Suffolk Coastal District Council
Air Quality Action Plan for Stratford St. Andrew - Final

In fulfilment of Part IV of the
Environment Act 1995
Local Air Quality Management

November (2017)

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Executive Summary

This Air Quality Action Plan (AQAP) has been produced as part of our statutory duties required by the Local Air Quality Management framework. It outlines the action we will take to improve air quality within the Stratford St. Andrew Air Quality Management Area (AQMA) in Suffolk Coastal District Council between 2016 and 2021.

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[1]. Suffolk Coastal District Council and Suffolk County Council are committed to reducing the exposure of people in Stratford St. Andrew to poor air quality in order to improve health.

Working together, we have developed actions that can be considered under the topic of Traffic Management as our priority is to tackle emissions from vehicles driving along the A12 in Stratford St. Andrew by reducing speeds and smoothing traffic flow.

In this AQAP we outline how we plan to effectively tackle air quality issues within our control. However, we recognise that there are a large number of air quality policy areas that are outside of our influence (such as vehicle emissions standards agreed in Europe), but for which we may have useful evidence, and so we will continue to work with regional and central government on policies and issues beyond Suffolk Coastal District Council's direct influence.

[1] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Responsibilities and Commitment

This AQAP was prepared by the Environmental Protection Department of Suffolk Coastal District Council in consultation with and support of Suffolk County Council.

This AQAP has been approved by:

Mr Stephen Baker - Chief Executive, Suffolk Coastal and Waveney District Councils

Mr Phil Gore - Head of Environmental Services & Port Health, Suffolk Coastal and Waveney District Councils

Mr Philip Ridley BSc (Hons) MRTPI - Head of Planning and Coastal Management, Suffolk Coastal and Waveney District Councils

Ms Sue Roper - Assistant Director, Strategic Development, Suffolk County Council

This AQAP will be subject to an annual review, appraisal of progress and reporting to the relevant Cabinet Portfolio Holder and County representative. Progress each year will be reported in the Annual Status Reports (ASRs) produced by Suffolk Coastal District Council, as part of our statutory Local Air Quality Management duties. If you have any comments on this AQAP please send them to Environmental Protection at:

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1 Introduction

This report outlines the actions that Suffolk Coastal District Council and Suffolk County Council will deliver between 2016 and 2021 in order to reduce concentrations of air pollutants and exposure to air pollution; thereby positively impacting on the health and quality of life of residents and visitors within the Stratford St. Andrew Air Quality Management Area (AQMA).

It has been developed in recognition of the legal requirement on the local authority to work towards Air Quality Strategy (AQS) objectives under Part IV of the Environment Act 1995 and relevant regulations made under that part and to meet the requirements of the Local Air Quality Management (LAQM) statutory process.

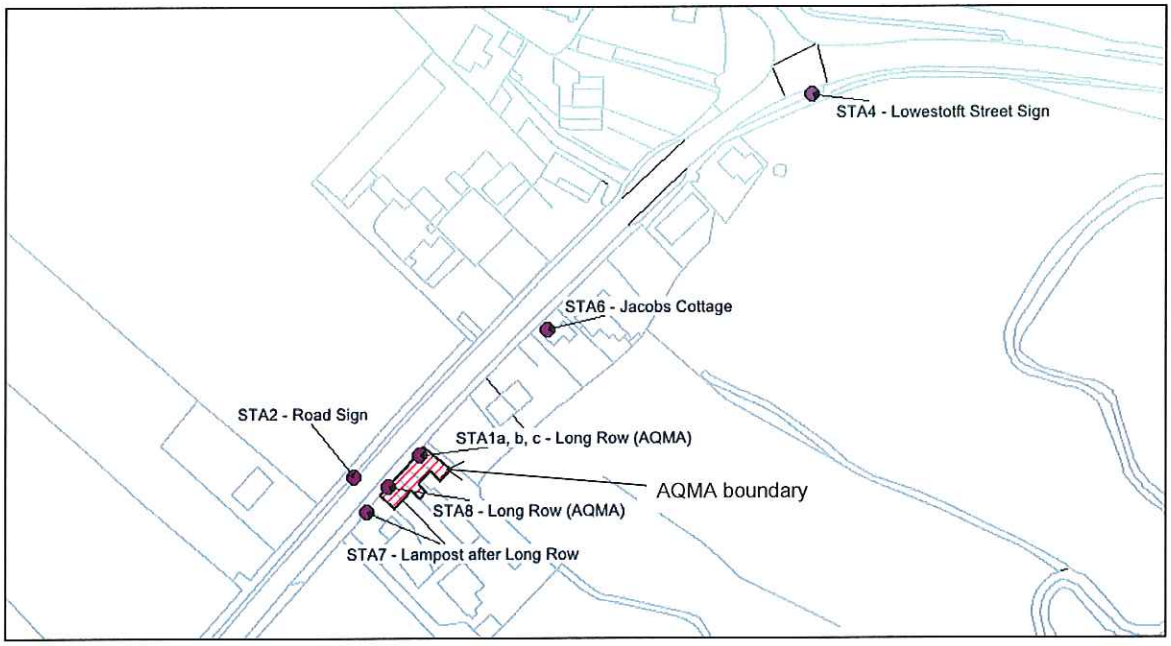
This Plan will be reviewed every five years and progress on measures set out within this Plan will be reported annually within Suffolk Coastal District Council's air quality ASR.

