Draft Linlithgow Air Quality Action Plan

Report for West Lothian Council

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Executive summary

This draft Air Quality Action Plan (AQAP) for Linlithgow, West Lothian has been prepared by West Lothian Council in line with its statutory obligations under Section 84 (2) of the Environment Act 1995. The Council has a statutory duty to manage local air quality within its designated boundaries. Under the Strategic Policy Framework for Local Air Quality Management published by the Scottish Government, West Lothian Council has undertaken a programme of air quality assessments. The policy framework requires the Council to undertake a series of air quality assessments to determine the current situation regarding local air quality, and to outline the progress of their local air quality management procedures to date.

Where an authority identifies that a given air quality objective is likely to be exceeded at a relevant location, it is obliged to declare an Air Quality Management Area (AQMA) and undertake a further assessment of existing and likely future air quality. The Authority must then develop an Air Quality Action Plan, setting out the local actions that will be implemented to improve air quality and work towards meeting the objectives.

What is the cause of the problem?

In the Linlithgow AQMA, exceedances of the annual mean objectives for NO_2 and PM_{10} have been identified, and source apportionment has been undertaken to identify the principal sources contributing to local exceedances of both pollutants. In reference to NO_2, the source apportionment indicated that cars represent the principal source within the Linlithgow AQMA. However, in terms of local concentrations of PM_{10}, modelling indicated that background concentrations constitute the most significant source of PM_{10} within the AQMA, with emissions from local road traffic are estimated to contribute the remaining 29-36%. More generally, traffic queuing and traffic congestion are considered to be contributing to the local air quality issues.

Air Quality Action Plan

A steering group including key representatives from relevant services of West Lothian Council has been formed to develop the draft AQAP. The steering group have considered the measures listed below and the wide range of potential options for improving air quality within the Linlithgow AQMA. Subsequently the steering group will undertake an assessment of each of these options. The options will be assessed against the following criteria:

- How much support was there initially within the steering group for the option;
- Potential air quality impact;
- Potential costs;
- Overall cost-effectiveness;
- Potential co-environmental benefits, risk factors, social impacts and economic impacts;
- Feasibility and acceptability.

Following the assessment, the options were prioritised for action. The draft plan will be reviewed by statutory consultees and will be subject to public consultation. The Plan is summarised in tabular form below.

No	Measure	Timescale
	Strategic Measures	
1	Liaise with the Scottish Government regarding the Consideration of National Measures to reduce background concentrations of PM	Short-term
2	Liaise with Scottish Government regarding National air quality policy	Short-term
3	Create approved Supplementary Planning Guidance for Air Quality	Short-term
	Direct measures	
4	Investigate Southern Distributor Link Road	Long-term

No	Measure	Timescale
5	Investigate Edinburgh Road to Manse Road Link Road	Long-term
6	Investigate Park and Ride Facility	Long-term
7	Investigate West Access Slip Road at M9 Junction 3	Long-term
8	Investigate High Street Vehicle Movement Restriction	Short-term
9	Investigate Incorporation of National Low Emission Framework and consideration of Low Emission Zone of High Street	Short/Medium/Long-term
10	Investigate Bus Stop Relocation	Short-term
11	Idling Campaign and Enforcement of Idling with Fixed Penalty Notices	Short-term
12	Investigate Decriminalise Parking in West Lothian and Introduce High Street Parking Charges and Enforcement	Medium-term
13	Review of West Lothian and Private Sector Delivery/Refuse Vehicle Timings and High Street Road Markings	Short-term
14	Review Timings at Junctions	Short-term
15	Investigate Local Bus/Fleet Improvements	Short-term
16	School Travel Plans	Short-term
17	Implement ECO Stars Scheme for HGV and Bus Operators	Medium-term
18	Install Electric Vehicle Charging Park Places	Short-term
19	Introduce Car Club	Medium-term
20	Active Travel and Cycling Infrastructure	Short-term
21	Provision of Air Quality Information	Short-term
22	Review West Lothian Council Travel Plan	Short-term
23	Create a Smoke Control Area	Short-term
24	Review Pedestrian Crossings	Short-term
25	Increase Monitoring Network	Short-term
26	Investigate Greening the Area with Trees	Medium-term

Note: AQMA = Air Quality Management Area. In this document, the AQMA comprises of an area of Linlithgow which has been subject to a formal order defining it as an area where an air quality objective is not being achieved. The map is available online at

https://www.westlothian.gov.uk/media/11612/Air-Quality-Map---Linlithgow/large/airqualitymap-linlithgow2.jpg

The plan aims to work at reducing principally transport emissions of NOx and PM_{10} in the AQMA. It is anticipated that a reduction of NOx and PM_{10} emissions is necessary for the achievement of the annual mean NO_2 air quality standard (40 $\mu g.m^{-3}$) and Scottish annual mean objective for PM_{10} (18 $\mu g.m^{-3}$) within the Linlithgow AQMA in future years. West Lothian Council will continue to review and assess air quality to monitor the situation and success of the plan. Following adoption, reports on progress of the implementation of the action plan will be submitted to the Scottish Government and SEPA on an annual basis.

What happens next?

West Lothian Council has prepared this draft AQAP with relevant stakeholders. It is designed to address the air quality problems identified in Linlithgow. It is a statutory duty for West Lothian Council to develop an AQAP following the declaration of an AQMA in response to identified exceedance(s) of one or more of the air quality strategy objectives. Before the plan can be adopted it must be subject to consultation with the general public, and must also be appraised and accepted by the Scottish Government and the Scottish Environment Protection Agency as being suitable for purpose. The purpose of the AQAP is on the basis of the evidence available, to set out the local actions that will be implemented to improve air quality and work towards meeting the objectives.

Table of contents

Appendices

1 Introduction

This plan has been produced by West Lothian Council and constitutes the Air Quality Action Plan (AQAP) designed to address the air quality problems identified in Linlithgow. It is a statutory duty for West Lothian Council to develop an Air Quality Action Plan following the declaration of an air quality management area (AQMA) in response to identified exceedance(s) of one or more of the air quality strategy objectives. Before the plan can be adopted it must be subject to consultation with the general public, and must also be appraised and accepted by the Scottish Government and the Scottish Environment Protection Agency as being suitable for purpose. The purpose of the Air Quality Action Plan is, on the basis of the evidence available, to set out the local actions that will be implemented to improve air quality and work towards meeting the objectives.

The Plan has been developed from discussions within a steering group and on the basis of guidance from West Lothian Council's contracted consultants, Ricardo Energy & Environment. The Plan will be subject to consultation.

Comments received during the consultation will be processed and taken into consideration and where possible incorporated into the Plan. The final version of the Plan will be submitted to the Scottish Government and SEPA for appraisal, and if accepted will then be adopted as a formal authority plan and will be implemented via the efforts of West Lothian Council and other stakeholders.

1.1 Objectives

The Plan summarises the air quality review and assessments that have been undertaken by West Lothian Council in recent years, focussing on exceedances of the Air Quality Strategy Objectives, and outlining the mechanisms and the targeted measures proposed by West Lothian Council that aim to improve local air quality. The plan focuses on air quality within Linlithgow, where an Air Quality Management Area (AQMA) came into force in April 2016 due to exceedances of both the NO_2 and fine particulates (PM_{10}) annual mean objectives. Twenty-six action plan measures have been incorporated within the Plan.

1.2 Report Contents and Structure

Policy Guidance LAQM.PGS (16) was published by the Scottish Government in 2016 outlines the key requirements of an effective Action Plan. The Action Plan should consider the following key points:

- Develop the AQAP in stages;
- Undertake appropriate local monitoring and assessment (source apportionment)
- Decide what level of actions are required
- Establish links to other key policy areas/ strategies
- Establish a Steering Group with key stakeholder groups at an early stage
- Undertake measure selection and impact assessment
- Agree monitoring and evaluation of success
- Undertake consultation

The remainder of this report is structured as follows:

- **Chapter 2** provides a brief overview of the significance of local air quality management on human health, the statutory duties placed on local authorities, and a summary of existing plans and strategies which may influence air quality at the study location;
- **Chapter 3** presents a summary of recent reviews of local air quality undertaken by West Lothian Council, and the results of the source apportionment exercise undertaken for the Linlithgow AQMA including the improvement required to meet the air quality objectives;

- **Chapter 4** describes how the AQAP has been developed by West Lothian Council;
- **Chapter 5** presents the range of potential options that were considered when aiming to improve local air quality within the designated AQMA and a summary of proposed measures to be adopted by West Lothian Council;
- **Chapter 6** provides an overview of the assessment process and the results of an assessment of each option.

2 Ambient Air Quality and Local Air Quality Management

This chapter outlines the significance of local air quality management in the context of human health, the legislation in place to protect human health, and the statutory duties places on local authorities in relation to Local Air Quality Management. This information is included to provide readers with a general overview of air quality issues and the Local Air Quality Management process in Scotland.

2.1 Potential Impacts of Air Pollution on Human Health

Air pollution has been associated with a wide range of effects on human health and the wider Air pollution has been associated with a wide range of effects on the wider environment. However, it is the potential negative impacts of ambient air pollution on human health that is the primary focus of local air quality management.

The World Health Organisation (WHO) has been consolidating, evaluating and publishing information relating to the impact of air pollution on human health since 1957 (WHO, 2017) and has published a series of Air Quality Guideline values (AQGs). They are intended to provide a basis for "protecting public health from adverse effects of air pollutants and for eliminating, or reducing to a minimum, those contaminants of the air that are known or likely to be hazardous to human health and well-being" (WHO Regional Office for Europe, 1987). The AQGs were designed to be relevant and applicable worldwide while also being specifically designed to address large regional inequalities in exposures to air pollution and the associated burden of disease (Krzyzanowski & Cohen, 2008).

As such, the WHO AQGs constitute an important and technically robust resource of air quality and health information that can be used by government authorities around the World to inform health-based standards. The WHO emphasises that before standards are adopted, the guideline values should be considered in the context of prevailing exposure levels and environmental, economic, and social conditions. In preparing the AQG, the WHO recognises that in certain circumstances there may be valid reasons for implementing policies and/ or standards which will permit pollutant concentrations above the guideline values. As such, it was assumed by the WHO that governments and regulatory authorities would consider economic and social factors when using the AQG as the basis for setting ambient standards, and thus placing responsibility for justifying standards above the AQG firmly with relevant national authorities.

The impacts of particulate matter on human health have been evaluated by assessing a wide range of different parameters and metrics. The most common include PM_{10}, $PM_{2.5}$, PM_1 and black smoke. The key studies that informed the derivation of WHO AQGs for PM focused on the health impacts of long-term exposure to $PM_{2.5}$ (COMEAP, 2011). The annual average WHO AQG of 10 µg m^{-3} of $PM_{2.5}$ was set as it was identified as a concentration that was considered to be below the most likely effect levels. As outlined above, key cohort studies such as the American Cancer Society cohort study (Pope et al., 2002) and the Harvard Six Cities study (Dockery et al., 1993) were important in the development of this guideline value. The guideline was selected as it represented the lower end of the concentration range at which statistically significant (> 95% confidence) effects on survival (total, cardiopulmonary and lung cancer mortality) were observable in the American Cancer Society Study. This was also supported by the findings of the Six Cities study which indicated that effects were likely observable within the range of 11-15 µg m^{-3}.

In order to determine short-term (24 h mean) guideline values for $PM_{2.5}$ and PM_{10}, the relationship between annual and 24 h average concentrations of particulate matter were used by the WHO. This resulted in the derivation of guidelines of 50 µg m^{-3} for PM_{10} and 25 µg m^{-3} for $PM_{2.5}$ respectively

The WHO identified that where these short-term guidelines were met, peaks of pollution that would result in significant excess illness were unlikely to be observed (COMEAP, 2011)

In the long-term, the available scientific evidence indicates that air pollution can have a significant effect on human health, although the effects will vary depending on where an individual lives (urban or rural) and the type of pollutant(s) to which they are exposed. Whilst the full extent of these impacts across the population is difficult to quantify, in the UK, poor air quality is considered to reduce the average life expectancy by several months (COMEAP, 2009). In recent years, emissions from motor vehicles have been shown to be having an increasing impact on urban air quality. As a result, a large number of authorities across the UK have declared Air Quality Management Areas in response to identified exceedances of the air quality strategy objectives and are developing plans to improve air quality at the local level.

2.2 Cleaner Air for Scotland - The Road to a Healthier Future

The Cleaner Air for Scotland (CAFS) was published in November 2015. This Strategy identifies the Scottish Government's policies focused on air quality and sets out a series of actions to improve air quality across Scotland. The document sets out six main objectives:

1. To reduce transport emissions by implementing low and zero emissions zones, promoting a modal shift away from the car, through active travel (walking and cycling), and reducing the need to travel;
2. To comply with the European and the Scottish legal requirements relating to air quality;
3. To inform, engage and empower the population to improve air quality;
4. To protect citizens from the harmful effects of air pollution and to reduce health inequalities;
5. To make sure that new or existing developments are not compromising air quality requirements and that places are designed to minimise air pollution and its effects;
6. To reduce greenhouse gas emissions and achieve Scotland's renewable energy targets whilst delivering co-benefits for air quality.

In addition to the six main objectives, CAFS outlines new initiatives to be implemented to compliment the objectives set, these initiatives include a National Modelling Framework and Low Emissions Framework. CAFS outlines further changes such as the adoption of the WHO guideline values for $PM_{2.5}$; this was transposed by the Air Quality Scotland Amendment Regulations 2016 when the annual mean objective for $PM_{2.5}$ was set at 10µg m^{-3}.

CAFS considers the impact of air quality on health and looks at the estimated costs as well as the premature deaths associated with poor air quality. It has been estimated that 2,000 premature deaths and around 22,500 lost life-years across the Scottish population are linked to fine particulate air pollution.

The measures detailed in this AQAP align and will deliver the six main objectives detailed in CAFS.

2.3 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland

The Environment Act 1995 placed a responsibility on UK Government to prepare an Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland. The most recent version of the strategy (2007)[1] sets out the current UK framework for air quality management and includes a number of air quality objectives for specific pollutants.

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69336/pb12654-air-quality-strategy-vol1-070712.pdf

The most recent version of the Air Quality Strategy sets out the UK vision for clean air for a good quality of life and the steps being taken to achieve this. The Strategy also outlines the established framework of local air quality management and details a series of air quality objectives to be achieved with the aim of protecting human health and the environment. The objectives have been set throughout the UK at levels that aim to protect the vulnerable in society from the harmful effects of breathing pollution (AQS, 2007), although more stringent national objectives have been established in Scotland (annual mean objective for PM_{10}).

Part IV of the Act, also requires that local authorities "review and assess" air quality within their respective boundaries. The 1997 Air Quality Strategy introduced the Local Air Quality Management (LAQM) model and associated Review and Assessment process. The Review and Assessment process is intended to locate and spatially define areas where the AQS objectives are not being met. In such instances, the Local Authority is required to declare an Air Quality Management Area (AQMA), carry out a Further Assessment of Air Quality, and develop an Air Quality Action Plan (AQAP) which should include measures to improve air quality so that the objectives may be achieved in the future. The timetables and methodologies for carrying out Review and Assessment studies are prescribed in the statutory Technical Guidance document LAQM.TG(16)[2].

Presented in Table 1 are the air quality objectives that are included in the Air Quality Standards (Scotland) Regulations 2010 (No. 1001) and Air Quality (Scotland) Amendments Regulations 2016 for the purposes of Local Air Quality Management (LAQM).

Table 1: Air Quality Objectives relevant in Linlithgow AQMA

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	15-minute mean	31.12.2005

[2] http://www.scottishairquality.co.uk/assets/documents/technical%20guidance/LAQM-TG16-April-16-v1.pdf

AQ Objective-Pollutant	Concentration	Measured as	Date to be achieved by
	a year		
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

The Objectives apply at locations where members of the public are likely to be exposed over the averaging period of the objective. Table 2 below summarises the locations where these objectives should and should not apply respectively.

Table 2: Typical locations where the objectives should and should not apply

Averaging period	Pollutants	Objectives should apply at …	Objectives should not generally apply at …
Annual mean	Nitrogen dioxide PM_{10}	All background locations where members of the public might be regularly exposed.	Building facades of offices or other places of work where members of the public do not have regular access.
		Building facades of residential properties, schools, hospitals, libraries etc.	Gardens of residential properties. Kerbside sites (as opposed to locations at the building facade), or any other location where public exposure is expected to be short term

Whilst it is anticipated that measures adopted at a national and international level will enable the objectives to be attained in the majority of relevant locations, measures adopted at a local level can make a significant contribution to improving air quality in specific locations. The UK government acknowledges the significant role that local authorities play in helping to achieve the air quality objectives.

2.4 The Local Air Quality Management Regime

Part IV of the Environment Act, 1995, places numerous statutory duties on local authorities in relation to local air quality management, a summary of which is outlined below:

1. Local authorities are required to undertake annual assessments of current and future air quality within their respective authority boundary and determine whether any of the air quality objectives are likely to be exceeded.
2. Where an authority identifies an area where one or more of the objectives are likely to be exceeded, the authority is required to designate the identified area, by official Order, as an Air Quality Management Area (AQMA). Such Orders may be amended or revoked as a result of the findings of later air quality assessments where these indicate a change in the extent of the exceedance, or that the relevant objective(s) are likely to be attained.
3. Following the declaration of an AQMA, the Local Authority is required to undertake a Further Assessment of current and likely future air quality within the AQMA, and to develop an Air Quality Action Plan (AQAP) outlining the measures that will be implemented at a local level in pursuit of the air quality objectives. The Further Assessment should be completed within 12 months of the AQMA designation Order and provide the technical justification to enable the authority to prepare an AQAP "in pursuit of the achievement of air quality standards and objectives in the designated area". Note that authorities are not obliged to meet the objectives but must show that it is working towards them.

The Air Quality Strategy states that air quality issues should be dealt with in a holistic and multi-disciplinary way. In developing an Air Quality Action Plan it is therefore important that the Local Authority engages with officers across relevant Services, notably strategic, development and transport planners, to ensure that any measures included in the plan are supported by the relevant parts of the authority. It is vital that organisations, groups and individuals that have an impact on local air quality work together to help attain the aims of an adopted plan. Furthermore, it is essential that the AQAP considers existing policies and programmes in operation within the region that may have important implications for the plan.

2.5 Existing Strategies and Policies relevant to Air Quality in Linlithgow

Numerous existing policies and strategies adopted at a local, regional and national level can exert significant effects, both positive and negative, on air quality in West Lothian. It is important that these plans and strategies are considered at an early stage of the development of the plan, as these will likely establish the context in which any specific options for improving air quality can be implemented. This following section identifies the most important of these.

