (µg m^{-3}) – BIAS Adjusted					**13**
Mary st- Annual Mean (µg m^{-3})					24.7
Mary st - Annual Mean (µg m^{-3}) – BIAS Adjusted					**19**

Appendix E- Fife ECO Stars Scheme

Fife Council held its second ECO Stars workshop to help Fife fleet operators become more efficient and improve local air quality on 15th March 2016 at City Chambers, Dunfermline.

Workshop attendees heard presentations on a range of topics including air quality and driver training, took part in lively discussions relating to fuel efficiency, fleet management and cultural change in organisations, and shared their experiences of the scheme.

Again the event was well attended and outcomes of this workshop will be used to influence future strategic discussion on these issues.

In November 2016 Fife ECO Stars Fleet Recognition Scheme welcomed its 100th member. The scheme, which was launched in October 2014, following investment from the Scottish Government, has one of the fastest growing membership rates of this scheme in the UK.

Appendix F Technical Specification of Automatic Monitoring Equipment

Appin Crescent Dunfermline

Station Name:	Appin Crescent, Dunfermline
Easting:	309926
Northing:	687722
Distance to kerb and road name/number	3m + (A907)
Site Classification:	Roadside
Manifold type and height:	Single Teflon tube, inlet height 1.7m
Network affiliation:	Scottish Air Quality Database
Quality control procedures:	UKAS calibration by Ricardo with Air Liquide gas cylinder
Pollutants measured on site:	PM_{10}, $PM_{2.5}$, PM_1, TSP, NOx, NO, NO_2
Instrument manufacturer:	FDMS, now FIDAS Thermo i-series
Calibration procedure and frequency:	2 weekly manual calibration
Site service arrangements:	6-monthly service by air monitors
Co-located passive sampler	Triplicate NO_2 tubes installed

Bonnygate Cupar

Station Name:	Bonnygate, Cupar
Easting:	337403
Northing:	714571
Site Classification:	Kerbside (<1m from Kerb)
Distance to kerb and road name/number	0.5m to Bonnygate (A91)
Distance to nearest junction and joining road name/number	Opposite the junction with Ladywynd
Start date of monitoring	19 December 2005
Manifold type and height:	Single Teflon tube, Inlet height 1.7m
Network affiliation:	Scottish Air Quality Database
Quality control procedures:	UKAS calibration by Ricardo with Air Liquide gas cylinder
Pollutants measured on site:	PM_{10}, $PM_{2.5}$, PM_1, TSP, NOx, NO, NO_2
Instrument manufacturer:	FDMS, now FIDAS Thermo i-series
Calibration procedure and frequency:	2-weekly manual calibration
Site service arrangements:	6-monthly service by Air Monitors
Co-located passive sampler	Triplicate NO_2 tubes installed

Admiralty Road, Rosyth

Station Name:	Admiralty Road, Rosyth
Easting:	311755
Northing:	683503
Site Classification:	Roadside
Distance to kerb and road name/number	6m (A985(T))
Start date of monitoring	March 2008
Manifold type and height:	Single Teflon tube, Inlet height 2m
Network affiliation:	Scottish Air Quality Database
Quality control procedures:	UKAS calibration by Ricardo with Air Liquide gas cylinder
Pollutants measured on site:	PM_{10}, $PM_{2.5}$, PM_1, TSP, NOx, NO, NO_2
Instrument manufacturer:	FIDAS 200 NOx – Thermo 42i
Calibration procedure and frequency:	2-weekly manual calibrations.
Site service arrangements:	6-monthly service by air monitors
Co-located passive sampler	Triplicate NO_2 tubes installed

St Clair Street, Kirkcaldy

Station Name:	St Clair Street, Kirkcaldy
Easting:	329143
Northing:	692986
Site Classification:	Roadside
Distance to kerb and road name/number	4.8m, Saint Clair Street/A921
Start date of monitoring	February 2011
Manifold type and height:	Single Teflon tube, Inlet height 2.5m
Network affiliation:	Scottish Air Quality Database
Quality control procedures:	UKAS calibration by Ricardo with Air Liquide gas cylinder
Pollutants measured on site:	PM_{10}, $PM_{2.5}$, PM_1, TSP, NOx, NO, NO_2
Instrument manufacturer:	FIDAS 200 NOx – Thermo 42i
Calibration procedure and frequency:	2-weekly manual calibration
Site service arrangements:	6-monthly service by air monitors
Co-located passive sampler	Triplicate NO_2 tubes installed

Glossary of Terms

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

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom

t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com