2 Summary of Current Air Quality in Stratford St. Andrew

Please refer to the latest air quality information from Suffolk Coastal District Council for more detailed information on current air quality in the district[2].

With specific regard to the Stratford St Andrew AQMA, diffusion tube monitoring for nitrogen dioxide (NO_2) has been undertaken along the A12 in the village since 2011. Concentrations above the annual mean objective have been recorded at a relevant receptor on Long Row cottages and following detailed assessment, an Air Quality Management Area (AQMA) was declared for 4 houses from 1-5 Long Row on 18th June 2014 (see Figure 2-1).

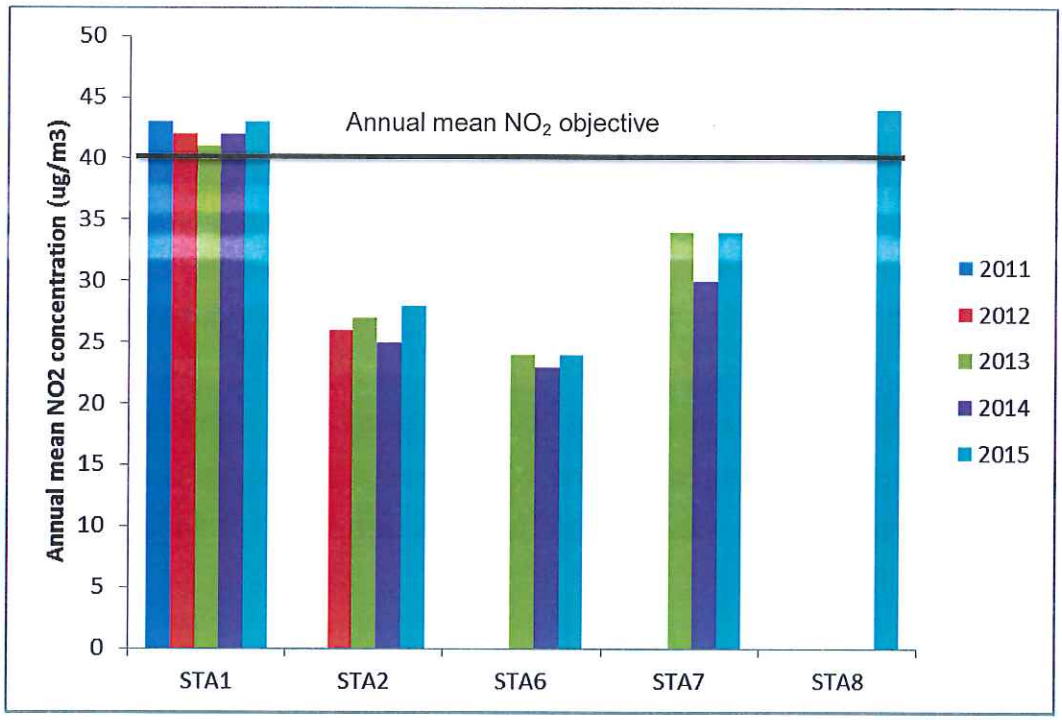
Figure 2-1: Map of AQMA boundary (striped area) in Stratford St. Andrew (from AQMA order) and location of diffusion tubes[3]



The most recent annual mean concentrations measured in 2015 within the AQMA remain above the annual mean objective of 40 µg/m^3, with 43 µg/m^3 measured at site STA1 and 44 µg/m^3 at a new site STA8. Although concentrations vary slightly from year to year, the 2015 annual mean concentration at STA1 remains the same as the level measured in 2011 as shown in Figure 2-2.