2.5.1 The National Transport Strategy

The National Transport Strategy for Scotland was published in December 2006 and refreshed in January 2016. The Strategy identified the need to provide an efficient, integrated and reliable transport network that successfully promotes economic growth, protection of the environment, health and social inclusion, and introduced three key strategic objectives:

1. To reduce journey times between Scotland's towns/ cities and global markets, tackle congestion and provide access to key markets;
2. To reduce emissions to tackle climate change;
3. To improve the quality, accessibility and affordability of transport, to give people the choice of public transport as an alternative to the car.

These key objectives have been designed to support the role of Government and respond to the strategic objectives, namely a Wealthier, Fairer, Smarter, Healthier, Safer, Stronger and Greener Scotland. The plan includes a wide range of commitments aimed at tackling each of the key strategic objectives. Commitments identified as being of particular significance to Linlithgow and the AQMA are:

- Investing to tackle congestion from the School Run;

- Promoting SMART[3] measures on all journeys, focusing especially on the commute to work through developing travel awareness and marketing campaigns;
- Exploring with key partners' sustainable travel demonstration towns across Scotland to reduce car use and promote cycling and walking;
- Promoting and encouraging new vehicle technologies;
- Supporting sustainable distribution strategies through the Scottish Road Haulage Association;
- Publishing a Bus Action Plan to help achieve a step change in the quality of bus service provision;
- Support the introduction of integrated ticketing pilots to enhance the passenger journey.

The Strategy clearly states that Regional Transport Partnerships, local authorities and transport operators will be key partners in delivering the strategic outcomes.

2.5.2 Regional Transport Strategy (2008-2023)

The Council is a member of the South East of Scotland Transport Partnership (SEStran)[4] which is one of seven statutory regional transport partnerships set up under the Transport (Scotland) Act 2005. The SEStran Regional Transport Strategy[5] was developed to complement the objectives of the National Transport Plan and includes 17 sub-objectives that stem from the four high level objectives of: Economy, Accessibility, Environment and Safety and Health. Assessment of the Regional Transport Strategy(RTS) objectives Policies and Inventory led to the development of three key themes:

1.	Region-wide initiatives	Region wide initiatives that affect the area measures affecting the whole SEStran area e.g. travel behaviour/ planning, integrated ticketing, regional freight initiatives, awareness campaigns and frameworks for parking (standards and management).
2.	Initiatives for specific areas and groups	Initiatives targeting accessibility and providing minimum levels of service to specific localities and groups, and rural areas.
3.	Network-based initiatives	Covering specific infrastructure schemes and public transport services on principal travel corridors. These include a wide range of measures proposed for movements of strategic importance to the SEStran area.

The (RTS) makes specific reference to the increasing importance of local air quality, its effects on human health and the role that transport plays in air quality issues in urban areas.

The strategy was updated in July 2015 to take into account the new policy documents that have been produced by the Scottish Government since the preparation of the 2008 RTS and which takes the plan up to 2023. The update takes account of the most recent data and information and the more detailed strategy development that SEStran has undertaken since 2008.The substance of the strategy and suggested intervention have not changed.

[3] SMART Measures: Specific, Measurable, Achievable, Realistic and Timed.

[4] http://www.sestran.gov.uk/

[5] http://www.sestran.gov.uk/files/Regional%20Transport%20Strategy.pdf

2.5.3 Local Transport Strategy for West Lothian

The current Local Transport Strategy (LTS) for West Lothian was developed in 2000 and incorporates the local traffic reduction plan. The plan was designed to run from 2000 to 2010 and a new strategy is due to be developed. The Strategy makes specific reference to the UK's Air Quality Strategy, and incorporates a range of objectives that target reductions in road traffic in West Lothian, but which could also contribute to reducing emissions of air pollutants from road traffic sources, and consequently reduce ambient concentrations of air pollutants such as nitrogen dioxide and particulate matter. The LTS includes the following objectives which could contribute to improving local air quality in West Lothian:

- Maximise accessibility for all by shifting the balance towards public transport
- Encouraging walking and cycling as alternatives to the private car
- Improve environmental conditions by reducing traffic intrusion in residential areas easing conditions for public transport and providing for pedestrians and cyclists
- Provide new roads where they bring substantial environmental and safety benefits and support the development strategy.

Due to the age of the current LTS, it is difficult to link to the existing situation within West Lothian and in particular the Linlithgow AQMA. However, the steering group recognise that the AQMA should be considered in detail during the development of the updated LTS for West Lothian. Moreover, the Local Development Plan for West Lothian is the most up-to-date statement of transport and planning policy for West Lothian. The Proposed Plan (2015) proposes an approach to development that considers the air quality impacts of traffic generation within the decision-making process.

2.5.4 The West Lothian Council – Green Transport Strategy

The Green Transport Strategy which has been submitted in November 2016 is a measure that is being delivered by West Lothian Council to enable the Council to work more efficiently. The transport strategy targets reduced emissions from Council-associated travel by (1) challenging the need to make a journey, (2) promoting alternative forms of travel such as car sharing and the use of public transport, and (3) through the leasing of 265 low carbon cars and vans. The use of low carbon vehicles will maximise the benefits from reduced business travel, fuel consumption, fuel costs, road tax and carbon emissions.

It has been anticipated that the Green Transport Strategy will also help the Council to reduce the Council's environmental impact by a third or 236 tonnes of carbon dioxide and based on 2009/10 figures is equivalent to 1,137,596 business miles.

The West Lothian Smarter Travel is part of the Green Transport Strategy and aims at giving an awareness on the different choices of travel such as walking, cycling or car sharing schemes for travelling to work, to school or in general. It also gives information on vehicle emissions.

2.5.5 West Lothian Local Plan

The West Lothian Local Plan was adopted by the Council and became operative on the 13thJanuary 2009. The plan takes a balanced approach to accommodating development whilst protecting and enhancing the environment. The Strategy seeks to:

- Implement the requirements of the Edinburgh and the Lothians Structure Plan 2015 (**The Structure Plan 2015 was revoked in June 2013 following approval by Scottish Ministers of the new Strategic Development Plan for South East Scotland (SESplan))**
- Maintain development momentum and continue to attract high quality investment
- Promote the principles of sustainable development
- Protect and enhance the natural and built heritage of West Lothian
- Continue to enhance the image of West Lothian in order to assist in encouraging economic investment and improve the quality of life for its residents

- Enhance accessibility to services, jobs and other activities important to the needs of the community
- Secure the widest possible economic and employment base in West Lothian
- Improve services and facilities to meet the need of all the community.

Providing guidance on location of development across West Lothian, it has two underpinning strategies. The first is to encourage the economic regeneration of West Lothian, while the second is to protect and enhance the district's built and natural heritage. These two underlying strategies fall under the general theme of following the principles of sustainability. The document details development plans across all potential areas, so that West Lothian Council is aligned to the same strategy and policy. As well as Strategy and Implementation, the report sets out development plans for the specific areas:

- Countryside
- Built and archaeological history
- Employment
- Housing
- Core development Areas
- Transport and accessibility
- Town Centres & Retailing
- Community, sport and education facilities and open space
- Natural resources, waste management & renewable energy
- Town Centres & Retailing
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Many of the development strategies for these areas could have an impact on Air Quality – either positively or negatively. In fact, the potential negative Air Quality impact due to construction development has been explicitly highlighted and acted upon by through the Policy IMP 09, revealing the council's attentiveness to potential Air Quality issues.

West Lothian Council is at an advanced stage in replacing the WLLP and it is anticipated that a new local development plan (LDP) will be adopted in 2017, it is currently examined under Section 19(3) of the Town and Country Planning (Scotland) Act 1997 (as amended). It focused on eight key issues, i.e., economic development; community regeneration; housing growth, delivery and sustainable housing locations/areas of restraint; infrastructure requirements and delivery; town centres and retailing; the natural and historic environment; climate change and renewable energy; and waste and minerals. The LDP covers the ten-year period from 2014 to 2024 but it also sets out a longer-term planning strategy for West Lothian.

2.5.6 West Lothian Local Development Plan 2015

The West Lothian Local Development Plan (LDP) was published in October 2015 and provides information on proposed development sites throughout West Lothian and policies to be considered when assessing planning applications. This document will in time replace the West Lothian Local Plan.

The LDP aims at supporting economic activity and to promote West Lothian as an attractive place to invest and do business. The LDP seeks to provide a framework for the growth which is necessary to provide direction and clarity for the determination of planning applications in West Lothian.

A supplementary guidance will be prepared so that developers try to implement transport mitigation measures for Linlithgow should a new development proceed.

Policy EMG 4 (reproduced below) of the West Lothian LDP states how air quality will be considered within the planning process. Policies DES1 and HOU4 also include requirements regarding air quality.

POLICY EMG 4 Air Quality

Where appropriate, developers will be required to provide additional information on the impact of their proposed development on air quality.

Development promoting behaviour change programmes in Linlithgow and Broxburn/Uphall to facilitate modal shift of shorter journeys to walking and cycling is supported in principle.

Development will not be supported where it is not possible to mitigate the adverse effects of that development on air quality effectively or where development proposals cause unacceptable air quality or dust impacts, or would result in sensitive uses, which give rise to air pollution concerns, being located within or close to uses with potential to generate such pollution.

Where appropriate, planning conditions will be imposed which require air quality monitoring apparatus to be installed.

Extract from POLICY DES1 Design Principles

When assessing development proposals, the developer will be required to ensure that:

- There is no significant adverse impact on amenity as a result of noise or particulates
- There are no significant adverse effects on air quality (particularly in and around Air Quality Management Areas) and, as appropriate, mitigation to minimise any adverse effects is provided.

POLICY HOU4 Windfall Housing Development in Linlithgow and Linlithgow Bridge

Linlithgow and Linlithgow Bridge are particularly sensitive to the impact of new infill housing development by virtue of unique historic character, environmental constraints (landscape setting, air quality and drainage), traffic congestion and the availability of education capacity.

Proposals for windfall housing development within the settlement boundary of Linlithgow/Linlithgow Bridge will therefore be subject to additional scrutiny and will only be supported where it can be demonstrated that their impact can be satisfactorily managed and would not singularly or cumulatively exacerbate these matters.

2.5.7 West Lothian Council Carbon Management Plan

West Lothian Council collaborated with the Carbon Trust, as part of the Scottish Local Authority Carbon Management Programme, to develop a Carbon Management Plan[6] for the Council. This has been reviewed recently and a new Carbon Management Plan is now in Place for 2015 – 2020. The plan looks to identify measures which will further reduce West Lothian's Carbon emissions, as well providing financial savings. An overall target has been established alongside a suite of projects and initiatives to reduce the council's carbon footprint by 20% by the end of the financial year 2020/21, rebased to a 2013/14 carbon footprint baseline year. The plan details medium to long term projects that will help West Lothian Council reduce its carbon emissions. In addition to reduced emissions and cost-savings, this plan forms an important part of West Lothian's response to the Scottish Government's Climate Change Bill.

[6] http://www.westlothian.gov.uk/media/downloaddoc/1799514/Climatechange

The vision of the plan is to enable West Lothian Council to reduce carbon emission from their activities and services, while also acting as a motivator to help partner organisations and businesses within West Lothian achieve similar reductions.

The Plan targets reductions from Council Property, owned housing, transport fleet, external lighting and commercial waste. Some of these measures may link with this Air Quality Action Plan, particularly the targeted reduction in emissions from the Council's fleet of vehicles.

2.5.8 West Lothian Council Active Travel Plan 2016 - 2021

In accordance with the Cycling Action Plan for Scotland (CAPS), West Lothian Council has prepared an Active Travel Plan for West Lothian (2016). This Plan sets out a strategic approach to mainstreaming walking, cycling and any non-motorised means of travel for every day, functional journeys. CAPS promotes a central vision for cycling in Scotland - by 2020, 10% of everyday journeys taken in Scotland will be by bike.

The Active Travel Plan will see the development of Local Active Travel Network Plans. These local Plans will present an existing network to support walking and cycling for functional journeys, and identify key gaps in the network which will support future funding bids for capital investment in active travel infrastructure. A Local Active Travel Network Plan will be produced for Linlithgow initially, as these provide an opportunity to tackle larger volumes of short journeys based on population size.

The Active Travel Plan also sets out a range of measures to encourage modal shift to active travel through behavioural change, and these will also be relevant to the AQMA in Linlithgow, and all other areas being monitoring for air quality issues related to traffic.

The Active Travel Plan is referred to within the Local Development Plan, and has the potential to become Supplementary Planning Guidance"

2.5.9 Single Outcome Agreement

A ten-year Single Outcome Agreement has been updated in September 2016 and has been developed for 2013-2023. The document sets out outcomes, indicators and activities that will be delivered and that will have an impact on the short term, medium and longer term – ensuring sustainability and transformational change.

One of those outcome is to "make the most efficient use of resources by minimising our impact on the built and natural environment". The two indicators to assess the delivery of this outcome are:

- Tonnes of CO_2 emissions per capita for the West Lothian District
- Percentage reduction in emissions from the council's activities and services (transport, fleet and business mileage, non-domestic buildings, street lighting, waste and water).

2.6 Consultation on the Action Plan

Authorities in Scotland must consult the agencies and organisations listed below following the preparation or revision of their Air Quality Action Plan:

- Scottish Ministers
- The Scottish Environment Protection Agency
- Neighbouring local authorities
- Other public authorities as appropriate
- Bodies representing local business interests and other organisations as appropriate (potentially including representatives of the public e.g. community councils)
- Any National Park authority within or adjacent to the Local Authority area.

Authorities should also proactively make copies of the Action Plan available to the public, and undertake other efforts deemed necessary to adequately consult members of the public on the content and significance of the plan. It is recommended that the consultation period be no less than 6 weeks in duration to enable consultees the opportunity to contribute to the process.

Following consultation and the formal adoption of the Action Plan, the Council is also required to submit annual Action Plan progress reports to the Scottish Government and SEPA.

3 Conclusions of previous rounds of LAQM review and assessments

West Lothian Council has completed its Local Air Quality Management duties in compliance with the guidance provided in Chapter 2 of this report. This work has reviewed air quality within the West Lothian geographical area and assessed whether any exceedances of the health based air quality objectives have been identified or have been predicted for future years. This chapter provides a brief summary of the work undertaken since 2010 and the conclusion drawn.

3.1 Summary of Relevant LAQM Review and Assessment in West Lothian Council 2010 to 2016

3.1.1 2010 Progress Report

In 2010, West Lothian Council prepared an LAQM Progress Report as required under the local air quality management regime. Monitoring at Linlithgow indicated that the annual mean PM_{10} objective was likely to be exceeded in the future as the 2009 measured concentration was equivalent to the objective.

Based on the monitoring data, it was agreed with the Scottish Government that a Detailed Assessment be carried out for High Street Linlithgow.

3.1.2 2011 Linlithgow Detailed Assessment

The measured annual PM_{10} concentration in 2009 was 18 $\mu g.m^{-3}$. Although, this indicates that the PM_{10} objective was being met at the monitoring site location on High Street, the analyser was located at a greater distance from the roadside in comparison with the locations of the nearest receptors and therefore, it was not representative of the worst-case location. It was expected that PM_{10} concentrations at locations closer to the roadside would be in excess of the annual mean PM_{10} objective.

The results of the dispersion modelling indicated that the annual mean PM_{10} objective was being exceeded along the length of the High Street and at the junctions at each end of the High Street.

On the basis of both the modelling and the measured concentrations the assessment concluded that the Council should proceed to the declaration of an AQMA in High Street Linlithgow to include the predicted areas of exceedances for the PM_{10} annual mean objective.

3.1.3 2012 Updating and Screening Assessment

Measured concentrations of PM_{10} at Linlithgow were well below the objective in 2011. However, it has been noted in previous reports that the location of the analyser is not representative of the worst-case location.

The Updating and Screening Assessment concluded that the declaration of the AQMA in Linlithgow should be postponed until the analyser was moved to a worst-case position.

3.1.4 2013 Progress Report

The measured PM_{10} annual mean concentration at Linlithgow was 12 $\mu g.m^{-3}$ in 2012.

The report proposed the action of relocating the Linlithgow monitoring station to the worst case 'canyon' area identified by the Detailed Assessment and approved by the Scottish Government.

3.1.5 2014 Progress Report

The Linlithgow High Street unit was decommissioned in October 2013 due to not being in a worst-case location and was relocated to a canyon area at the east end of Linlithgow High Street in October 2013, and renamed Linlithgow High Street 2.

The annual mean PM_{10} concentration, that has been annualised, met the objective at the relocated Linlithgow site. Diffusion tubes concentrations indicate an exceedance of the NO_2 annual mean objective in Linlithgow High Street.

The report concluded that a Detailed Assessment for NO_2 will need to be undertaken.

3.1.6 2015 Updating and Screening Assessment

Measured PM_{10} annual mean concentrations reached the objective in Linlithgow in 2014, while NO_2 measured annual mean concentration at this same location is just below the NO_2 annual mean objective.

The conclusion of the report indicated that a detailed assessment for PM_{10} and NO_2 will be undertaken for High Street Linlithgow.

3.1.7 2016 Updated Detailed Assessment

A Detailed Assessment for Linlithgow conducted in 2016 confirmed the findings of the 2015 Updating and Screening Assessment, namely, that exceedances of the Scottish annual mean PM_{10} and NO_2 objectives were occurring at locations of relevant human exposure. Within the study area the modelling predicted concentrations in excess of the annual mean NO_2 objective along High Street. However, there are limited residential properties at ground floor. There was one property where the NO_2 annual mean objective was predicted to be in excess of the objective. There were no exceedances predicted at first floor level.