[2] http://www.eastsuffolk.gov.uk/environment/environmental-protection/air-quality/air-quality-reports/
[3] http://www.suffolkcoastal.gov.uk/assets/Documents/District/Air-quality/StrafordStAndrewAQMAJune2014.pdf

Figure 2-2: Trends in annual mean NO_2 concentrations in Stratford St. Andrew



3 Suffolk Coastal's Air Quality Priorities

3.1 Public Health Context

Local air quality has a clear public health issue and following a reform of public health services, local authorities now have a new duty to carry out a public health function. Local authorities therefore need to promote links with departments including public health, environmental protection, transport, planning and sustainability to raise awareness of the effect of air pollution on public health and to encourage local action to be taken. Within Suffolk, the wider Air Quality Group is working with the Public Health division within the County Council on ways to better integrate and promote LAQM work across these disciplines.

The Department for Health's Public Health Outcomes Framework includes an indicator related to air pollution on the "fraction of all-cause adult mortality associated with man-made particulate pollution ($PM_{2.5}$)", broken down by local authority. In Suffolk Coastal District Council this fraction is reported as 5.4% which is slightly higher than the English average of 5.3%.[4] Actions that are considered to reduce road traffic related emissions of NO_x and PM_{10} may also address emissions of $PM_{2.5}$ thus contributing to an improvement in this indicator.

3.2 Planning and Policy Context

Suffolk Coastal District Council adopted their Local Plan in the form of a Core Strategy and Development Management Polices (DMP) in 2013. With specific reference to the A12 and the air quality issue at Stratford St. Andrew, this road is a key route that runs north to south through the district connecting Lowestoft with Martlesham and Ipswich (key employment and service areas in East Suffolk), together with connection of more rural coastal areas to the primary road network (e.g. the A14). The District and County Councils have aspirations for a four village by-pass for the villages of Farnham, Little Glemham, Marlesford and Stratford St. Andrew. If this was to happen, this could potentially deal with some of the issues along the road such as slow speeds and poor air quality at houses located very close to the road.

[4] http://www.phoutcomes.info/public-health-outcomes-framework#page/0/gid/1000043/pat/6/par/E12000004/ati/101/are/E10000007

The designation of an AQMA at Stratford St. Andrew and the publication of his action plan will form a material planning consideration in the determination of planning applications that may affect air quality in the area. A notable development that could have an impact on this area is Sizewell C nuclear power station as this road is part of the planned route for construction traffic. This development is still within the pre-application planning stage but potential impacts have been considered as part of this action plan.

3.3 Source Apportionment

The measures presented in this report are intended to be targeted towards the predominant sources of emissions within the Stratford St. Andrew AQMA.

A source apportionment exercise was carried out by Suffolk Coastal District Council as part of their Further Assessment modelling report in 2015. This report identified that within the AQMA, the percentage source contributions were primarily from road traffic emissions along the A12 compared to background and rural sources (Table 3-1). On the A12, the key contributors to NO_x emissions are cars and HGVs. However, it is important to note that although HGVs and buses only make up 6% of the traffic flow on the A12, their combined contribution to road NO_x concentrations is disproportionate at 53.5%.

Table 3-1: Percentage contribution of sources to NO_x concentrations within the AQMA

Site	A12	Minor Roads	Other sources	Rural
STA 1	82.8%	0.4%	0.5%	16.3%

Table 3-2: Percentage contribution of road traffic sources to road NO_x concentrations within the AQMA

Site	Motorbike	Car	LGV	Rigid HGV	Articulated HGV	Bus and Coach
STA 1	0.3%	39.4%	6.8%	27.6%	20.8%	5.1%

3.4 Required Reduction in Emissions

Based on the most recent 2015 concentrations, a reduction in NO_2 concentration of 3 $\mu g/m^3$ (STA1) and 4 $\mu g/m^3$ (STA8) would be required to attain the annual mean objective of 40 $\mu g/m^3$ within the AQMA.

However, when considering emissions from road traffic, reductions should be expressed in terms of NO_x rather than NO_2 as there is a non-linear relationship between NO_x and NO_2. Therefore, following the methodology in the Guidance and using the NO_x-NO_2 calculator tool, the reduction in road-NO_x has been calculated for both diffusion tube sites. These results show that in 2015, a 7.9 $\mu g/m^3$ reduction (11%) and 13.4 $\mu g/m^3$ reduction (17%) in road NO_x would be required at STA1 and STA8 respectively to meet the NO_2 objective.

3.5 Key Priorities

The further assessment concluded that the main source of NOx emissions within the Stratford St Andrew AQMA is from vehicles driving along the A12 (which contributed 82%), with nearly half of this contribution from heavy goods vehicles (HGVs) despite these making up only 6% of the total traffic flow and 39% of emissions from cars.