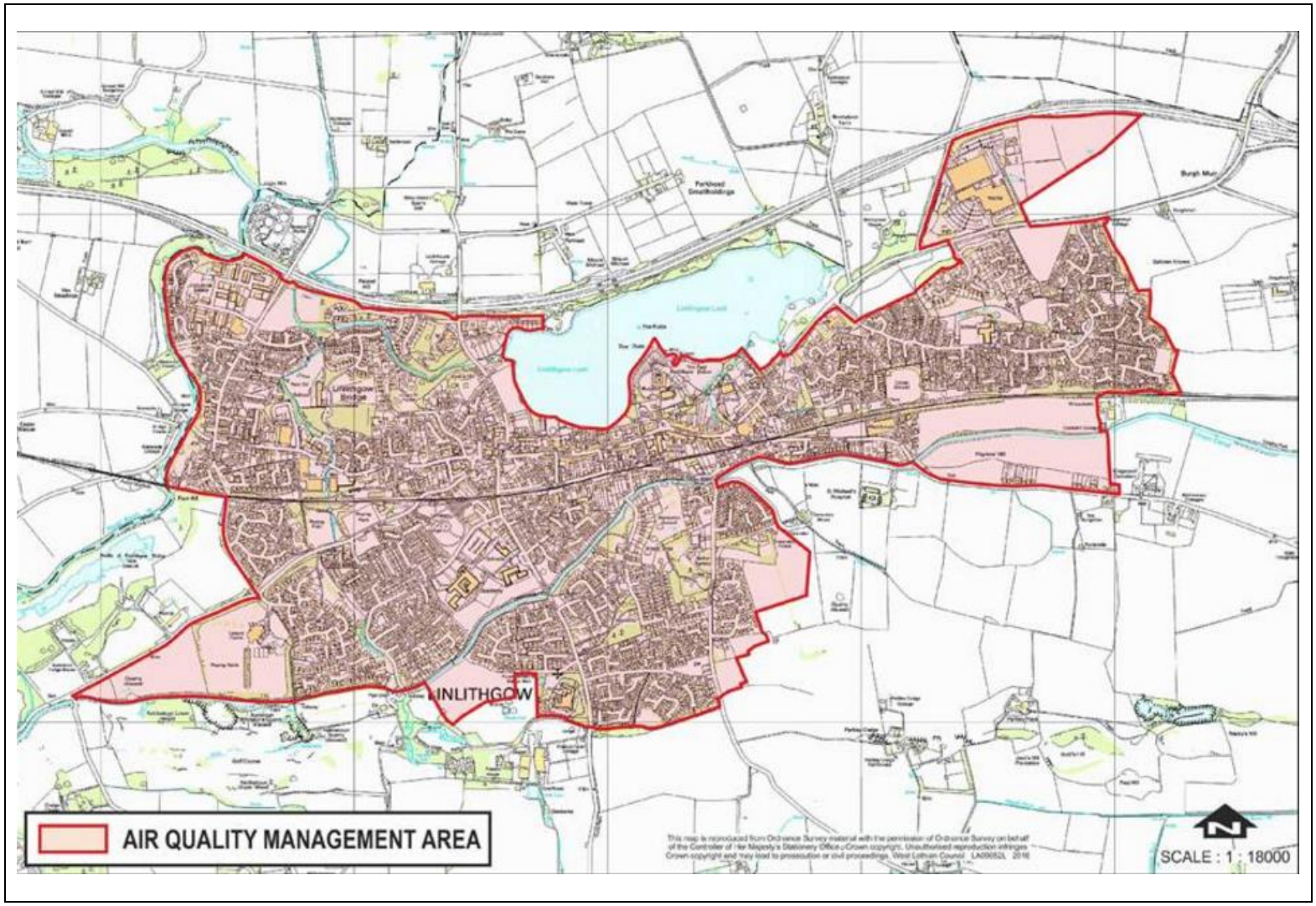
The modelling results indicated that there that there were approximately 10 properties within the study area where the annual mean PM_{10} objective was exceeded.

The report recommended that an AQMA should be declared in Linlithgow.

3.1.8 Linlithgow AQMA Declaration

The Linlithgow AQMA for annual mean concentrations of both NO_2 and PM_{10} was declared in April 2016. The boundary of the AQMA is presented in Figure 1.

Figure 1 Linlithgow AQMA



3.2 Summary of the source apportionment for Linlithgow

Following the declaration of the Linlithgow AQMA, a source apportionment analysis has been undertaken. The aim of the source apportionment is to identify the sources of emissions that contribute to local concentrations of NO_2 and PM_{10}. The source apportionment provides a significant technical input to the action plan by identifying the principal local sources that can be targeted and considered within the action plan.

3.2.1 Source apportionment

Source apportionment is the process whereby the contributions of different pollutant sources to ambient concentrations are quantified. This allows the Local Authority's action plan to target specific sources when attempting to reduce pollutant concentrations in the AQMA. In local air quality, the relevant sources typically include: road transport, local background concentrations, industrial, domestic and commercial sources. In AQMAs where road transport is identified as one of the principal source of emissions, the relative contributions from the different types of vehicles (e.g. cars, HGV and buses) can also be determined to identify which vehicle types represent the most significant sources of pollution. Thus, the source apportionment allows the most important source or sources to be identified and options to reduce ambient concentrations of pollutants can then be considered and assessed.

The source apportionment exercise was undertaken using an air dispersion model[7] which modelled the contributions of emissions of NO_2 and PM_{10} from various sources at relevant exposure locations. The receptors of relevant exposure utilised within the study were correlated with the data from the automatic monitoring site and the diffusion tubes located within the study area. These receptors are presented in Figure 2. The receptors were chosen as locations where the public were likely to be regularly present and exposed over the averaging period of the objectives.

The results of the source apportionment exercise have helped the Linlithgow AQAP Steering Group to identify the most appropriate measures to include within the draft Action Plan. This exercise has enabled the prominent sources of emissions to be targeted, to help bring the most effective reduction in emissions and subsequently annual mean concentrations of NO_2 and PM_{10}.

NO_2 is mainly a secondary source i.e. the result of the oxidation of Nitrogen Oxides. Therefore, source apportionment analysis considers the emission of NOx (Nitrogen Oxides) which are assumed to be representative of the main sources of NO_2. The source apportionment also considered the emission of PM_{10} (Particulate Matter).

To calculate the proportion of total pollutant concentrations attributable to various types of vehicles, the latest version of the Emissions Factor Toolkit at the time of the modelling was used (EFT v6.0.2); whereby emission sources were effectively switched on or off; e.g. for calculating the contribution from HGVs all other sources were set to zero. This allowed derivation of new emission rates for the road segments which were then modelled in ADMS-Roads to obtain the contribution of each source to ambient NO_2 concentrations at the worst-case specified receptor locations i.e. the locations where the highest concentrations were predicted.

The contributions from each of the following sources have been quantified:

- Background
- Moving vehicles
- Cars
- Light Goods Vehicles

[7] ADMS-Roads

- Heavy Good Vehicles
- Buses

The respective contributions from the above sources have been modelled at a selection of receptor locations across the study area shown in Figure 2; this includes the locations where the highest NO_2 and PM_{10} annual mean concentrations were predicted. Table 3 and Table 4 summarises the relevant NOx contributions from the above sources at the ten worst-case receptor locations. The PM_{10} results are presented in Table 5 and Table 6. The source apportionment results are presented visually using segmented bar charts in Figure 3 to Figure 6. The full results of the source apportionment at all receptor locations are presented in Appendix 1.

Examination of the source apportionment results indicate that:

- Background NOx concentrations account for a relatively small proportion, up to 30.2% of total NOx concentrations within the study area; whereas background PM_{10} accounts for up to a more significant 71.4% of the total concentration at each receptor.
- At all receptor locations on the west end of the High Street there is a higher proportion of road NOx and PM_{10} attributable to buses and LGVs than on the east side of the street.
- There is a higher proportion of road NOx and PM_{10} attributable to HGVs on the east side of High Street than on the west side.
- The locations where the highest pollutant concentrations are being measured and modelled are at locations where traffic is known to be regularly slow moving and within high sided street canyon like topography. This indicates that any measures that can improve traffic flow at these locations where pollutant dispersion is poor will help to reduce annual mean concentrations. This could include for example, consideration of changes in traffic light or traffic light locations.

Figure 2: Receptor locations for source apportionment

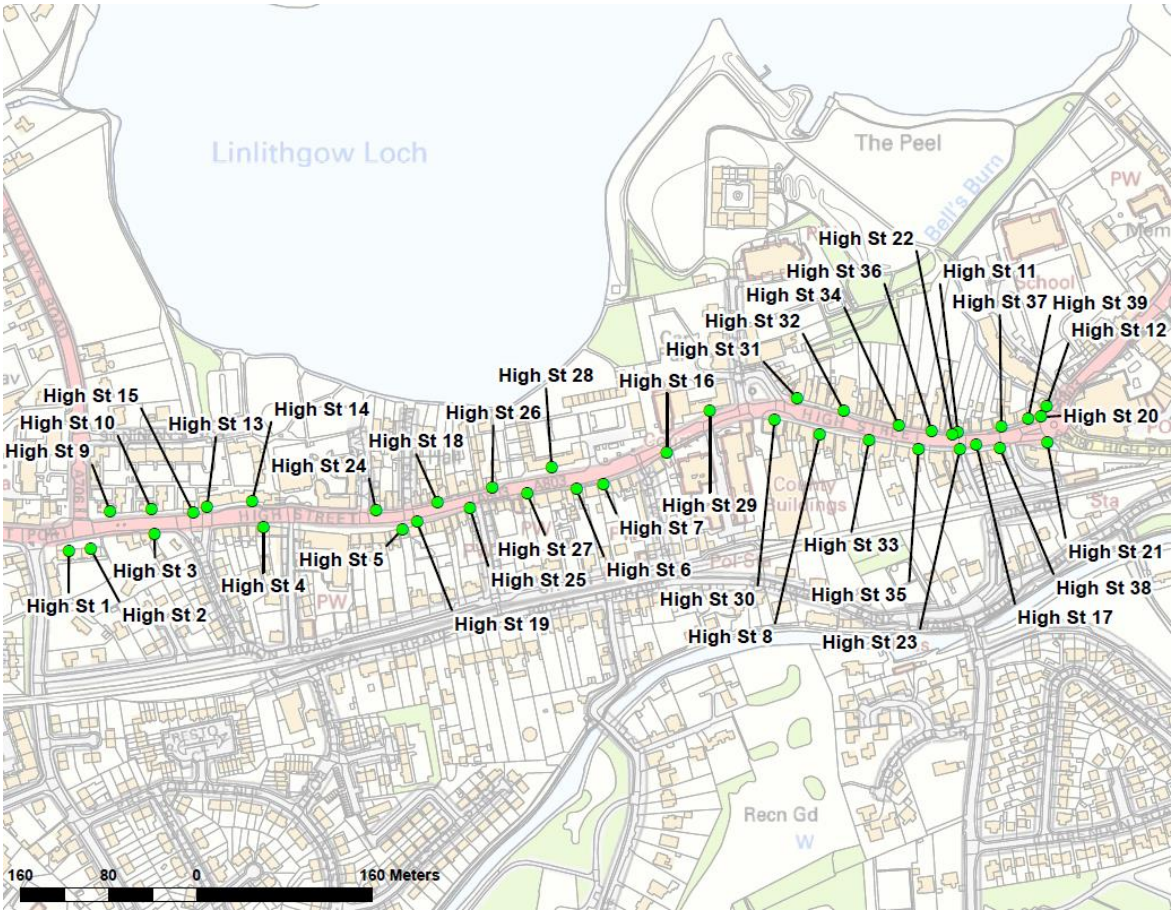


Table 3: NOx source apportionment – Contribution by vehicle type (µg.m^{-3}) (Excludes motorcycles)

Receptor location	Total NOx	Background	Road NOx	Cars	HGV Artic	HGV Rigid	Buses	LGV
High St 15	86.3	21.6	64.7	32.7	2.1	7.9	9.0	12.9
High St 16	80.2	20.6	59.7	28.6	1.7	6.7	7.5	15.1
High St 17	77.0	20.6	56.4	36.2	4.4	8.4	3.3	4.1
High St 18	74.6	21.6	53.0	27.5	1.5	5.8	6.2	11.9
High St 19	71.3	21.6	49.7	23.8	1.3	5.3	6.0	13.2
High St 22	72.7	20.6	52.2	31.5	5.0	8.7	3.3	3.5
High St 24	71.5	21.6	49.9	26.0	1.4	5.4	5.8	11.2
High St 26	74.3	21.6	52.6	27.7	1.4	5.5	5.9	12.0
High St 27	76.9	20.6	56.3	27.6	1.3	5.6	6.2	15.6
High St 36	71.7	20.6	51.1	30.9	4.9	8.5	3.3	3.5

Table 4: NOx source apportionment – Contribution by vehicle type (% of total NOx)

Receptor location	Total NOx	Background	Road NOx	Cars	HGV Artic	HGV Rigid	Buses	LGV
High St 15	100%	25.1%	74.9%	37.9%	2.5%	9.1%	10.4%	14.9%
High St 16	100%	25.6%	74.4%	35.7%	2.1%	8.4%	9.4%	18.8%
High St 17	100%	26.7%	73.3%	47.0%	5.7%	10.9%	4.3%	5.3%
High St 18	100%	29.0%	71.0%	36.9%	2.0%	7.8%	8.4%	16.0%
High St 19	100%	30.3%	69.7%	33.4%	1.8%	7.5%	8.4%	18.6%
High St 22	100%	28.3%	71.7%	43.4%	6.9%	11.9%	4.6%	4.8%
High St 24	100%	30.2%	69.8%	36.3%	1.9%	7.6%	8.2%	15.7%
High St 26	100%	29.1%	70.9%	37.3%	1.8%	7.5%	8.0%	16.2%
High St 27	100%	26.8%	73.2%	35.9%	1.6%	7.3%	8.1%	20.2%
High St 36	100%	28.7%	71.3%	43.1%	6.8%	11.9%	4.6%	4.9%

Table 5: PM_{10} source apportionment – Contribution by vehicle type (µg.m^{-3}) (Excludes motorcycles)

Receptor location	Total PM_{10}	Background	Road NOx	Cars	HGV Artic	HGV Rigid	Buses	LGV
High St 15	20.1	13.7	6.4	4.2	0.1	0.4	0.4	1.3
High St 16	20.0	13.2	6.8	4.2	0.1	0.4	0.4	1.6
High St 17	19.7	13.2	6.5	5.2	0.2	0.5	0.2	0.4
High St 18	19.9	13.7	6.1	4.1	0.1	0.4	0.3	1.3
High St 19	19.5	13.7	5.7	3.6	0.1	0.3	0.3	1.4
High St 20	18.5	13.2	5.3	4.2	0.2	0.4	0.1	0.4
High St 24	19.5	13.7	5.8	3.9	0.1	0.3	0.3	1.2
High St 25	19.7	13.7	6.0	3.8	0.1	0.4	0.3	1.4
High St 26	20.2	13.7	6.5	4.4	0.1	0.4	0.3	1.3
High St 37	20.3	13.2	7.2	4.5	0.1	0.4	0.4	1.7

Table 6: PM_{10} source apportionment – Contribution by vehicle type (% of total PM_{10})

Receptor location	Total PM_{10}	Background	Road NOx	Cars	HGV Artic	HGV Rigid	Buses	LGV
High St 15	100%	68.1%	31.9%	20.8%	0.5%	2.1%	1.9%	6.5%
High St 16	100%	66.0%	34.0%	21.3%	0.5%	2.1%	1.9%	8.1%
High St 17	100%	66.9%	33.1%	26.2%	1.1%	2.6%	0.8%	2.2%
High St 18	100%	69.1%	30.9%	20.6%	0.4%	1.9%	1.7%	6.4%
High St 19	100%	70.5%	29.5%	18.4%	0.4%	1.8%	1.6%	7.3%
High St 20	100%	71.4%	28.6%	22.5%	1.1%	2.3%	0.7%	1.9%
High St 24	100%	70.2%	29.8%	19.8%	0.4%	1.8%	1.6%	6.1%
High St 25	100%	69.6%	30.4%	19.1%	0.4%	1.8%	1.7%	7.3%
High St 26	100%	67.7%	32.3%	21.7%	0.4%	1.9%	1.7%	6.5%
High St 37	100%	64.8%	35.2%	22.3%	0.4%	2.0%	1.8%	8.6%

Figure 3: NOx source apportionment (expressed in µg.m^{-3})

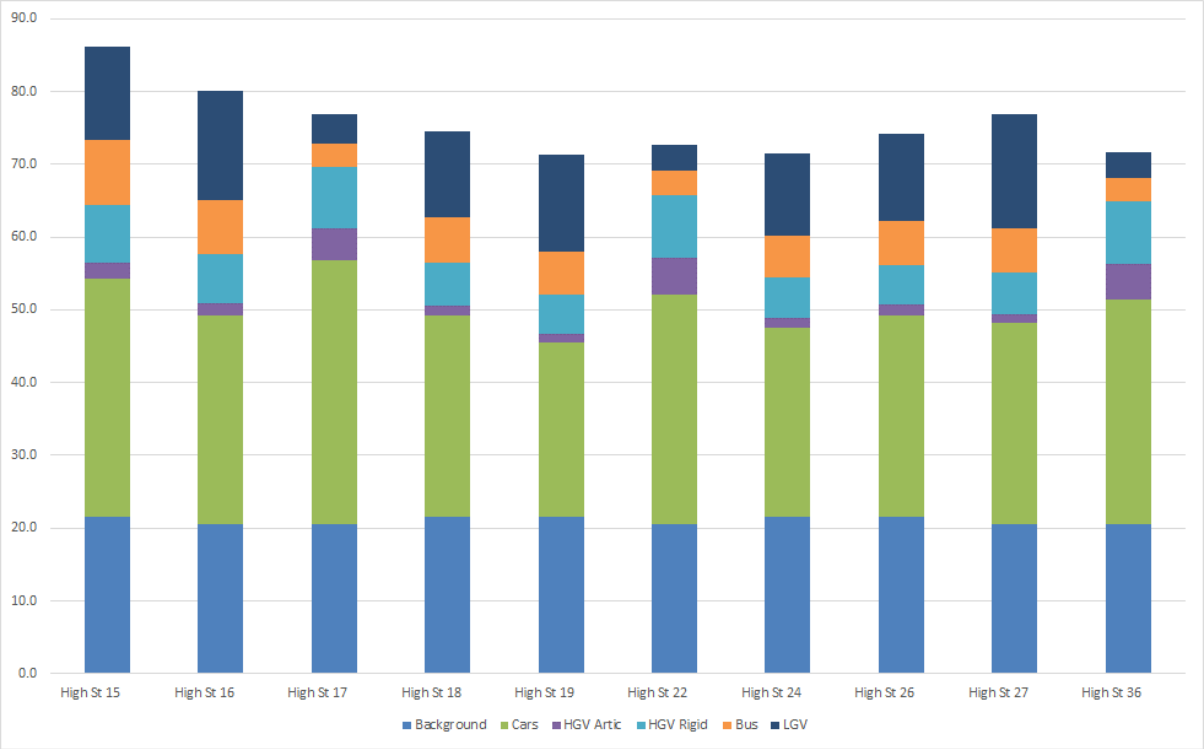


Figure 4: NOx source apportionment (expressed as a percentage)