Within the village of Stratford St. Andrew, the A12 is a single carriageway with a current speed limit of 30 mph. There is a 50 mph speed limit sign leaving the village towards the south just outside the AQMA. The further assessment modelling work showed that vehicles increased their speed as they started to leave the village with the highest emissions found on the southbound carriageway closest to the AQMA.

The A12 is on the local highway network and managed by Suffolk County Council (SCC). There are limited options available to reduce traffic flow and specifically the number of HGVs along this route. To assist in the development of alternative measures as part of the action plan, a drive cycle study was conducted around the AQMA as part of the further assessment. This involved driving an instrumented vehicle at different speeds and styles (e.g. acceleration) and considering the impact these styles had on emissions and modelled NO_2 concentrations. The study found that if vehicles were able to be driven in a smoother manner (i.e. more passively) than in the existing situation, it may be possible to reduce NO_x emissions sufficiently

to meet the annual mean NO_2 objective. The outputs from the drive cycle study are presented in Appendix A.

Based on these findings, measures that have been considered by the District and County Council for action for the Stratford St. Andrew AQMA are to:

- Move the location of the 30 mph speed limit sign at least 200 metres out of the village.
- Introduce vehicle activated speed signs, ideally one at the start of the AQMA (southbound) and one at the position of the existing 30 mph sign on the northbound side.
- Introduce southbound speed cameras prior to cottages
- Introduce average speed cameras on both sides of the road within the 30 mph speed limit
- Physically move the A12 carriageway away from the houses in the AQMA
- In the long term to put in place a village by-pass
- To discuss mitigation measures to reduce emissions from HGVs associated with construction traffic from the proposed Sizewell C power station

These measures have been considered by the District and County Council and by the steering group (see section 4.2).

4 Development and Implementation of the Stratford St. Andrew AQAP

4.1 Consultation and Stakeholder Engagement

In developing this AQAP, we have consulted and/or worked with other local authorities, agencies, businesses and the local community to improve local air quality. Schedule 11 of the Environment Act 1995 requires local authorities to consult the bodies listed in Table 4-1. In addition, we have undertaken wider consultation and stakeholder engagement initially in July 2014 following AQMA declaration and in March 2016 as part of the Further Assessment results and development of the action plan:

- Consultations published on the Council website
- Articles in local newspaper and Coastline magazine (delivered to every household in the district)
- Consultation letters requesting ideas/comments distributed directly to households within in the AQMA and along the A12 in Stratford St. Andrew and Farnham

The response to our consultation stakeholder engagement is given in Appendix B

Table 4-1 – Consultation Undertaken

Yes/No	Consultee
Yes	the Secretary of State
Yes	the Environment Agency
Yes	the highways authority
Yes	all neighbouring local authorities including Parish Councils, District Councils and County
Yes	other public authorities as appropriate, such as Public Health officials and Councillors
Yes	bodies representing local business interests and other organisations as appropriate

The most recent Public Consultation on the draft of this Action Plan was undertaken in August and September 2017. Two consultation responses were received, in addition to comments provided by Defra, and all are detailed in Appendix B.

4.2 Steering Group

The A12 is on the local highway network and managed by Suffolk County Council (SCC). This includes responsibility for road works, condition of roads and pavements, street lighting and traffic management and road safety including speed limit and signage. Although it is the District Council that is responsible for LAQM and working towards the annual mean objective for NO_2, the County Council is fully involved and engaged to put in place appropriate measures to improve vehicle emissions and air quality in the AQMA.

Following declaration of the Stratford St. Andrew AQMA in June 2014, we have set up a steering group with representatives from the District, County and Parish Councils to consider measures that could be adopted within the action plan. To date there have been four meetings held in September 2014 and 2015, November 2014 and February 2015. A further meeting to discuss measures and progress with the County was held in June 2016. The draft action plan was presented to the steering group before publication.

The steering group members have discussed the key priorities and various options for Stratford St. Andrew, focusing on physical measures or infrastructure that could reduce and smooth vehicle speeds (see Section 3.5). Various matters related to these measures have been considered at the meeting, including costs for signage, installation and running of cameras, responsibility for these (i.e. County or District), planning consent issues and agreements required by organisations such as Suffolk Roadsafe Board and the police.

5 AQAP Measures

A number of measures have been considered by the Steering Group during the development of the plan. As outlined in Appendix C, two that will not be pursued as part of this action plan included physically moving the A12 away from the houses in the AQMA, and painting buildings and/or roads and pavements with Titanium Dioxide paint to reduce NO_x. Those that are being actively pursued aim to result in a change in vehicle driving style and smoothing of speed close to the AQMA. The air quality further assessment showed that this could potentially reduce NO_x emissions from vehicles and therefore contribute to meeting the annual mean NO_2 objective (Savage and Turpin, 2015).