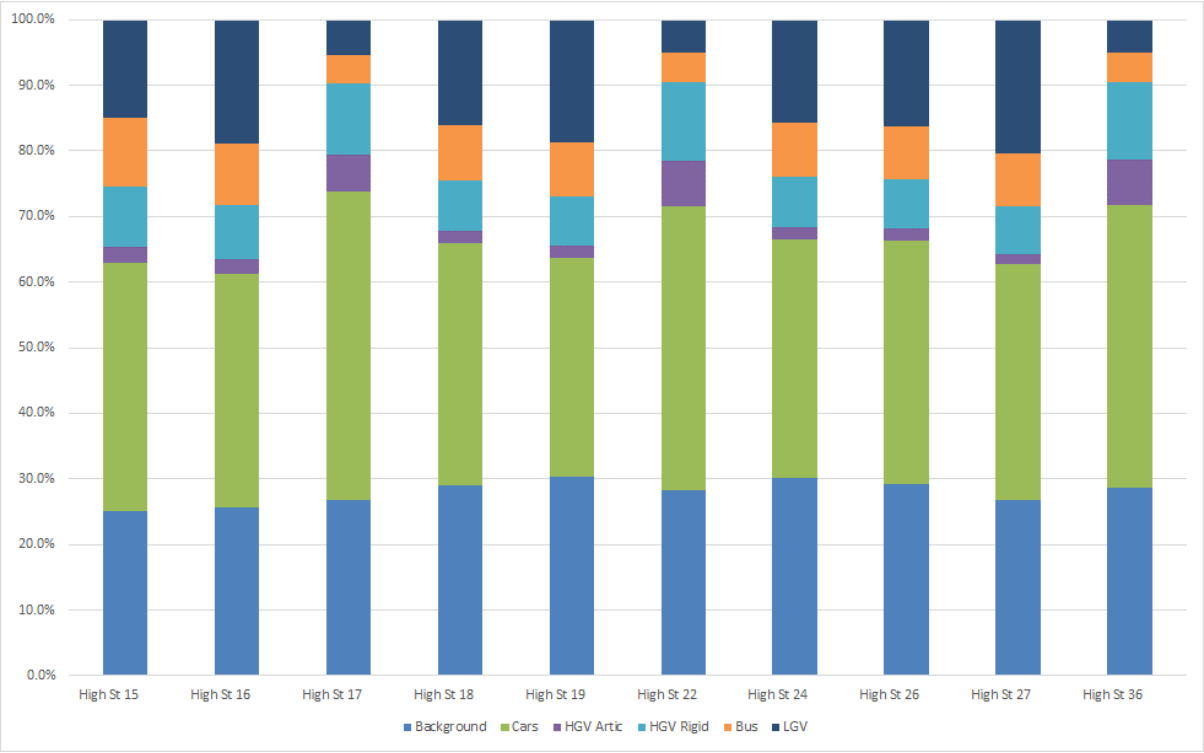


Figure 5: PM_{10} source apportionment (expressed in $\mu g.m^{-3}$)

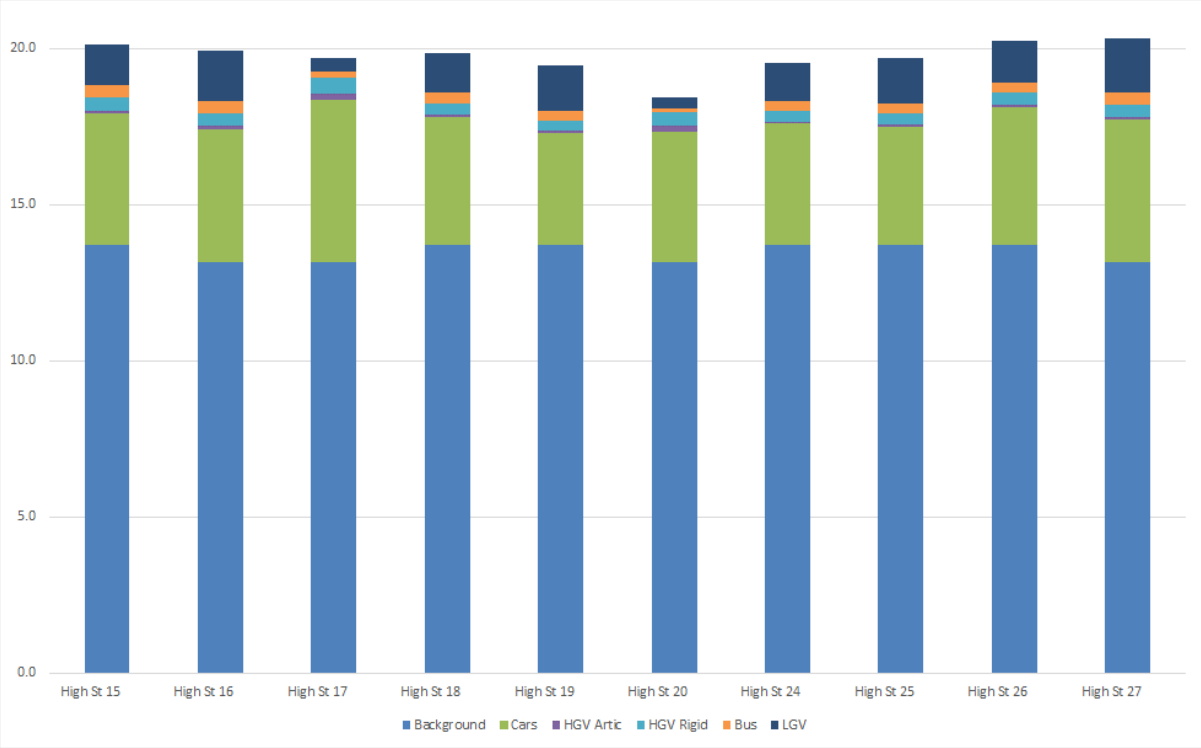
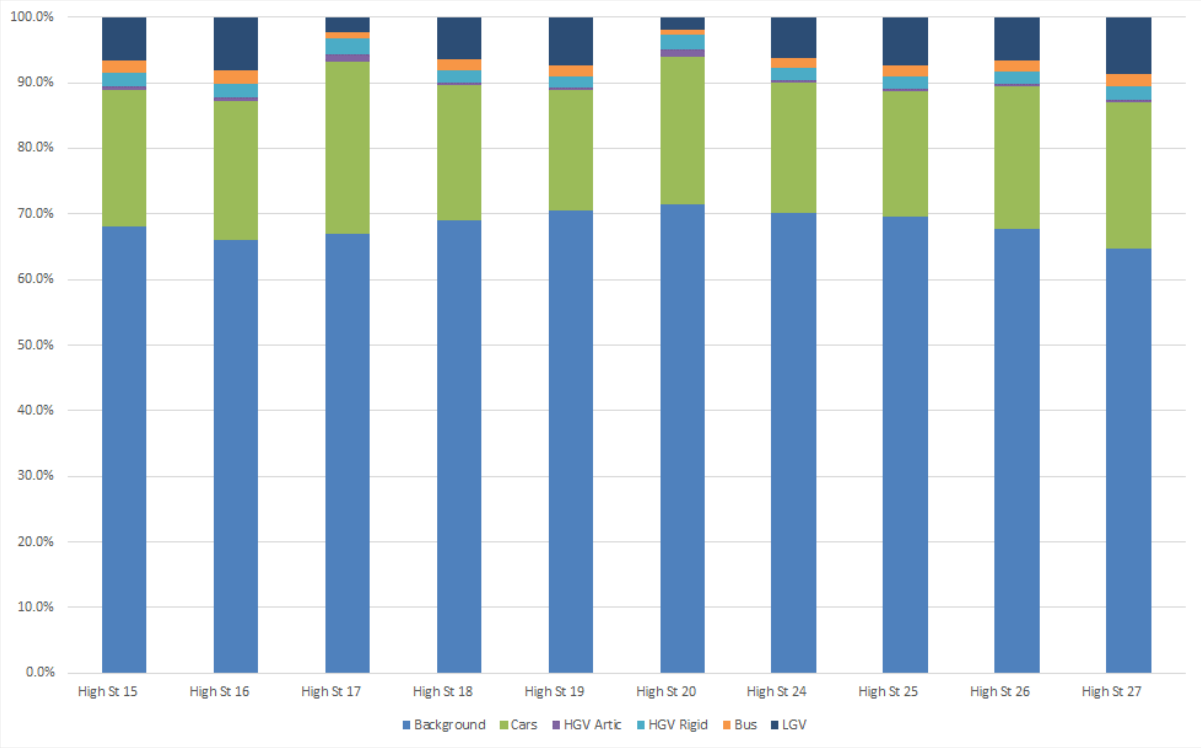


Figure 6: PM_{10} source apportionment (expressed as a percentage)



3.2.2 Conclusions of Source Apportionment

Based on the findings of the source apportionment exercise, West Lothian Council have considered measures that will target reductions in emissions from road traffic in general, but have focused on measures that target reductions in emissions from traffic queuing/ congestion. In terms of the impact of various components of the traffic fleet, it is clear that cars represent the principal source of local emissions of both NOx and PM_{10} and should be targeted by measures within the draft air quality action plan.

3.3 Scenario analysis

Additional modelling has been undertaken as part of this Air Quality Action Plan to model the potential impact of two potential scenarios (measures) to ascertain their potential impact on local concentrations of NO_2 and PM_{10} and in terms of compliance with the relevant objectives. The scenarios assessed were:

1 Change in bin lorries times to avoid peak hours and loading times restriction for deliveries. Those measures will impact traffic speed by 5 to 10%. Two scenarios will be modelled showing the reduction of speed by 5 % and 10% respectively.

2 Reduction of LGV traffic flows by 10%. This aims to demonstrate the volume of free flowing traffic will affect ambient pollutant concentrations.

These scenarios were modelled to inform future management decisions, but do not speculate on how the necessary reductions may be achieved. The scenarios were selected to obtain an indication of what impact various changes in traffic volume and queuing could have on concentrations of NO_2 and PM_{10} within High Street, Linlithgow. For scenarios 1 and 2, a range of reductions were assessed to inform the action plan. The lower reductions were included to assess the impact of what were considered to be more realistic changed in both parameters, 5% and 10% reduction in speed. It was considered that these reductions could feasibly be implemented with the appropriate considerations and therefore could be used to give an indication of what could feasibly be achieved by measures that could bring about such changes. A summary of these scenario analyses is presented below together with anticipated impacts on concentrations of NOx and PM_{10} at relevant receptors.

3.3.1 Predicted Reductions – Scenario Analysis

Scenarios 1 to 3 as detailed above, are representative of the potential impacts on traffic flow should some of the measures be implemented. To model this, a new set of emissions were derived for all modelled roads using the Emissions Factor Toolkit[8] (EfT) for each scenario. The results of these scenarios are presented in Table 7 and Table 8.

Table 7: NO_2 concentrations at receptors for the 'do-nothing' and Scenarios

Receptor location	2014 Baseline	Scenario 1 – Increase speed by 5% ($\mu g.m^{-3}$)	Scenario 2 – Increase speed by 10% ($\mu g.m^{-3}$)	Scenario 3 – Reduction of LGVs flows by 10% ($\mu g.m^{-3}$)
High St 1	26.3	26.2	26.1	26.0
High St 2	25.9	25.8	25.7	25.7
High St 3	32.8	33.1	32.9	32.9

[8] Emissions Factor Toolkit for Vehicle Emissions: http://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html#eft

Receptor location	2014 Baseline	Scenario 1 – Increase speed by 5% (µg.m^{-3})	Scenario 2 – Increase speed by 10% (µg.m^{-3})	Scenario 3 – Reduction of LGVs flows by 10% (µg.m^{-3})
High St 4	28.4	28.7	28.6	28.3
High St 5	28.6	28.5	28.2	28.4
High St 6	29.9	29.6	29.6	29.3
High St 7	28.5	28.6	28.6	28.3
High St 8	23.7	23.6	23.4	23.7
High St 9	30.3	29.7	29.6	29.5
High St 10	30.4	30.2	30.0	30.2
High St 11	33.7	34.0	33.8	34.1
High St 12	29.9	29.8	29.8	30.0
High St 13	33.8	33.4	33.3	33.2
High St 14	29.3	29.2	29.2	28.9
High St 15	**40.6**	39.8	39.6	39.5
High St 16	38.0	39.1	39.0	38.8
High St 17	37.7	37.3	36.9	37.6
High St 18	36.6	36.2	35.9	36.1
High St 19	35.3	34.9	34.6	34.8
High St 20	34.7	34.3	34.1	34.6
High St 21	33.6	33.3	33.1	33.5
High St 22	35.7	35.5	35.3	35.5
High St 23	31.2	31.0	30.8	31.1

*Values presented in bold indicate modelled exceedances of the annual mean objective.

Table 8 : PM_{10} concentrations at receptors for the 'do-nothing' and Scenarios

Receptor location	2014 Baseline	Scenario 1 – Increase speed by 5% (µg.m^{-3})	Scenario 2 – Increase speed by 10% (µg.m^{-3})	Scenario 3 – Reduction of LGVs flows by 10% (µg.m^{-3})
High St 1	16.4	16.3	16.3	16.2
High St 2	16.4	16.3	16.3	16.2
High St 3	**18.1**	**18.2**	**18.2**	**18.1**
High St 4	17.7	17.7	17.7	17.6
High St 5	17.5	17.4	17.3	17.3
High St 6	17.9	17.7	17.7	17.6
High St 7	17.4	17.4	17.4	17.3
High St 8	15.8	15.7	15.7	15.7
High St 9	17.3	17.2	17.1	17.1
High St 10	17.6	17.6	17.6	17.5
High St 11	17.8	17.9	17.9	17.9
High St 12	17.2	17.2	17.2	17.2
High St 13	**18.2**	**18.1**	**18.1**	**18.0**
High St 14	17.8	17.8	17.8	17.7

Receptor location	2014 Baseline	Scenario 1 – Increase speed by 5% (µg.m^{-3})	Scenario 2 – Increase speed by 10% (µg.m^{-3})	Scenario 3 – Reduction of LGVs flows by 10% (µg.m^{-3})
High St 15	**19.9**	**19.6**	**19.6**	**19.5**
High St 16	**19.6**	**19.8**	**19.8**	**19.7**
High St 17	**19.6**	**19.4**	**19.4**	**19.4**
High St 18	**19.7**	**19.6**	**19.6**	**19.5**
High St 19	**19.2**	**19.1**	**19.1**	**19.0**
High St 20	**18.4**	**18.3**	**18.3**	**18.3**
High St 21	**18.2**	**18.0**	**18.0**	**18.0**
High St 22	**18.2**	**18.2**	**18.2**	**18.2**
High St 23	17.4	17.3	17.3	17.3

*Values presented in bold indicate modelled exceedances of the annual mean objective.

The greatest reduction in concentrations for both annual mean NO_2 and PM_{10} are seen under Scenario 3 which was representative of a 10% reduction of Light Good Vehicle numbers.

Scenario 1 and 2 considered the potential air quality benefit as a result of an increase in speed. ie if the flow of traffic was smoother with less queuing. The air quality benefit is the same at each location under each scenario.

The results indicate that none of the scenarios considered in isolation would results in the PM_{10} annual mean objective being met, based on the 2014 baseline conditions. Therefore, a combination of scenarios may be required to address compliance with the PM_{10} objective.

4 Development of the Action Plan

This section reports on how the Action Plan has been developed to date.

4.1 Formation of Action Planning Steering Group

The development of the Action Plan began with an inception meeting, which was attended by a number of Local Authority officers. These officers have guided and been consulted on the development of the Action Plan. In this way, the Action Plan has been influenced by their local knowledge and area of responsibility.

This steering group comprises:

- David Brewster, Senior Environmental Health Officer, West Lothian Council
- Paul Couper, Environmental Health Officer, West Lothian Council
- Sarah Gillespie, Technical Officer, West Lothian Council
- Tom Burr, Vehicle Emissions Officer, West Lothian Council
- Stewart Ness, Tourism and Town Centre Officer, West Lothian Council
- Gordon Brown, Senior Engineer, West Lothian Council
- Chris Alcorn, Principal Planner, West Lothian Council
- Chris Nicol, Engineer, West Lothian Council
- Desmond Bradley, Transport Integration Manager, Scotrail
- Deborah Paton, Policy Officer, West Lothian Council
- John Lamb, Local Air Quality Management Specialist, SEPA

The steering group was formed to provide an appropriate forum for developing the Air Quality Action Plan. The composition of the group was carefully considered to include representatives from relevant Local Authority Services and representatives from external organisations with an interest in air quality and who may have an influence on the measures being considered within the draft plan.

4.2 Action plan Development Process

Throughout the action planning process, the guidance outlined in LAQM TG (16) has been followed. LAQM TG (16) outlines the key requirements for the development of an effective Action Plan:

- Develop the AQAP in stages
- Undertake appropriate local monitoring and assessment (source apportionment)
- Decide what levels of actions are required
- Establish links with other key policy areas/strategies
- Undertake measures selection and impact assessment
- Agree monitoring and evaluation of success

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5 Action Plan Options and Assessment

During the development of the Action Plan, the steering group has considered a full range of relevant options aimed at reducing ambient pollutant concentrations within the designated AQMA. The process has consisted of a gradual refinement of the range of potential options under consideration, to enable the focus to be centred on measures that directly address the principal problem (road traffic emissions), are feasible and cost-effective compared to others.

As a result of continuing discussions and considerations of the steering group, some options have been amalgamated with other options, and going forward, further changes may also result from the forthcoming wider consultation process. This section describes how this was achieved and outlines some of the considerations of the steering group.

5.1 Initial Assessment of Options

This section reports on the work undertaken to consider the full range of Air Quality Action Plan options available in line with the requirements outlined in LAQM.PG(S) (16), to enable the identification of feasible and effective measures that can be developed in the Action Plan.

5.1.1 Range of Possible Options

The Policy Guidance LAQM.PG(S) (16) states that Air Quality Action Plans must focus on 'effective, feasible, proportionate and quantifiable measures' and provide 'evidence that all available options have been considered on the grounds of cost effectiveness and feasibility'.

A wide range of potential options may be available to West Lothian Council and other stakeholders to improve local air quality within the Linlithgow AQMA. Therefore, at the onset of the action planning process it is appropriate to consider all potential options. The identification of potential measures for the consideration of the Steering Group was undertaken through a review of existing local and regional plans, consideration of measures referenced in LAQM.PG(S) (16) and relevant guidance documents as well as recommendations of members of the Steering Group. Whilst West Lothian Council may not have the necessary powers to implement all such options, they may work with, or encourage other organisations and agencies that have the capacity to take such options forward.

Table 9: Potential Options to Improve Air Quality within the Linlithgow AQMA

Type	Description	Notes
1	Strategic measures	Road transport emissions constitute a significant source of air pollution across the UK, and have contributed to the declaration of numerous Air Quality Management Areas. Due to the prevalence of road transport, a local long-term strategy is required to bring about a progressive reduction in emissions from the road transport sector in future years and encourage improvements in local air quality as a result. Furthermore, in Scotland, a more stringent annual mean objective for PM_{10} is in place. Consequently, background concentrations of particulate matter make a significant contribution to local PM_{10} concentrations. A long-term strategy aimed at reducing concentrations from these sources might include:

		• Building the capacity to better assess and manage the environmental impacts from road transport. • Specific commitments or targets within local development and transport planning policy to significantly reduce the impacts of new development. • Liaising with the Scottish Government to encourage the consideration/ implementation of national actions to reduce background concentrations of PM_{10} in Scotland, including contributions from other parts of the EU. Undertaking more detailed 'feasibility assessments' of complex actions or measures that would otherwise be eliminated from consideration.
2	Move sources away from the AQMA	Road transport emissions have been shown to represent the principal source of NO_x within the AQMA and make a significant contribution to local PM_{10} concentrations. The construction of new roads could divert traffic away from the roads in the AQMA. Less traffic on these roads results in lower pollution levels in the AQMA. However, the opportunity to build such roads is frequently absent. In cases where such roads can be built, care needs to be exercised that the locations where the new roads are built do not become AQMAs in turn. Alternative new roads are proposed associated with planned development in the area. **Note that this option moves emissions from one location to another with no requirement to reduce them. Overall emissions may be increased by such actions.**
3	Traffic Management – optimisation of traffic movement through AQMA	Changes in how the roads in the AQMA are signed or otherwise managed may reduce emissions from road transport a) by diverting some traffic onto better routes for them, or b) by reducing congestion/ stationary traffic. **Note that the opportunity to take such action is frequently limited.**
4	Reduce emissions from sources by technical means	Most vehicles using roads in the AQMA are conventional petrol or diesel-powered vehicles with a range of ages. There are many technical options to convert such vehicles into ones using cleaner engine and fuel technology. By accelerating the uptake of these technologies, the emissions in the AQMAs would be reduced. **Note that technology does not always work in a positive sense for all emissions. They sometimes trade benefits for one pollutant against negative aspects for another one.**
5	Reduce emissions from sources by reducing the demand for travel or achieving better travel choices	An important way to reduce emissions from transport is to reduce the number of journeys made through the AQMA. This could be achieved either through reducing the need to make some journeys, or by ensuring that these journeys are made via a less polluting form of transport. The success of such measures depends on policies that influence how people make travel choices. Note that there is increasing emphasis placed on such policies and that they work holistically by reducing emissions of all pollutants and greenhouse gases.

6	Other	May include a variety of measures e.g. targeting reduced emissions from domestic sources, industry or statutory nuisance.

5.2 Initial responses to the options

For each of the provisional options considered by the Steering Group, a decision has been made to eliminate several options from further consideration, or to consider the option further. This decision has been made with reference to:

1. Comments received from the steering group
2. The conclusions from the source apportionment exercise presented in Chapter 3

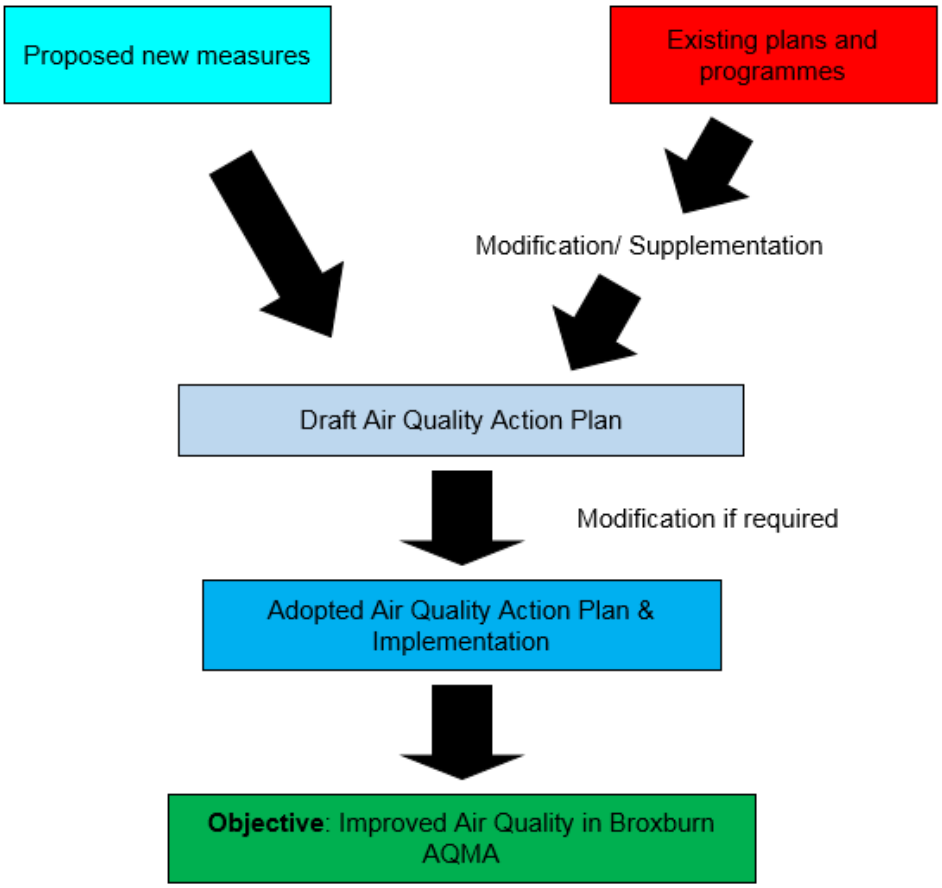
Taking into consideration the situation in the Linlithgow AQMA, the findings of the source apportionment exercise (Section 3) and existing Council Policy, several of the measures included within the provisional list of measures were eliminated from further consideration at this time. These measures are presented in

Table 10: Options eliminated from further consideration in the Linlithgow AQMA

Traffic management
Build Edinburgh Road car park

The measures listed in Table 10 have been excluded from further consideration at this time as it was considered to encourage more car usage and therefore wouldn't lead to a reduction in air pollution. West Lothian Council intends to consider and further develop all of the remaining measures for inclusion within the Air Quality Action Plan. These measures include several new measures that require to be developed further prior to implementation. Also included are numerous measures that are in the process of being implemented by West Lothian Council but which may require some modification or supplementation in order to make a more significant contribution to improving local air quality in the Linlithgow AQMA and also meet future reporting requirements.

Figure 7: Overview of measures included within the Action Plan



A summary of the remaining new measures proposed for inclusion in the Action Plan are presented in Table 11.

Table 11: Measures selected for inclusion in the Linlithgow AQAP

1. Strategic Measures
Liaise with the Scottish Government regarding the consideration of National Measures to Reduce Background Concentrations of PM
Liaise with the Scottish Government regarding National Air Quality Policy
Create Supplementary Planning Guidance on Air Quality
2. Move traffic away from the AQMA
Investigate Southern Distributor Link Road
Investigate Edinburgh Road to Manse Road Link Road
Investigate Park and Ride Facility
Investigate West Access Slip Road at M9 Junction 3
Investigate High Street Vehicle Movement Restriction

3. Traffic Management – optimisation of traffic movement through the AQMA
Investigate Incorporation of National Low Emissions Framework and consideration of Low Emission Zone of High Street
Investigate Bus Stop Relocation
Idling Campaign and Enforcement of Idling with Fixed Penalty Notices
Investigate Decriminalise Parking in West Lothian and Introduce High Street Parking Charges and Enforcement
Review of West Lothian and Private Sector Delivery/Refuse Vehicle Timings and High Street Road Markings
Review Timings at Junctions
4. Reduce the emissions from source
Investigate Local Bus/Fleet Improvements
School Travel Plans
Implement ECOStars Scheme for HGV and Bus Operators
5. Better travel choices/ behavioural change
Install Electric Vehicle Charging Park Places
Introduce Car Club
Active Travel and Cycling Infrastructure
Provision of Air Quality Information
Review WLC Staff Travel Plan
6. Reduce emissions from non-transport sources
Create a Smoke Control Area
7. Other
Review Pedestrian Crossings
Increase Monitoring Network
Investigate Greening the Area with Trees

5.3 Strategic measures

It is important that Air Quality Action Plans support and consider existing and or forthcoming transport and development plans, and vice versa. Therefore, some integration of the AQAP with the current and any future local transport strategy and the local development plan is considered essential and represents a strategic and integrated approach to local air quality management.

5.3.1 Liaise with the Scottish Government Regarding the Consideration of National Measures to Reduce Background Concentrations of PM

The source apportionment study undertaken as part of the further assessment identified that background sources make a significant contribution to local concentrations of PM_{10}. Background sources of particulate matter include a wide range of natural and man-made processes including industry, residential and commercial combustion and transport sources. However, local authorities have very limited opportunities to address background concentrations of pollutants and instead must rely on regional and national measures to address these and contribute to improving local concentrations.

West Lothian Council proposes to liaise with the Scottish Government regarding the consideration and adoption of new measures that will contribute to reducing background concentrations of PM and other pollutants.

Measure	Title
1	Liaise with the Scottish Government Regarding the Consideration of National Measures to Reduce Background Concentrations of PM

Definition	Key Intervention
Maintain contact with the Scottish Government regarding the adoption of national measures to reduce background concentrations of PM	Increase focus on background concentrations of PM and encourage national action
Responsible authority and other partners	**Powers to be used**
West Lothian Council • Planning and Economic Development	Voluntary

5.3.2 Liaise with Scottish Government Regarding National Air Quality Policy

Measure	Title
2	Liaise with Scottish Government Regarding National Air Quality Policy

Definition	Key Intervention
Maintain contact with the Scottish Government regarding the adoption of national air quality measures	Increase focus on background concentrations of PM and encourage national action
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Planning and Economic Development	Voluntary

5.3.3 Create Supplementary Planning Guidance for Air Quality

This measure is intended to develop and adopt a West Lothian Council Air Quality and Development Guidance note for developers, followed by the development and adoption of Supplementary Planning Guidance. The Council propose a 2-stage approach to the development of such guidance as it recognises that the adoption of formal planning guidance in relation to air quality may take some time to be developed and adopted. The intention to provide a guidance note will outline the potential requirement to undertake an Air Quality Impact Assessment for certain developments and the required content of such assessments. The guidance should enable a consistent approach to air quality impact assessment to be adopted in the Council and minimise the potential effects of future development on air quality across West Lothian.

Measure	Title
3	Create Supplementary Planning Guidance for Air Quality

Definition	Key Intervention
a. Develop and adopt supplementary planning guidance relating to air quality	Local planning considerations aim to mitigate the cumulative negative air quality impacts of new development
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Planning and Economic Development	Voluntary

5.4 Move traffic away from the AQMA

These measures are intended to avoid or divert traffic away from Linlithgow High Street. Ideally West Lothian Council would like to see an increase in active travel and a reduction in number of cars, however, not all car users and car trips will be able to use an alternative method of travel. These

measures will need to be investigated to find out the likely air quality benefit before they can be taken forward.

5.4.1 Investigate Southern Distributor Link Road

Measure	Title
4	Southern Distributor Link Road

Definition	Key Intervention
a. Carry out feasibility study b. Seek planning permission c. Seek funding d. Implementation of option	Reduce potential commuting road traffic through AQMA
Responsible authority and other partners	**Powers to be used**
West Lothian Council • Roads and Transportation	Voluntary and Formal

5.4.2 Investigate Edinburgh Road to Manse Road Link Road

Measure	Title
5	Edinburgh Road to Manse Road Link Road

Definition	Key Intervention
a. Carry out feasibility study b. Seek planning permission c. Seek funding d. Implementation of option	Reduce potential commuting road traffic through AQMA
Responsible authority and other partners	**Powers to be used**
West Lothian Council • Roads and Transportation	Voluntary and Formal

5.4.3 Investigate Park and Ride Facility

Park and Ride (long distance and into town centre).

Measure	Title
6	Park and Ride Facility

Definition	Key Intervention
a. Review previous feasibility study for Park and Ride facility b. Seek funding and planning permission if still applicable c. Implementation of option if deemed appropriate	Reduce air pollution emissions from moving traffic
Responsible authority and other partners	**Powers to be used**
West Lothian Council • Roads and Transportation	Voluntary and Formal

5.4.4 Investigate West Access Slip Road at M9 Junction 3

Measure	Title
7	West Access Slip Road at M9 Junction 3

Definition	Key Intervention
a. Carry out feasibility study into West Access Slip Road at M9 Junction 3 b. Seek Agreement with Falkirk Council on project c. Seek Planning Permission for project d. Implementation of option	Reduce potential commuting road traffic through AQMA
Responsible authority and other partners	**Powers to be used**
West Lothian Council	Voluntary and Formal

• Roads and Transportation	

5.4.5 Investigate High Street Vehicle Movement Restrictions

Measure	Title
8	High Street Vehicle Movement Restrictions
Definition	**Key Intervention**
a. Carry out feasibility study into High Street movement restrictions b. If appropriate, seek powers and funding to restrict some vehicle movement in high street c. Vehicle movement restriction powers granted	Reduce air pollution emissions from moving traffic
Responsible authority and other partners	**Powers to be used**
West Lothian Council • Roads and Transportation	Voluntary and Formal

5.5 Traffic Management

The National Low Emissions Framework (NLEF) is a transport-focused science-led, evidence based appraisal process to enable local authorities to justify the business case for, and implement, a range of air quality improvement options related to transport. Low Emission Zones (LEZs) set minimum emission standards for access to a defined area. The investigation of this measure is intended to look at the highest polluting vehicles that enter the high street.

5.5.1 Investigation of National Low Emissions Framework (NLEF) and consideration of Low Emission Zone of High Street

Measure	Title
9	Investigation of NLEF and LEZ of High Street
Definition	**Key Intervention**
a. Carry out feasibility study into NLEF and LEZ of High Street b. Implementation of option – if deemed appropriate.	Reduce air pollution emissions from moving traffic
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Roads and Transportation • Environmental Health	Voluntary

5.5.2 Investigate Bus Stop Relocation

Measure	Title
10	Bus Stop Relocation
Definition	**Key Intervention**
a. Review current locations for bus stops and bus routes and assess relocation needs b. Implementation of option – if deemed appropriate.	Reduce air pollution emission from stationary traffic
Responsible authority and other partners	**Powers to be used**
West Lothian Council: Roads and Transportation	Voluntary

5.5.3 Idling Campaign and Enforcement of Idling with Fixed Penalty Notices

West Lothian Council intends to raise awareness of vehicle idling enforcement. The Road Traffic (Vehicle Emissions) (Fixed Penalty) (Scotland) Regulations 2003 empower Councils to appoint officers who can request drivers of stationary vehicles to switch off engines being run unnecessarily

and issue fixed penalties of £20 to drivers who fail to co-operate. West Lothian Council propose to investigate adopting these powers and use the mechanism to not only tackle emissions of air quality pollutants from stationary vehicles, but also to raise awareness of air pollution generally. West Lothian Council is already in an idling vehicle campaign, being a key partner in the drive to reduce vehicle emissions' campaign. The campaign, carried out by the East Central Scotland Vehicle Emissions Partnership which is hosted and managed by West Lothian Council also includes East Lothian, and Midlothian Councils and is aimed at tackling drivers' attitudes to harmful emissions and rising fuel costs.

The Campaign operates a system whereby if members of the public witness a vehicle idling (approx. 3 minutes or over) they can call an **idling/smoky hotline** leaving the date, time, location and vehicle registration number on **01845 451888**. Members of the public can also leave this information or information on vehicles which are producing excessive exhaust smoke, on a form which can be found on the website "switchoffandbreathe.org".

Measure	**Title**
11	Idling Campaign and Enforcement of idling with Fixed Penalty Notices
Definition	**Key Intervention**
a. Seek the powers to undertake idling vehicle enforcement b. Use vehicle emission testing and idling enforcement work to raise public awareness of air pollution	Reduce emissions from stationary and moving vehicles within West Lothian, and increase awareness of air pollution problems
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Planning and Economic Development East Central Scotland Vehicle Emissions Partnership Police Scotland	Voluntary and enforcement The Road Traffic (Vehicle Emissions) (Fixed Penalty) (Scotland) Regulations 2003

5.5.4 Investigate Decriminalise Parking in West Lothian and Introduce High Street parking charges and Enforcement

Parking across West Lothian is currently enforced by Police Scotland. However, due to competing priorities and resources there has been little enforcement of parking in Linlithgow High Street and across West Lothian. This measure intends to move enforcement from Police Scotland to West Lothian Council. There may be potential for further enforcement of parking restrictions that are currently in place and the introduction/replacement of these parking restrictions.

Measure	**Title**
12	Decriminalise Parking in West Lothian and Introduce High Street Parking Charges and Enforcement
Definition	**Key Intervention**
a. Review current parking and enforcement arrangements b. Undertake feasibility study c. Seek the powers to decriminalise parking in West Lothian d. Seek enforcement tools to ensure parking arrangements are enforced e. Implementation of option – if deemed appropriate.	Reduce air pollution emissions from slow moving vehicles due to parking
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Roads and Transportation	Voluntary and enforcement

5.5.5 Review of West Lothian and Private Sector Delivery/Refuse Vehicle Timings and High Street Road Markings

Measure	**Title**
13	Review of West Lothian and Private Sector Delivery/Refuse Vehicle Timings and High Street Road Markings

Definition	Key Intervention
a. Review current bin lorry timings in Linlithgow High Street b. Review current loading arrangements and potentially place new loading time restrictions on deliveries etc. c. Review road marking on High Street d. Implementation of change – if deemed appropriate.	Try to ensure off-peak bin lorry pick up's Traffic control and management to ensure smooth flow
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Fleet Services • Environmental Health • Town Centre Management • Roads and Transportation	Voluntary and enforcement

5.5.6 Review Timings at Junctions

In order to alleviate traffic queuing, the steering group has decided that it is an essential requirement for the air quality action plan to investigate options to optimise traffic light phasing within the AQMA and surrounding network to ensure that the changes will not simply result in moving the problem from one area to another part of Linlithgow. Furthermore, the steering group considered that it may be beneficial to investigate mechanisms by which traffic signalling can be altered in response to elevated levels of NOx and PM_{10}, and that this option will be included in the initial feasibility stage assessment.

Measure	Title
14	Review Timings at Junctions
Definition	**Key Intervention**
a. Assessment of options to optimise traffic signal phasing within the AQMA and reduce local traffic-based emissions of air pollutants. b. Implementation of identified traffic management option – following feasibility stage.	Reduced traffic queuing and emissions within the AQMA with the intention of reducing local ambient concentrations of NO_2 and PM_{10}.
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Roads and Transportation	Voluntary

5.6 Reduce the emissions from the source

5.6.1 Local Bus and Fleet Improvements

Bus operators, Local business, West Lothian Council fleet

Measure	Title
15	Investigation of Local Bus and Fleet Improvements
Definition	**Key Intervention**
a. Development of a Local/ Voluntary Bus Quality Partnership b. Encourage Private and public operators to pursue cleaner vehicles and abatement • Bus operators • Local business • WLC fleet c. TG.16 Public transport improvements, potential for 'cleaner' buses and better euro standards d. Look at publicity for town bus service and potentially increase routes if feasable	Increase usage of bus service and move away from use of cars. Improve fleet standards.