The lead authority for funding and implementing the measures to be taken forward is SCC through their Local Transport Plan (LTP) strategic improvement work. The LTP identifies a bypass on the A12 of the villages of Marlesford, Little Glemham, Stratford St. Andrew and Farnham as a strategic transport infrastructure improvement to be delivered in the next 5-7 years. The Government has provided funding of £1 million to develop the full business case for this bypass, and this is anticipated to be prepared by Summer 2017. The measures considered in this action plan are in addition to this LTP scheme.

The measures considered in the action plan are listed in Table 5-1. This includes information on:

- the responsible individual and departments/organisations who will deliver each action
- the estimated cost of implementing each action (overall cost and cost to the local authorities)
- the expected benefit in terms of pollutant emission and/or concentration reduction
- the timescale for implementation
- how progress will be monitored

A summary of a few of the priority measures is given below. The first option considered would be to physically move the existing 30 mph sign further south away

from the AQMA in order to deter drivers from accelerating past the AQMA as they leave the village. This measure would require a new permanent Traffic Regulation Order (TRO) to alter the signage and put in place the required traffic management at a cost of approximately £20,000. This capital funding has been agreed. The County and District have agreed a suitable location for this and the County Council has organised for the local and statutory consultation process to be undertaken to implement this TRO. This consultation finishes at the end of February. Following this process, the new speed limit extension needs to be drafted and advertised for 21 days to give time for any potential objections, which if received need consideration by the Rights of Way Committee. To allow time for this process, and for the design and construction phase, it is anticipated that the works will be completed by Autumn 2017 at the latest.

More aspirational measures that may be considered in the future would be for the County and District to investigate installing a vehicle activated sign (s) northbound and/or southbound to re-inforce the change to the 30 mph speed limit at the AQMA. The results from the further assessment suggested that installing a camera on both carriageways would be the most effective way to smooth the two-way traffic flow. The cost for each sign would be approximately £8,000 to install and would take 8 months following the agreement of a suitable location with sufficient space and sightline. There would also be ongoing revenue costs including electricity supply and maintenance to consider. The capital and revenue funding for these signs has not yet been agreed.

The District Council will continue to monitor NO_2 along the A12 in Stratford St. Andrew and through the planning process they will determine the likely impacts of any new developments that may affect traffic flow and emissions along this route, in particular the proposed Sizewell C power station. An indication of the likely future impacts of this development is provided in Appendix D.

Table 5-1 – Air Quality Action Plan Measures

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
SHORT-TERM AND PRIORITY ACTIONS											
1	Move the location of the southern 30mph speed limit sign southwards	Traffic Management	Reduction of speed limits	SCC	2016	2017	Reduction in NO_2 concentrations in AQMA Reduction in vehicle speed within AQMA	Reduction in concentration by up to 2 $\mu g/m^3$	Speed limit panel agreed experimental TRO to move sign for up to 18 months. Police has approved the application.	By Autumn 2017 following statutory consultant and design procedures.	Capital funding has been agreed to amend the TRO at approx. £20,000 (£6,000 for design and £14,000 for construction)
2	Assessment of planning applications for impact on air quality	Policy Guidance and Development Control	Air Quality Planning	SCDC	Ongoing	Ongoing	No new housing introduced into area of exceedence (AQMA) unless mitigation measures are in place to offset impacts	No significant increases in concentrations due to new developments	Officers in Environmental Protection work with Planning to ensure that each application is appropriately assessed for air quality.	2021	The assessment process takes account of national guidance (including EPUK) and local procedures
LONG-TERM AND ASPIRATIONAL MEASURES											
3	Measure 1 together with a southbound permanent vehicle activated sign	Traffic Management	Reduction of speed limits	SCC	2017	2018	Reduction in NO_2 concentrations in AQMA Reduction in vehicle speed within AQMA	Reduction in concentration to below the objective	Discussions between SCDC and SCC	2018	Follow on from measure 1. Would need a site assessment. Would require capital funding (min £8,000) and revenue funding. **Not yet approved.**