Responsible authority and other partners	Powers to be used
West Lothian Council: • Roads and Transportation • Environmental Health	Voluntary

5.6.2 School Travel Plans

A School Travel Plan is package of measures aimed at helping improve the school run, reduce congestion and increase road safety, make school and pupils healthier, make routes to school as safe as possible and look after our environment.

Measure	Title
16	School Travel Plans
Definition	**Key Intervention**
a. Review current school travel plans b. Update or implement school travel plans in Linlithgow if deemed appropriate	Encourage increased active travel to and from school
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Education Services • Roads and Transportation	Voluntary

5.6.3 Implement ECOStars Scheme for HGV and Bus Operators

ECOStars is a voluntary scheme that provides recognition and guidance on environmental best practice to operators of good vehicles, buses and coaches whose fleets regularly serve within a Council area.

ECOStars rates individual vehicles and the overall operation of a vehicle fleet, using a star rating system, to recognise levels of operational and environmental performance. It aims to reduce the energy used by commercial and passenger transport fleets by encouraging increased adoption of fuel efficiency measures. This will bring about benefits for members through more efficient operations, reduced fuel costs and emissions.

Measure	Title
17	Implement ECOStars Scheme for HGV and Bus Operators
Definition	**Key Intervention**
a. Contact Eco Stars regarding feasibility of setting up a local scheme b. Secure funding c. Deliver Scheme d. Consider extending scheme to Private Hire Taxi's	Encourage commercial fleet operators to run their vehicles more efficiently, reducing their fuel consumption, which in turn will reduce vehicle carbon, nitrogen oxides (NOx) and particulate matter (PM) emissions.
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Operational Services • Planning and Economic Development ECO Stars Fleet Operators	Voluntary

5.7 Reduce emissions by reducing demand for traffic, change in travel choice

5.7.1 Electric Vehicle Charging Points

West Lothian Councils Climate Change Unit have successfully secured funds to install charging points in the Council area. There is a plan to add charging units in the future. West Lothian Council have adopted new engine and low emission technologies in council fleet vehicles and currently there are a number of electric vehicle charging points at council buildings.

Measure	**Title**
18	Electric Vehicle Charging Points
Definition	**Key Intervention**
Promote installation of electric vehicle charging points through secured funding and private investment.	Reduce vehicle emissions through increasing electric vehicle fleet.
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Planning and Economic Development • Operational Services Private providers	Voluntary

5.7.2 Introduce Car Club

A car club gives people the choice of a fleet of vehicles in their local area and access to a car when they require, but without the burden of the fixed costs of vehicle ownership. Car club schemes tend to reduce the number of journey trips and reduce emissions. Commercially based car clubs operate in many urban areas and numerous community based clubs are run on a social enterprise basis.

Measure	**Title**
19	Introduce Car Club
Definition	**Key Intervention**
a. Undertake feasibility study to introduce a car club in Linlithgow b. Implementation of option – if deemed appropriate.	Reduce number of vehicles in Linlithgow
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Fleet Services	Voluntary

5.7.3 Active Travel and Cycling Infrastructure

Active travel is primarily defined as making journeys by walking, cycling and scooting. It can also include horse-riding and even running and non-motorised water-based transport. It is an approach to travel and transport that focuses on physical activity as opposed to motorised means. An example of a recent measure that West Lothian Council has introduced is the Linlithgow Leisure Centre and Linlithgow Academy / schools on Preston Road – Canal Towpath ramps. Linlithgow also currently has an active travel map which can be found here:

http://transitionlinlithgow.weebly.com/uploads/8/2/7/7/82770112/townmap-web-100dpi.jpg

Measure	**Title**
20	Active Travel and Cycling Infrastructure
Definition	**Key Intervention**
a. Finalise Local Active Travel Network Plan for Linlithgow b. Undertake feasibility study on measures included in LATNP for Linlithgow c. Implement active travel and cycling infrastructure measures	Uptake of less polluting forms of transport

Responsible authority and other partners	Powers to be used
West Lothian Council: • Roads and Transportation	Voluntary

5.7.4 Provision of Air Quality Information

The Linlithgow AQMA steering group recognises that behavioural changes form a key component of the long-term plan to improve air quality and health within Linlithgow and West Lothian generally. In order to get public buy in to improving the situation, it is crucial that the public is informed and aware of the problem and its nature. West Lothian Council operates an extensive air quality monitoring network, with data from several of these monitoring sites made available to the public through the Scottish Air Quality Database and website[9]. In addition, the most recent air quality management reports prepared by the Council are available through the Council website[10]. However, the Council propose to investigate ways in which the visibility of air pollution as a local problem can be raised within the local authority area.

In order to continue to raise the profile of Air Quality Management across West Lothian, the Council propose to undertake a public awareness exercise aimed at improving awareness of local air quality issues and encouraging members of the public to participate in improving local air quality.

Measure	Title
21	Provision of Air Quality Information
Definition	**Key Intervention**
a. Continue to make information relating to local air quality management available through the Council website. b. Undertake a publicity campaign to raise awareness of the Linlithgow AQMA.	To increase awareness of local air quality issues and encourage changes in behaviour that will contribute
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Planning and Economic Development Scottish Government East Central Scotland Vehicle Emissions Partnership	Voluntary

5.7.5 Review West Lothian Council Staff Travel Plan

Measure	Title
22	Review West Lothian Council Staff Travel Plan
Definition	**Key Intervention**
a. Carry out review of West Lothian Council's Staff Travel Plan to ensure that all available opportunities to reduce air pollution have been considered b. Consider recommendations to West Lothian Council's Staff Travel Plan c. Implement recommendations	Eliminate unnecessary travel by council fleet
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Corporate Services	Voluntary

[9] http://www.scottishairquality.co.uk/index.php

[10] http://westlothian.gov.uk/law-licensing/1101/airquality2/

5.8 Reduction from non-transport sources

5.8.1 Create a Smoke Control Area

Smoke Control Areas were first introduced to prevent the continuation of the smogs of the 1960s and earlier. They are intended to limit smoke from homes and businesses by setting standards for fires using a chimney. Smoke Control Areas do not prevent burning or bonfires. West Lothian Council will aim to carry out a study to look at the potential benefits of declaring a smoke control area and implement if deemed appropriate.

Measure	**Title**	
23	Create a smoke control area	
Definition		**Key Intervention**
a. Review current background pollution levels and undertake study on creation of smoke control area b. Implementation of option – if deemed appropriate.		Reduce background pollution levels
Responsible authority and other partners		**Powers to be used**
West Lothian Council: • Environmental Health		Voluntary

5.9 Other

5.9.1 Review Pedestrian Crossings

During the development of the action plan, the steering group examined examples of good practice adopted by other Scottish Local Authorities in term of air quality action planning. Following this, the Linlithgow AQMA steering group have identified that it may be beneficial to local air quality to examine the options for moving some of the pedestrian crossings within the AQMA to areas where emissions from queuing traffic could be dispersed more readily, and to help control traffic flow through the AQMA.

Measure	**Title**	
24	Review Pedestrian Crossings	
Definition		**Key Intervention**
a. Undertake study to assess the potential for changes to pedestrian crossing location and timings b. Implementation of option – if deemed appropriate.		Reduce waiting times in key locations
Responsible authority and other partners		**Powers to be used**
West Lothian Council: • Road and Transportation Services		Voluntary

5.9.2 Increase Monitoring Network

- Establish $PM_{2.5}$ monitoring within AQMA, possibly relocate site
- Additional diffusion tube monitoring
- Background monitoring to validate background concentrations

Measure	**Title**	
25	Increase Monitoring Network	
Definition		**Key Intervention**
a. Review current monitoring network and assess opportunity to increase monitoring of key pollutants		Increase accuracy of modelling

b. Implementation of option – if deemed appropriate.	data
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Environmental Health	Voluntary

5.9.3 Investigate Greening the Area with Trees

There is evidence that urban trees remove large amounts of air pollution and improve urban air quality.

Research in recent years has begun to identify how urban greening, and tree planting, might be tailored to achieve air quality goals whilst fulfilling many of the other beneficial functions of urban green space. Not all vegetation positioning yields an equal pollutant removal potential. Local airflows and pollutant concentrations will significantly affect the efficiency with which vegetation can remove pollution. West Lothian Council aims to increase the "greening" of Linlithgow if it is deemed to show benefits in terms of air quality.

Measure	**Title**
26	Investigate Greening the Area with Trees
Definition	**Key Intervention**
a. Assess opportunity to plant trees along the High Street and undertake feasibility study on air pollution benefits b. Implementation of option – if deemed appropriate.	Reduce emissions through intercepting airborne particles
Responsible authority and other partners	**Powers to be used**
West Lothian Council: • Nets • Road and Transportation Services	Voluntary

6 Methodology Utilised to Assess Shortlisted Measures

In accordance with the government guidance, the measures short-listed for inclusion within the action plan have been assessed against a wide range of criteria in order to assess their suitability for inclusion within the plan and enable suitable measures to be prioritised. At this stage, a number of measures are still in development, and it is likely that as these measures are further defined their contribution to the plan will require to be assessed in further detail. The criteria against which options were assessed were:

1. Potential air quality impact;
2. Implementation costs;
3. Cost-effectiveness;
4. Potential co-environmental benefits, risk factors, social impacts and economic impacts;
5. Feasibility and Acceptability.

The following paragraphs outline how the assessment has been undertaken.

6.1 Potential Air Quality Impact

This is a key assessment in that the AQAP must focus on prioritising options that improve air quality most effectively. The assessment is complex in that the detailed assessment of any given option could normally be subject to a study of its own requiring significant resources.

A semi-quantitative assessment relying on a level of judgement has been adopted. The method used is outlined below:

1. The description of the option and the proposed change to be brought about by the option is used alongside the source apportionment analysis (Chapter 3) to define what proportion of road transport emissions would potentially be affected by the option.
2. A view is then expressed on how much of the traffic would actually be changed by the option.
3. The proportion of emissions potentially affected by the option and the view on how far they could be changed by the option are combined to express a view on how much transport emissions may be reduced in the AQMA due to the option.
4. A view is then expressed on how significant this change in emissions would be in terms of making progress towards the air quality standard in the AQMA.

For the purpose of the AQ assessment the result of the realistic intervention has been assessed as having a potentially:

- **Zero** local AQ benefit if the realistic intervention is 0% or worse
- **Small** local AQ benefit if the realistic intervention is 1%
- **Medium** local AQ benefit if the realistic intervention is 2-5%
- **Large** local AQ benefit if the realistic intervention is >5%.

6.2 Implementation Costs

The potential implementation costs of each option are assessed as follows:

- **Cost neutral** (measure already implemented through existing plans/ programmes)
- **Low** costs (up to £20k annually e.g. for small surveys or campaigns or other options using current resources)
- **Medium** costs (up to £60k annually e.g. for a full time officer and resources)
- **High** costs (up to £200k annually e.g. for small traffic management schemes)

- **Very high** costs (above £200k annually e.g. for new infrastructure)

The assessed costs attempt to include the costs to vehicle operators as well as to West Lothian Council. These cost bandings may be subject to revision depending on comments received from those consulted.

6.3 Cost-Effectiveness

The effectiveness of each measure in improving air quality is compared to the implementation costs in the following matrix:

AQ benefit / Cost	Score	Zero	Small	Medium	Large
Score		0	1	2	3
Neutral	5	0	5	10	15
Low	4	0	4	8	12
Medium	3	0	3	6	9
High	2	0	2	4	6
Very High	1	0	1	2	3

In this table the assessed implementation costs and potential air quality impacts have been given a weighted score. The product of the weighted scores for each option is calculated. The results can be interpreted as follows:

1. If the product is **high** (10 or more) then the measure is more cost-effective (significant impacts for the cost involved) and perhaps favourably cost-effective
2. If the product is **medium** (between 5-9) then the measure is in the **medium** range of cost-effectiveness
3. If the product is **low** (4 or less) then the measure is less cost-effective (small impacts for the cost involved) and perhaps unacceptably poor in cost-effectiveness terms.

This method only estimates the *relative* cost-effectiveness of options rather than their *absolute* values. The method is useful during discussions of the relative priority of different options. The final cost-effectiveness value is sensitive to changes in the assumptions of how effective a measure might be in reducing emissions and how costly it is.

6.4 Potential Co-Environmental Benefits

In this assessment other environmental benefits are highlighted.

1. Greenhouse gases: The likely effect on greenhouse gas emissions is assessed as being an overall reduction or a local reduction perhaps with emissions being relocated elsewhere.
2. Noise.

Without detailed information on the true impacts of the options these assessments rely on judgement.

6.5 Potential Risk Factors

In this assessment risk factors are highlighted. These may be looked at more closely within a Strategic Environmental Assessment of any measure implemented. At this stage it is simply highlighted whether or not it is likely that the measure would:

1. Relocate emissions and hence lead to worsening air quality elsewhere
2. Require a change in land use
3. Place limits on pace of development, or increase costs of development significantly.

Without detailed information on the true impacts of the measures, these assessments rely on judgement.

6.6 Potential Social Impacts

Potential social impacts are highlighted. These may need to be examined more closely when developing the options further. At this stage, it is simply highlighted whether or not it is likely that the option would potentially:

1. Provide health benefits in terms of lower exposure to pollutants or increased mobility
2. Increase road safety
3. Improve accessibility

Without detailed information on the true impacts of the options these assessments rely on judgement.

6.7 Potential Economic Impacts

Potential economic impacts are highlighted. These may need to be examined more closely when developing the options further. At this stage, it is simply highlighted whether or not it is likely that the option would potentially:

1. Influence sustainable development or accessibility
2. Reduce or increase overall travel time
3. Place additional requirements on operators.

6.8 Feasibility and Acceptability

Each option has been assessed for its feasibility against three simple criteria. These are whether the authority has:

1. The executive powers under existing legislation to implement and enforce a measure. Alternatively, whether the authority has an existing mechanism to influence other agencies to implement a measure
2. Secured funding for the measure or a straightforward route for securing funding
3. Characterised the potential positive and negative impacts of the measure with sufficient evidence or confidence to make a decision to implement the measure.

Table 12 below sets out the criteria adopted for defining the option as being feasible over the short, medium or long term, or as being unfeasible. Each option is assessed against each criterion. The final feasibility timeframe is defined according to which of the three assessments results in the longest of the four possible terms (short, medium, long or unfeasible). For example, an option for which powers are clear and for which impacts are well characterised but for which funding will be difficult to obtain would be assessed as feasible over the long term.

Table 12: Criteria for feasibility analysis

Feasible in the:	Authority has the powers	Funding secured	Potential positive and negative impacts are well characterised
Short term (1-2 years)	Yes, clearly defined and already exercised	Yes potentially straightforward	Yes
Medium term (3-6 years)	Yes but novel or with an element of uncertainty	Yes with forward planning	Not without further study
Long term (>6 years)	Highly uncertain	No or extremely difficult	Not without further study

Feasible in the:	Authority has the powers	Funding secured	Potential positive and negative impacts are well characterised
Unfeasible	No	Will never attract funding	Hard to characterise and with high risks

In relation to the acceptability, a preliminary judgement is expressed on how acceptable each option might be to stakeholders according to the following criteria:

1. The option is considered potentially acceptable if: the option is unlikely to compel people to change behaviour or increase their costs significantly or at least some level of behaviour change or personal costs are required but the scheme is overall consistent with community policies;
2. The option is considered potentially unacceptable if: unacceptably intrusive changes in behaviour or large personal costs would be incurred.

Final judgements on acceptability will necessarily rest with the elected Council members.

A summary of the results of the assessment are presented in Table 13 below, with further details presented in Appendix 1.

Table 13: Summary Assessment of Proposed Measures

Summary Assessment of Proposed Measures										
No.	Measure Title (CE Score)	Potential Air Quality Impact	Estimated Costs	Cost Effectiveness	Potential Co-environmental Impacts	Risk Factors	Potential Social Impacts	Potential Economic Impacts	Lead Authority	Feasibility/ Acceptability
Strategic measures										
1.	Liaise with the Scottish Government regarding the Consideration of National Measures to Reduce Background Concentrations of PM				Greenhouse Gases; Health Improvement; Improve Local Environment	None	Low Risk	None	WLC	Short Term; Yes
2.	Liaise with Scottish Government regarding National air quality policy				Greenhouse Gases; Health Improvement; Improve Local Environment	None	Low Risk	None	WLC	Short Term; Yes
3.	Create approved SPG for Air Quality				Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	limits development; increases cost of development	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; additional requirements on operators; influence sustainable development	Environmental Health	Short Term; Yes
Move traffic away from the AQMA										

Summary Assessment of Proposed Measures										
No.	Measure Title (CE Score)	Potential Air Quality Impact	Estimated Costs	Cost Effectiveness	Potential Co-environmental Impacts	Risk Factors	Potential Social Impacts	Potential Economic Impacts	Lead Authority	Feasibility/ Acceptability
4.	Investigate Southern Distributor Link Road	Medium	Very High	Low	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	Relocate Emission; land use change; limits development; increases cost of development; Needs to be in LDP	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; additional requirements on operators; influence sustainable development; +ve impact on businesses	Environmental Health; Roads; Planning; Climate Change; Legal Services; Fleet Services; Health Improvement Team; Town Centre management	Long Term; Yes
5.	Investigate Edinburgh Road to Manse Road Link Road	Small	Very High	Low	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	Relocate Emission; land use change; limits development; increases cost of development; needs to be in LDP	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; additional requirements on operators; influence sustainable development; no impact on businesses	Roads; Planning;	Long Term; Yes

Summary Assessment of Proposed Measures										
No.	Measure Title (CE Score)	Potential Air Quality Impact	Estimated Costs	Cost Effectiveness	Potential Co-environmental Impacts	Risk Factors	Potential Social Impacts	Potential Economic Impacts	Lead Authority	Feasibility/ Acceptability
6.	Investigate Park and Ride Facility (long distance and into town centre)	Large – but may need other parking restrictions	Very High	Low	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	Relocate Emission; land use change; limits development;	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; additional requirements on operators; influence sustainable development; +ve impact on businesses	Roads; Planning	Long Term; Yes
7.	Investigate West Access Slip Road at M9 Junction 3	Medium until survey is done	Very High	Low	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	Relocate Emission;	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; additional requirements on operators; influence sustainable development; +ve impact on businesses	Roads; Planning;	Long Term; Yes
8.	Investigate High Street Vehicle Movement Restriction	Large	Very High	Low	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	Relocate Emission; land use change; limits development; increases cost of development	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; additional requirements on operators; influence sustainable development; -ve impact on businesses	Roads; Planning	Short Term; No
Traffic Management										