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
4	Measure 1 together with a northbound permanent vehicle activated sign	Traffic Management	Reduction of speed limits	SCC	2017	2018	Reduction in NO_2 concentrations in AQMA Reduction in vehicle speed within AQMA	Reduction in concentration to below the objective	Discussions between SCDC and SCC	2018	Ideally this camera would be installed alongside measure 3 to smooth all traffic flow close to the AQMA. Would need a site assessment and would require capital funding (min £8,000) and revenue funding. **Not yet approved.**
5	Southbound speed camera just prior to cottages	Traffic Management	Reduction of speed limits	SCC	Dependent on measure 1-3	12 months from agreeing location	Reduction in NO_2 concentrations in AQMA Reduction in vehicle speed within AQMA	Reduction in concentration to below the objective	Some discussions between SCDC and SCC	2019-2020?	Would need a site assessment to confirm adequate location and radar sightline. Need support from Suffolk Roadsafe Board and police. Would require capital funding of £40,000 and ongoing revenue funding. SCC advise that source for funding not currently identified. **Not yet approved.**
6	Average speed camera system throughout Stratford St Andrew and Farnham	Traffic Management	Reduction of speed limits	SCC	Dependent on measure 1-3	18 months from agreeing scheme	Reduction in NO_2 concentrations in AQMA	Reduction in concentration to below the objective	Consideration of option only. Aspirational measure due to high costs.	Dependent on measure 1-3	Would need a site assessment to confirm adequate location and radar sightline. Need support from Suffolk Roadsafe Board and police. Would require high capital funding of £250,000 and high revenue funding unlikely to be affordable. **Not yet approved.**

Measure No.	Measure	EU Category	EU Classification	Lead Authority	Planning Phase	Implementation Phase	Key Performance Indicator	Target Pollution Reduction in the AQMA	Progress to Date	Estimated Completion Date	Comments
7	Possible A12 Stratford St Andrew bypass	Traffic Management	Strategic highway improvements	SCC	Not known currently	Not known currently	Reduction in NO_2 concentrations in AQMA Reduction in traffic flows within AQMA	Reduction in concentration to below the objective	The Government has provided funding of £1 million to develop the full business case for a 4 villages bypass, and this is anticipated to be prepared by Summer 2017	Not known currently	Consideration of part funding by Sizewell C being investigated. The bypass would be completed within the next 5-7 years if it goes ahead. Sizewell C Stage 2 Consultation proposals include the option of a 2 village bypass for Farnham and Stratford St Andrew.
8	Mitigation of emissions from Sizewell construction traffic through planning process	Policy Guidance and Development Control	Low Emissions Strategy/Other Policy	SCDC	2020	Beyond 2020	Number of low emission vehicles in fleet	No significant increase of concentrations	Preliminary discussions on likely impacts with EDF Energy at pre-application stage	Long term (post 2030)	Initial modelling predicts increases in vehicles (particularly HGVs) associated with construction traffic along A12 accessing Sizewell. Peak construction year of 2024 could have increases 375 HGVs and >1000 total vehicle movements per day. Modelling of the potential impact on AQMA has been conducted (see Appendix C).

In summary, the priority measure in the action plan is for the County Council to move the 30 mph speed sign further south out of the village of Stratford St. Andrew on the A12 by putting in place a permanent TRO. This action has been agreed and if there are no objections, it should be in place by Autumn/2017. The District Council will continue to monitor the impact of this measure on NO_2 concentrations.. If there are no improvements, then the District and County Councils will consider taking forward measures 3 and 4. The local authority will provide regular annual updates on implementation of these actions and changes to measured concentrations as part of their ASR.

Appendix A: Results of the Drive Cycle study (taken from the Further Assessment Report November 2015)

Drive cycle survey

The first step in the further assssment was to conduct a drive cycle survey to collect second by second speed data and then to conduct detailed analysis. A survey schedule was designed that allowed drive cycles to be conducted at different times of day in both directions along the A12. A survey car was instrumented with a VBox System[5] that reads the on-board diagnostic output to record a number of parameters that included speed, acceleration and gear selection. The VBox recorder also includes a GPS receiver used to log the location and operation of the instrumented vehicle.

Driving behaviour surveys were conducted on 24th September 2014. The following three profiles or styles of driving behaviour were recorded at different times of the day.

1. Typical style (applying a car following technique). Keeping behind the vehicle in front and mimicking its behaviour in both directions.
2. Passive style. Leaving the village in the south-westerly direction passing through the AQMA. Maintaining the 30 mph speed limit until the 50 mph sign and then accelerating smoothly up to 50 mph. On entering the village from the south-west, slowing down gently to 30 mph as the speed sign is approached.
3. Aggressive style. Leaving the village in the south-westerly direction maintaining a speed of 30 mph and then accelerating as quickly as possible up to 50 mph. In the opposite direction, entering the village at speed and then breaking harshly at the 30 mph sign.