Summary Assessment of Proposed Measures										
No.	Measure Title (CE Score)	Potential Air Quality Impact	Estimated Costs	Cost Effectiveness	Potential Co-environmental Impacts	Risk Factors	Potential Social Impacts	Potential Economic Impacts	Lead Authority	Feasibility/ Acceptability
9.	Investigate Incorporation of N-LEF – National Low Emissions Framework and consideration of Low emission zone of High Street. Guidance on criteria for vehicles to be published early 2017. – Still to do				Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	Relocate Emission; land use change; limits development; increases cost of development	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; additional requirements on operators; influence sustainable development; +ve/-ve impact on businesses	Environmental Health; Roads; Planning; Climate Change; Legal Services; Fleet Services; Health Improvement Team; Town Centre management	Short Term; Medium Term; Long Term; Unfeasible; Yes/No
10.	Investigate Bus Stop Relocation	small	Low	Low	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	Relocate Emission; land use change; limits development; increases cost of development	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; additional requirements on operators; influence sustainable development; +ve impact on businesses	Roads; Legal Services	Short Term Yes

Summary Assessment of Proposed Measures										
No.	Measure Title (CE Score)	Potential Air Quality Impact	Estimated Costs	Cost Effectiveness	Potential Co-environmental Impacts	Risk Factors	Potential Social Impacts	Potential Economic Impacts	Lead Authority	Feasibility/ Acceptability
11.	Idling Campaign and Enforcement of Idling with Fixed Penalty Notices.	Small	Medium	Low	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	Relocate Emission	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; influence sustainable development; +ve impact on businesses	Environmental Health	Short Term Yes
12.	Investigate Decriminalise Parking in West Lothian and Introduce High Street Parking Charges and Enforcement	Medium	Very High at start but revenue stream offsets on-going year costs but not implementation costs	Low	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	Relocate Emission;	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; additional requirements on operators; -ve impact on businesses	Roads; Legal Services;	Medium Term; Yes
13.	Review of West Lothian and Private Sector Delivery/Refuse Vehicle Timings and High Street Road Markings	Small	Low	Low	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	None	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; additional requirements on operators; influence sustainable development; +ve impact on businesses	Roads; Legal Services; Environmental Health Fleet Services; Town Centre management	Short Term; Yes

Summary Assessment of Proposed Measures										
No.	Measure Title (CE Score)	Potential Air Quality Impact	Estimated Costs	Cost Effectiveness	Potential Co-environmental Impacts	Risk Factors	Potential Social Impacts	Potential Economic Impacts	Lead Authority	Feasibility/ Acceptability
14.	Review Timings at Junctions	Small	Low	Low	Greenhouse Gases; Health Improvement; Improve Local	Relocate Emission;	Health Benefits; Road Safety;	Reduce Travel Time; +ve impact on businesses	Roads;	Short Term; Yes
Reduce the emissions from source										
15.	Investigate Local Bus/Fleet Improvements	Small	Low	Low	Greenhouse Gases; Health Improvement; Improve Local Environment	None	Health Benefits	Low	Environmental Health	Short Term; Yes
16.	School Travel Plans	Small	Low	Low	Greenhouse Gases; Health Improvement; Improve Local Environment	None	Health Benefits	Low	Environmental Health; Education	Short Term; Yes
17.	Implement ECOStars Scheme for HGV and Bus Operators	Small	Medium	Low	Greenhouse Gases; Health Improvement; Improve Local Environment	None	Health Benefits;	additional requirements on operators	Environmental Health	Medium Term; Yes
Reduce emissions by reducing demand for traffic, change in travel choice										

Summary Assessment of Proposed Measures										
No.	Measure Title (CE Score)	Potential Air Quality Impact	Estimated Costs	Cost Effectiveness	Potential Co-environmental Impacts	Risk Factors	Potential Social Impacts	Potential Economic Impacts	Lead Authority	Feasibility/ Acceptability
18.	Install Electric Vehicle Charging Park Places	Small	Medium	Low	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	Increases cost of development	Health Benefits	influence sustainable development; +ve impact on businesses	Environmental Health; Roads; Climate Change; Legal Services; Fleet Services;	Short Term; Yes
19.	Introduce Car Club	Small	Cost Neutral	Medium	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise		Health Benefits; Road Safety;	Reduce Travel Time;	Fleet Services;	Medium Term; Yes
20.	Active Travel and Cycling Infrastructure	Small	Medium	Low	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	increases cost of development	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; influence sustainable development; +ve impact on businesses	Environmental Health; Roads; Planning;	Short Term; Yes
21.	Provision of Air Quality Information	Zero	Low	Low	None	None	None	+ve impact on businesses	Environmental Health	Short Term; Yes

Summary Assessment of Proposed Measures										
No.	Measure Title (CE Score)	Potential Air Quality Impact	Estimated Costs	Cost Effectiveness	Potential Co-environmental Impacts	Risk Factors	Potential Social Impacts	Potential Economic Impacts	Lead Authority	Feasibility/ Acceptability
22.	Review WLC Staff Travel Plan	Small	Cost Neutral	Medium	Greenhouse Gases; Health Improvement; Improve Local Environment; Noise	None	Health Benefits; Road Safety; Improve Accessibility	Reduce Travel Time; +ve and-ve impact on businesses	Corporate Services	Short Term; Yes
Reduction from non-transport sources										
23.	Create a Smoke Control Area	Small	Low	Low	Greenhouse Gases; Health Improvement; Improve Local Environment	None	None	Additional requirements on operators; influence sustainable development; +ve impact on businesses – one business may have to modify	Environmental Health; Legal Services	Short Term; Unfeasible; Yes
Other										
24.	Review Pedestrian Crossings	Zero	Medium	Low	None	None	Road Safety	Reduce Travel Time; +ve impact on businesses	Roads	Short Term; Yes
25.	Increase Monitoring Network	Zero	Medium	Low	None	None	Health Benefits	None	Environmental Health	Short Term; Yes

Summary Assessment of Proposed Measures										
No.	Measure Title (CE Score)	Potential Air Quality Impact	Estimated Costs	Cost Effectiveness	Potential Co-environmental Impacts	Risk Factors	Potential Social Impacts	Potential Economic Impacts	Lead Authority	Feasibility/ Acceptability
26.	Investigate Greening the Area with Trees	Small	High	Low	Greenhouse Gases; Health Improvement; Improve Local Environment	None	Health Benefits;	additional requirements on operators; +ve impact on businesses	Nets and Roads	Medium Term; Yes

Appendices

Appendix 1: Source Apportionment Full Results

Appendix 1 – Source apportionment full results

Table A1.1 and Table A1.2 summarise the relevant NOx contributions from the sources at all receptor locations. The PM_{10} results are presented in Table A1.3 and Table A1.4. The source apportionment results are presented visually using bar charts in Figures A1.1 to A1.4.

Table A1.1: NOx source apportionment – Contribution by vehicle type (µg.m^{-3}) (excludes motorcycles)

Receptor location	Total NOx	Background	Road NOx	Cars	HGV Artic	HGV Rigid	Buses	LGV
High St 1	48.7	21.6	27.1	12.6	0.8	3.2	3.8	6.6
High St 2	47.7	21.6	26.1	12.3	0.7	3.0	3.6	6.4
High St 3	64.6	21.6	43.0	20.2	1.2	4.9	5.7	11.0
High St 4	53.4	21.6	31.7	15.6	0.7	3.1	3.5	8.7
High St 5	54.3	21.6	32.6	16.0	0.8	3.5	3.9	8.5
High St 6	57.4	20.6	36.9	18.4	0.8	3.7	3.9	10.0
High St 7	54.2	20.6	33.7	16.8	0.8	3.4	3.6	9.0
High St 8	42.8	20.6	22.2	13.8	1.5	3.2	1.5	2.2
High St 9	58.8	21.6	37.2	18.4	1.2	4.5	5.2	7.9
High St 10	59.0	21.6	37.3	19.0	1.1	4.3	4.8	8.2
High St 11	67.4	20.6	46.9	28.5	4.4	7.7	3.0	3.2
High St 12	57.0	20.6	36.4	23.1	3.1	5.4	2.0	2.7
High St 13	67.8	21.6	46.1	23.1	1.5	5.5	6.3	9.7
High St 14	56.1	21.6	34.5	18.2	0.9	3.7	4.0	7.7
High St 15	86.3	21.6	64.7	32.7	2.1	7.9	9.0	12.9
High St 16	80.2	20.6	59.7	28.6	1.7	6.7	7.5	15.1
High St 17	77.0	20.6	56.4	36.2	4.4	8.4	3.3	4.1
High St 18	74.6	21.6	53.0	27.5	1.5	5.8	6.2	11.9
High St 19	71.3	21.6	49.7	23.8	1.3	5.3	6.0	13.2
High St 20	69.0	20.6	48.4	30.5	4.3	7.4	2.8	3.4
High St 21	66.0	20.6	45.4	29.2	3.2	6.6	2.9	3.4
High St 22	72.7	20.6	52.2	31.5	5.0	8.7	3.3	3.5
High St 23	60.3	20.6	39.8	25.0	3.3	6.2	2.5	2.8
High St 24	71.5	21.6	49.9	26.0	1.4	5.4	5.8	11.2
High St 25	71.1	21.6	49.5	24.0	1.2	5.2	5.9	13.2
High St 26	74.3	21.6	52.6	27.7	1.4	5.5	5.9	12.0
High St 27	76.9	20.6	56.3	27.6	1.3	5.6	6.2	15.6
High St 28	52.3	20.6	31.7	16.6	0.8	3.3	3.5	7.6
High St 29	60.1	20.6	39.5	20.7	1.3	4.5	4.6	8.4
High St 30	52.5	20.6	31.9	19.1	2.0	4.3	2.4	4.1
High St 31	59.2	20.6	38.6	23.4	2.8	5.7	2.7	4.1
High St 32	57.4	20.6	36.9	22.9	2.9	5.5	2.3	3.2
High St 33	49.9	20.6	29.4	18.6	2.2	4.3	1.8	2.4
High St 34	60.9	20.6	40.3	25.3	3.4	6.2	2.4	3.1
High St 35	57.3	20.6	36.7	22.6	3.2	5.8	2.4	2.6
High St 36	71.7	20.6	51.1	30.9	4.9	8.5	3.3	3.5
High St 37	60.4	20.6	39.8	25.1	3.4	6.1	2.3	2.8
High St 38	61.0	20.6	40.5	25.8	3.2	6.1	2.4	2.9
High St 39	59.3	20.6	38.7	24.3	3.4	6.0	2.3	2.8

Table A1.2: NOx source apportionment – Contribution by vehicle type (% of total NOx)

Receptor location	Total NOx	Background	Road NOx	Cars	HGV Artic	HGV Rigid	Buses	LGV
High St 1	100%	44.4%	55.6%	25.9%	1.6%	6.5%	7.9%	13.6%
High St 2	100%	45.3%	54.7%	25.9%	1.6%	6.3%	7.5%	13.4%
High St 3	100%	33.5%	66.5%	31.2%	1.8%	7.5%	8.9%	17.1%
High St 4	100%	40.5%	59.5%	29.3%	1.3%	5.9%	6.6%	16.3%
High St 5	100%	39.9%	60.1%	29.4%	1.5%	6.4%	7.1%	15.6%
High St 6	100%	35.8%	64.2%	32.0%	1.5%	6.4%	6.9%	17.4%
High St 7	100%	37.9%	62.1%	31.0%	1.5%	6.2%	6.7%	16.6%
High St 8	100%	48.1%	51.9%	32.3%	3.6%	7.4%	3.4%	5.2%
High St 9	100%	36.8%	63.2%	31.3%	2.0%	7.6%	8.8%	13.5%
High St 10	100%	36.7%	63.3%	32.2%	1.9%	7.2%	8.1%	13.9%
High St 11	100%	30.5%	69.5%	42.2%	6.6%	11.5%	4.4%	4.7%
High St 12	100%	36.1%	63.9%	40.6%	5.5%	9.4%	3.6%	4.7%
High St 13	100%	31.9%	68.1%	34.1%	2.2%	8.1%	9.4%	14.2%
High St 14	100%	38.6%	61.4%	32.4%	1.6%	6.5%	7.1%	13.8%
High St 15	100%	25.1%	74.9%	37.9%	2.5%	9.1%	10.4%	14.9%
High St 16	100%	25.6%	74.4%	35.7%	2.1%	8.4%	9.4%	18.8%
High St 17	100%	26.7%	73.3%	47.0%	5.7%	10.9%	4.3%	5.3%
High St 18	100%	29.0%	71.0%	36.9%	2.0%	7.8%	8.4%	16.0%
High St 19	100%	30.3%	69.7%	33.4%	1.8%	7.5%	8.4%	18.6%
High St 20	100%	29.8%	70.2%	44.1%	6.2%	10.8%	4.0%	5.0%
High St 21	100%	31.2%	68.8%	44.2%	4.9%	10.0%	4.4%	5.2%
High St 22	100%	28.3%	71.7%	43.4%	6.9%	11.9%	4.6%	4.8%
High St 23	100%	34.1%	65.9%	41.4%	5.5%	10.2%	4.1%	4.7%
High St 24	100%	30.2%	69.8%	36.3%	1.9%	7.6%	8.2%	15.7%
High St 25	100%	30.4%	69.6%	33.7%	1.7%	7.3%	8.2%	18.5%
High St 26	100%	29.1%	70.9%	37.3%	1.8%	7.5%	8.0%	16.2%
High St 27	100%	26.8%	73.2%	35.9%	1.6%	7.3%	8.1%	20.2%
High St 28	100%	39.3%	60.7%	31.7%	1.5%	6.3%	6.6%	14.5%
High St 29	100%	34.2%	65.8%	34.4%	2.1%	7.6%	7.7%	13.9%
High St 30	100%	39.2%	60.8%	36.3%	3.7%	8.3%	4.6%	7.7%
High St 31	100%	34.7%	65.3%	39.4%	4.8%	9.6%	4.5%	6.9%
High St 32	100%	35.8%	64.2%	40.0%	5.0%	9.6%	3.9%	5.6%
High St 33	100%	41.2%	58.8%	37.2%	4.5%	8.7%	3.5%	4.8%
High St 34	100%	33.8%	66.2%	41.5%	5.5%	10.2%	3.9%	5.0%
High St 35	100%	35.9%	64.1%	39.5%	5.5%	10.2%	4.2%	4.6%
High St 36	100%	28.7%	71.3%	43.1%	6.8%	11.9%	4.6%	4.9%
High St 37	100%	34.1%	65.9%	41.6%	5.6%	10.2%	3.8%	4.7%
High St 38	100%	33.7%	66.3%	42.3%	5.2%	9.9%	3.9%	4.8%
High St 39	100%	34.7%	65.3%	41.0%	5.7%	10.1%	3.8%	4.6%

Table A1.3: PM_{10} source apportionment – Contribution by vehicle type ($\mu g.m^{-3}$ of total PM_{10}) (excludes motorcycles)

Receptor location	Total PM_{10}	Background	Road NOx	Cars	HGV Artic	HGV Rigid	Buses	LGV
High St 1	16.4	13.7	2.7	1.6	0.0	0.2	0.2	0.7
High St 2	16.4	13.7	2.7	1.6	0.0	0.2	0.2	0.7
High St 3	18.3	13.7	4.6	2.8	0.1	0.3	0.3	1.2
High St 4	17.8	13.7	4.1	2.6	0.0	0.2	0.2	1.0
High St 5	17.5	13.7	3.8	2.4	0.0	0.2	0.2	0.9
High St 6	18.0	13.2	4.8	3.1	0.1	0.3	0.2	1.1
High St 7	17.6	13.2	4.4	2.8	0.1	0.3	0.2	1.0
High St 8	15.8	13.2	2.6	2.0	0.1	0.2	0.1	0.2
High St 9	17.4	13.7	3.7	2.4	0.1	0.2	0.2	0.8
High St 10	17.7	13.7	4.0	2.6	0.1	0.2	0.2	0.8
High St 11	17.9	13.2	4.8	3.7	0.2	0.4	0.1	0.3
High St 12	17.2	13.2	4.0	3.2	0.1	0.3	0.1	0.3
High St 13	18.4	13.7	4.7	3.0	0.1	0.3	0.3	1.0
High St 14	18.0	13.7	4.2	2.9	0.1	0.2	0.2	0.8
High St 15	20.1	13.7	6.4	4.2	0.1	0.4	0.4	1.3
High St 16	20.0	13.2	6.8	4.2	0.1	0.4	0.4	1.6
High St 17	19.7	13.2	6.5	5.2	0.2	0.5	0.2	0.4
High St 18	19.9	13.7	6.1	4.1	0.1	0.4	0.3	1.3
High St 19	19.5	13.7	5.7	3.6	0.1	0.3	0.3	1.4
High St 20	18.5	13.2	5.3	4.2	0.2	0.4	0.1	0.4
High St 21	18.2	13.2	5.0	4.0	0.2	0.4	0.1	0.4
High St 22	18.4	13.2	5.2	4.0	0.2	0.5	0.1	0.4
High St 23	17.5	13.2	4.3	3.4	0.2	0.4	0.1	0.3
High St 24	19.5	13.7	5.8	3.9	0.1	0.3	0.3	1.2
High St 25	19.7	13.7	6.0	3.8	0.1	0.4	0.3	1.4
High St 26	20.2	13.7	6.5	4.4	0.1	0.4	0.3	1.3
High St 27	20.3	13.2	7.2	4.5	0.1	0.4	0.4	1.7
High St 28	17.2	13.2	4.0	2.7	0.1	0.2	0.2	0.8
High St 29	17.6	13.2	4.4	2.9	0.1	0.3	0.2	0.9
High St 30	16.9	13.2	3.8	2.8	0.1	0.3	0.1	0.4
High St 31	17.6	13.2	4.4	3.4	0.1	0.3	0.1	0.4
High St 32	17.4	13.2	4.3	3.3	0.2	0.3	0.1	0.3
High St 33	16.6	13.2	3.4	2.7	0.1	0.3	0.1	0.3
High St 34	17.7	13.2	4.6	3.6	0.2	0.4	0.1	0.3
High St 35	17.0	13.2	3.8	3.0	0.1	0.3	0.1	0.3
High St 36	18.3	13.2	5.1	4.0	0.2	0.5	0.1	0.4
High St 37	17.6	13.2	4.5	3.5	0.2	0.4	0.1	0.3
High St 38	17.8	13.2	4.6	3.7	0.2	0.4	0.1	0.3
High St 39	17.4	13.2	4.2	3.3	0.2	0.3	0.1	0.3

Table A1.4: PM_{10} source apportionment – Contribution by vehicle type (% of total PM_{10})

Receptor location	Total PM_{10}	Background	Road NOx	Cars	HGV Artic	HGV Rigid	Buses	LGV
High St 1	100%	83.5%	16.5%	10.0%	0.2%	1.0%	1.0%	4.1%
High St 2	100%	83.7%	16.3%	10.0%	0.2%	1.0%	1.0%	4.0%
High St 3	100%	75.0%	25.0%	15.2%	0.3%	1.5%	1.5%	6.3%
High St 4	100%	77.1%	22.9%	14.5%	0.3%	1.3%	1.2%	5.5%
High St 5	100%	78.2%	21.8%	13.8%	0.3%	1.3%	1.2%	5.2%
High St 6	100%	73.2%	26.8%	17.2%	0.3%	1.5%	1.4%	6.3%
High St 7	100%	75.0%	25.0%	16.1%	0.3%	1.4%	1.3%	5.8%
High St 8	100%	83.3%	16.7%	12.9%	0.5%	1.2%	0.5%	1.5%
High St 9	100%	78.8%	21.2%	13.6%	0.3%	1.4%	1.3%	4.6%
High St 10	100%	77.4%	22.6%	14.8%	0.3%	1.4%	1.3%	4.8%
High St 11	100%	73.4%	26.6%	20.5%	1.1%	2.3%	0.7%	1.8%
High St 12	100%	76.6%	23.4%	18.5%	0.9%	1.8%	0.6%	1.6%
High St 13	100%	74.6%	25.4%	16.5%	0.4%	1.6%	1.5%	5.3%
High St 14	100%	76.4%	23.6%	16.0%	0.3%	1.4%	1.2%	4.7%
High St 15	100%	68.1%	31.9%	20.8%	0.5%	2.1%	1.9%	6.5%
High St 16	100%	66.0%	34.0%	21.3%	0.5%	2.1%	1.9%	8.1%
High St 17	100%	66.9%	33.1%	26.2%	1.1%	2.6%	0.8%	2.2%
High St 18	100%	69.1%	30.9%	20.6%	0.4%	1.9%	1.7%	6.4%
High St 19	100%	70.5%	29.5%	18.4%	0.4%	1.8%	1.6%	7.3%
High St 20	100%	71.4%	28.6%	22.5%	1.1%	2.3%	0.7%	1.9%
High St 21	100%	72.4%	27.6%	21.8%	0.8%	2.1%	0.8%	2.0%
High St 22	100%	71.6%	28.4%	21.9%	1.2%	2.5%	0.8%	1.9%
High St 23	100%	75.3%	24.7%	19.4%	0.9%	2.0%	0.7%	1.7%
High St 24	100%	70.2%	29.8%	19.8%	0.4%	1.8%	1.6%	6.1%
High St 25	100%	69.6%	30.4%	19.1%	0.4%	1.8%	1.7%	7.3%
High St 26	100%	67.7%	32.3%	21.7%	0.4%	1.9%	1.7%	6.5%
High St 27	100%	64.8%	35.2%	22.3%	0.4%	2.0%	1.8%	8.6%
High St 28	100%	76.5%	23.5%	15.7%	0.3%	1.4%	1.2%	4.9%
High St 29	100%	74.9%	25.1%	16.8%	0.4%	1.6%	1.3%	5.0%
High St 30	100%	77.8%	22.2%	16.6%	0.6%	1.6%	0.7%	2.5%
High St 31	100%	74.8%	25.2%	19.1%	0.8%	2.0%	0.8%	2.4%
High St 32	100%	75.5%	24.5%	19.0%	0.9%	1.9%	0.7%	1.9%
High St 33	100%	79.3%	20.7%	16.3%	0.7%	1.6%	0.5%	1.5%
High St 34	100%	74.2%	25.8%	20.1%	1.0%	2.1%	0.7%	1.8%
High St 35	100%	77.4%	22.6%	17.5%	0.8%	1.9%	0.6%	1.6%
High St 36	100%	72.0%	28.0%	21.6%	1.2%	2.5%	0.8%	1.9%
High St 37	100%	74.7%	25.3%	19.9%	1.0%	2.0%	0.6%	1.7%
High St 38	100%	74.0%	26.0%	20.6%	0.9%	2.0%	0.7%	1.7%
High St 39	100%	75.6%	24.4%	19.2%	0.9%	2.0%	0.6%	1.6%

Figure A1.1: NOx source apportionment – Contribution by vehicle type (µg.m^{-3}) (excludes motorcycles)

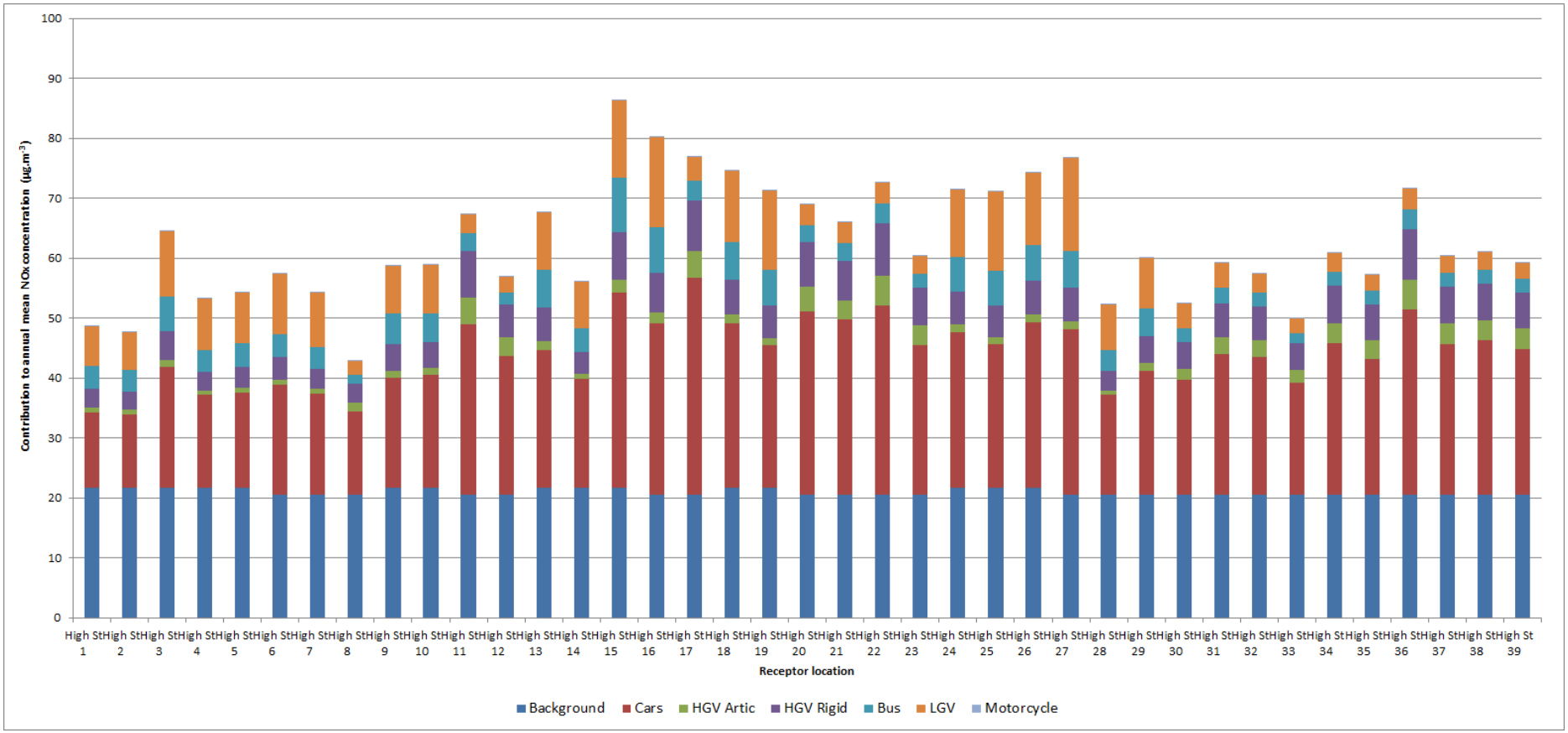


Figure A1.2: NOx source apportionment – Contribution by vehicle type (% of total NOx)

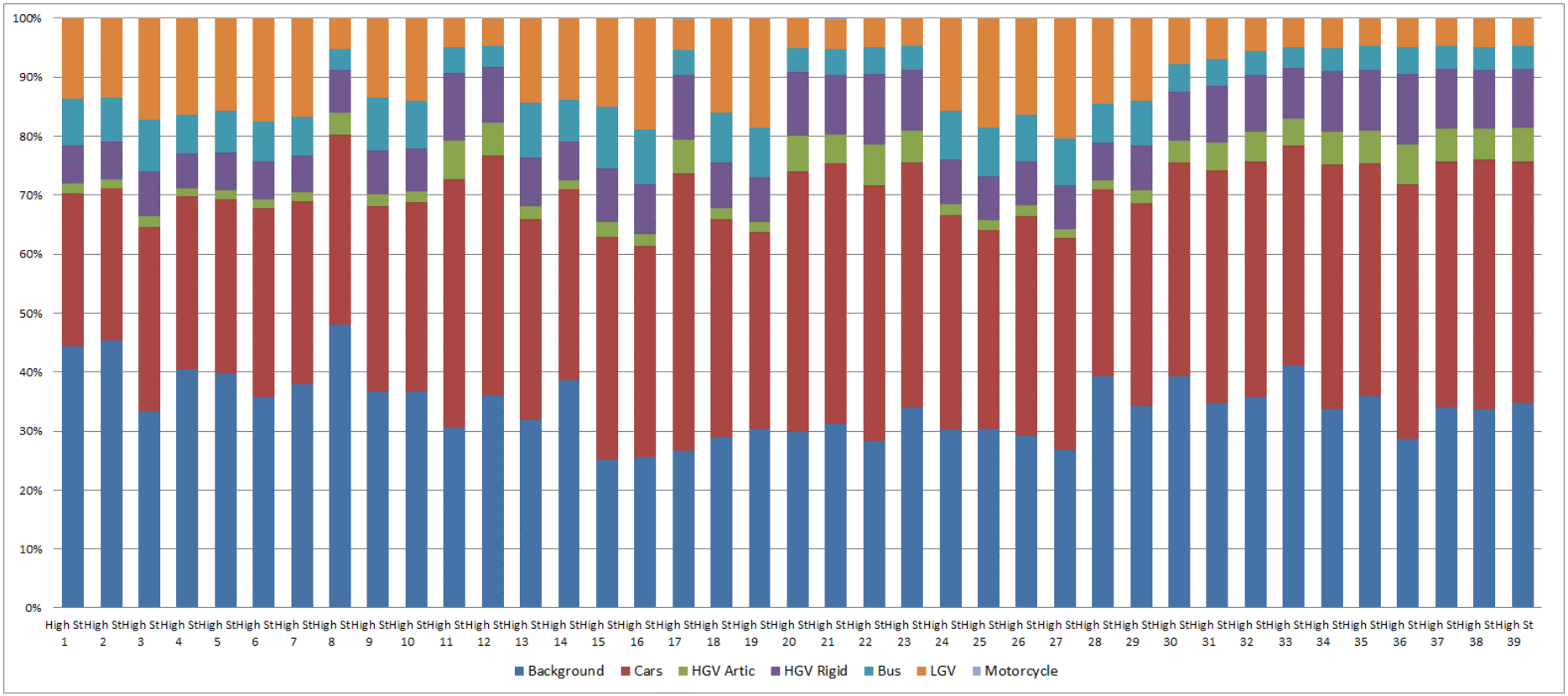


Figure A1.3: PM_{10} source apportionment – Contribution by vehicle type ($\mu g.m^{-3}$) (excludes motorcycles)

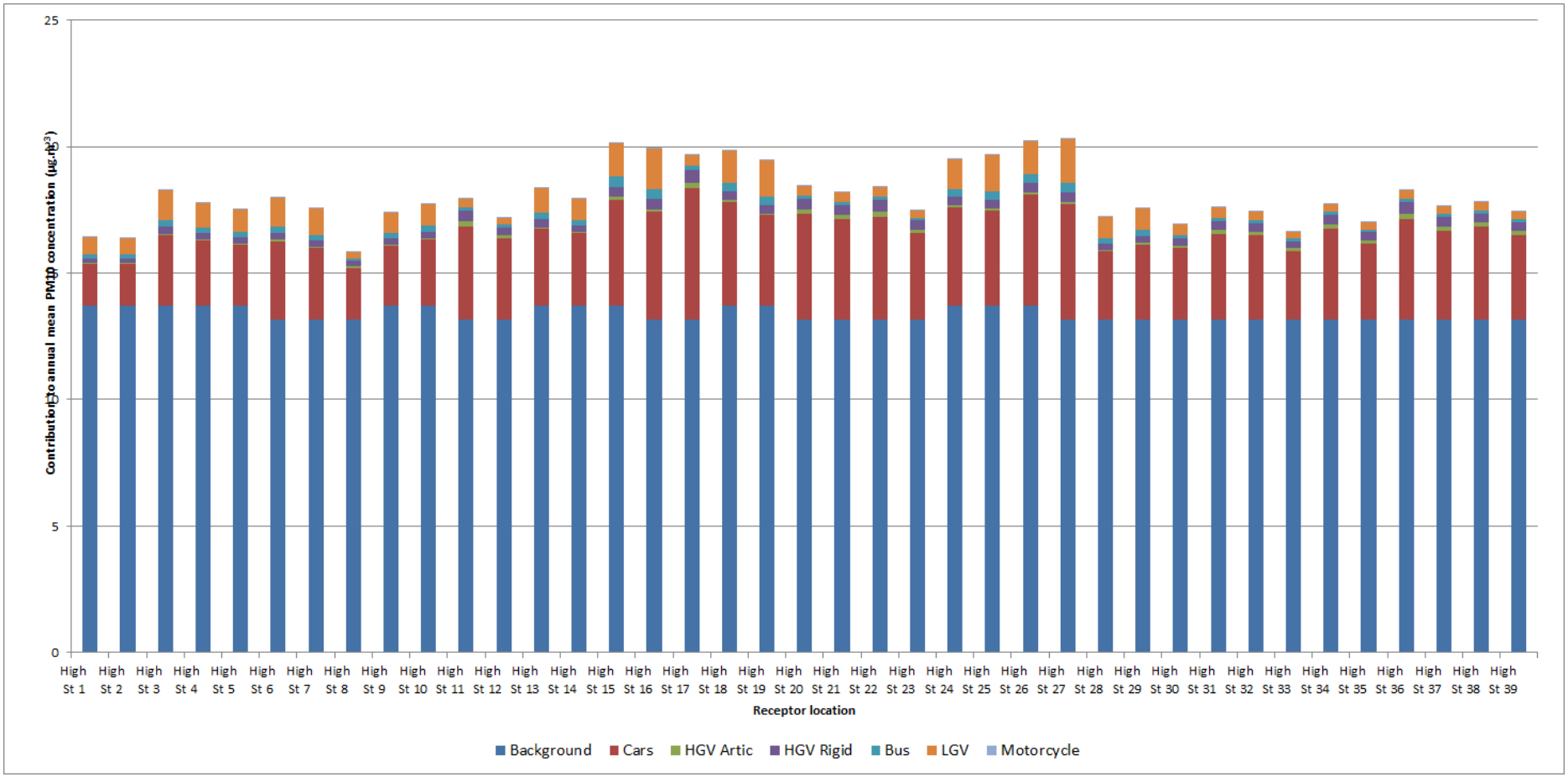
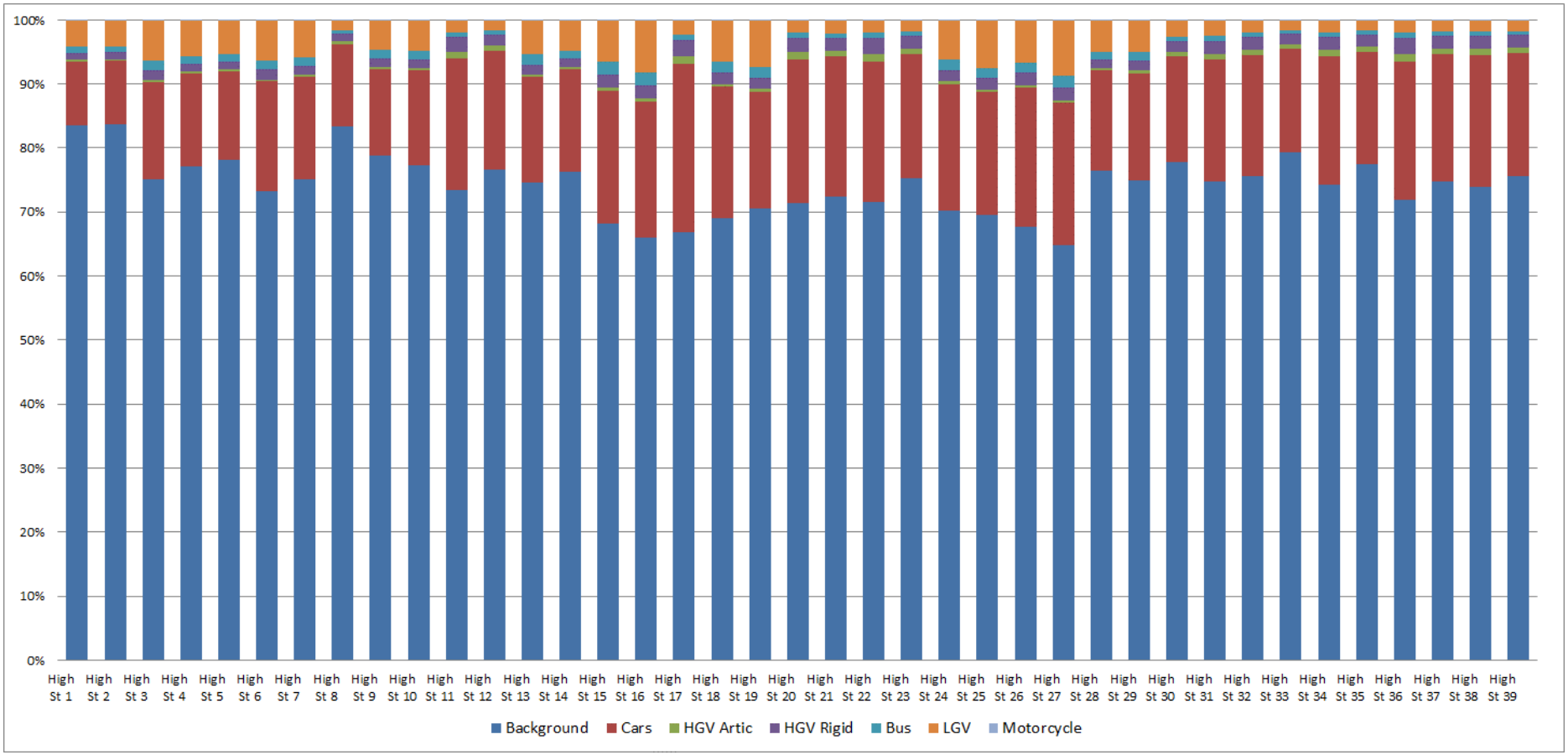


Figure A1.4: PM_{10} source apportionment – Contribution by vehicle type (% of total PM_{10})



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