Scenarios assessed

During the inter-peak (i.e. middle of the day) period only[6], two scenarios were tested whereby the speed limit sign was theoretically moved to 150 metres (scenario 1) and 200 metres (scenario 2) further outside of the existing speed limit designation at the edge of the village. Typical driving style was employed to accelerate to 50 mph at the new designated sign location and vice versa in the other direction. The aim of this was to determine if vehicles accelerated past the cottages, travelling soutbound out of the village and conversely decelerated towards the village so that they were maintaining a steady spead past the AQMA.

An additional scenario was attempted to simulate the impact of installing a speed bump at the 30 mph sign, but it was deemed to be too dangerous to investigate the resulting driving behaviour without first cordoning off the road.

Data processing and analysis

Over the course of the survey day, 84 independent surveys were driven acrosss both directions. These data (second by second) were downloaded from the in-car recording

[5] VBox Automotive. https://www.vboxautomotive.co.uk/index.php/en/
[6] Inter-peak periods typically have less traffic and so make this type of analysis easier and safer to conduct.

system and visualised spatially using GIS software. A total of 5,892 data points were recorded during the entire survey. These points are shown in Figure 1 below.

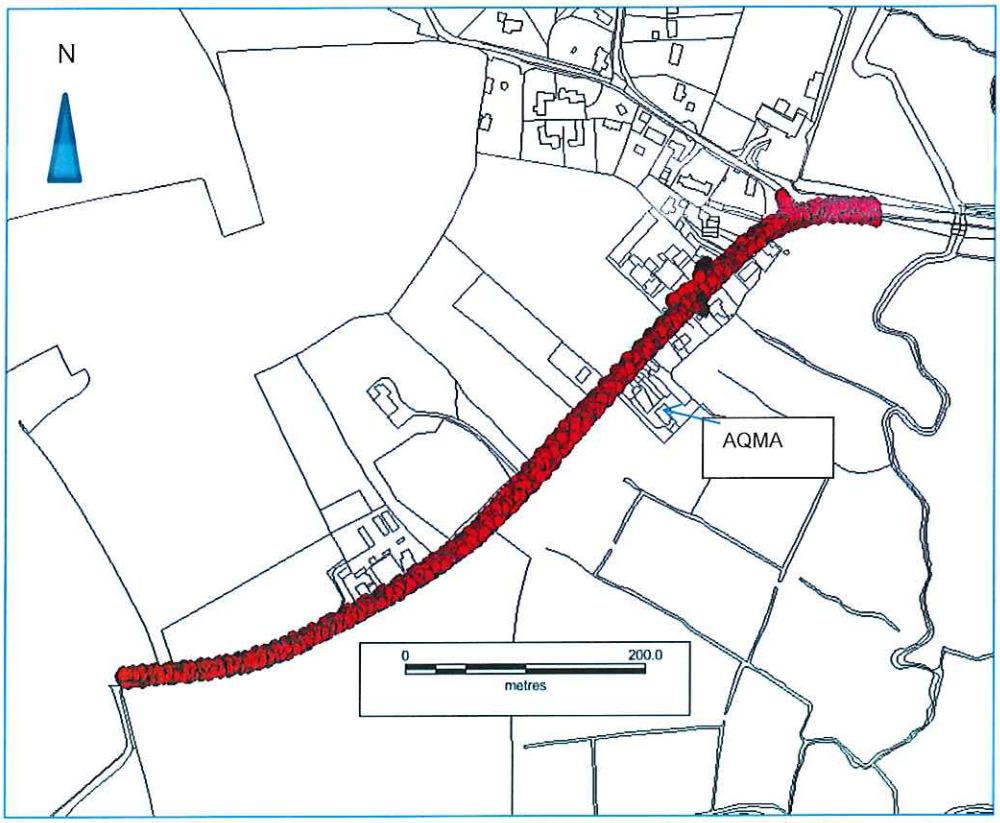


Figure 1: All driving cycle data points collected within Stratford St. Andrew

All logged data were checked in terms of spatial and operational integrity and were then processed into a format suitable for emissions modelling. Data were processed to identify individual driving cycles by time of day with specific driving styles and direction of travel and statistics including relative positive acceleration, deceleration, idling time, average speed at different times of day were calculated.

In this report, vehicles travelling in the northbound direction refer to those travelling essentially north-east into Stratford St. Andrew from Ipswich in the west. Vehicles travelling south-west are termed travelling in the southbound direction from Lowestoft, i.e. leaving the village with the AQMA located on the left.

Drive cycle statistics

The average speeds for the three driving styles and two scenarios across all runs in the morning and the afternoon, by direction of travel are summarised in Table 1. The table shows data for the entire route and for those data points collected immediately adjacent to the AQMA.

Across the route, the aggressive driving styles tended to have a higher average speed than the passive and typical driving styles, of 34 miles per hour (55 km/h) across the entire drive cycle (as given in Figure 1). The average speed adjacent to the AQMA at Long Row cottages was generally lower, For example, under typical driving styles, the average speed in the northbound direction was 29 mph and in the southbound direction towards the 50 mph sign this was between 28 mph to the speed limit of 30 mph. The

maximum speed recorded under typical driving styles adjacent to the AQMA was 37 mph in the southbound direction.

Table 1 shows average speeds determined following a typical driving style for scenarios representing moving the sign further out of the village. For these, the values for the morning and afternoon periods are similar to driving behaviour conducted during the inter-peak period. At this stage, the results show that average speeds are similar to those in style 1 both across the entire route and adjacent to the AQMA, i.e. there is no obvious reduction in average speed when leaving the village if the speed limit is relocated. However the maximum speed is lower at 31 mph compared to that recorded in style 1.

In fact, the average speed across all three driving styles including the two scenarios is 30.4 mph with a standard deviation of ~2.2 mph. Hence, there would appear to be a reasonable level of consistency regarding average speed.

Table 1: Average speeds by direction, time of day and driving style (values given in miles per hour).

Direction	Time of day	Average speed (mph)				
		Style 1 (typical)	Style 2 (passive)	Style 3 (aggressive)	Scenario 1 (100 m sign)	Scenario 2 (200m sign)
Entire route Northbound	AM	33	31	34	31	32
	PM	32	29	34	31	32
AQMA Northbound	AM	29	28	27	27	28
	PM	29	29	31	27	28
Entire route Southbound	AM	35	33	34	32	31
	PM	29	33	35	32	31
AQMA Southbound	AM	27	30	28	31	29
	PM	30	29	30	31	29

For similar average speeds, transient driving behaviour can have a profound effect on the emissions profile. In other words emissions can vary considerably for similar average speeds. The following analysis is aimed at examining those transient effects.

The number of acceleration, deceleration and idle (stationary) events are illustrated for runs with **typical** driving styles in Figure 2 and Figure 3 overleaf. Over the entire route, the proportion of acceleration and deceleration events is similar at 50:50 with very little idling time although there are a slightly higher proportion of vehicles accelerating in the southbound direction compared to northbound.

Figure 2: Proportion of acceleration, deceleration and idle time, typical driving style, northbound direction across entire drive cycle route.

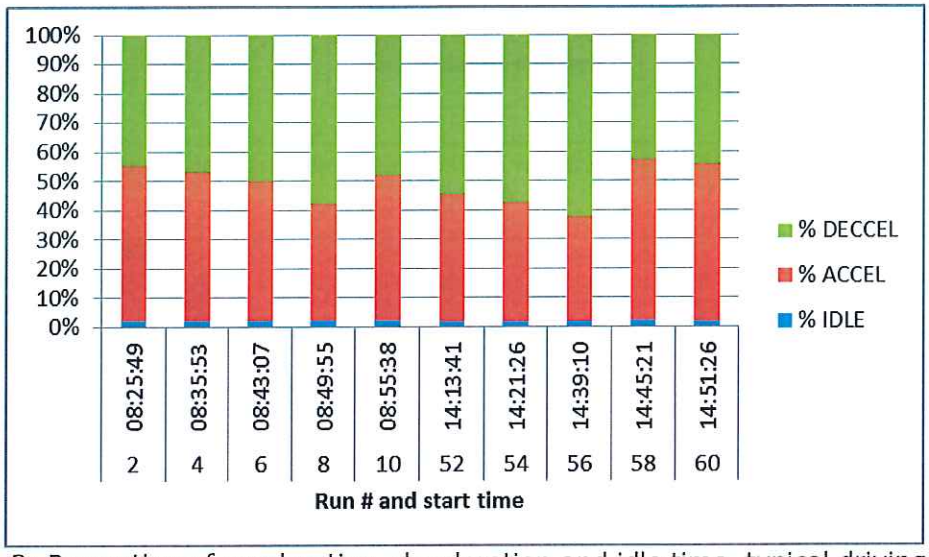


Figure 3: Proportion of acceleration, deceleration and idle time, typical driving style, southbound direction across entire drive cycle route.

Parts of the drive cycle that relate to the section of road adjacent to Long Row cottages show that there are many more acceleration events in the southbound direction (i.e. vehicles leaving the village accelerating from 30 to 50 mph) compared to those vehicles entering the village who are reducing their speed towards the 30 mph sign (see Figure 4 and Figure 5).

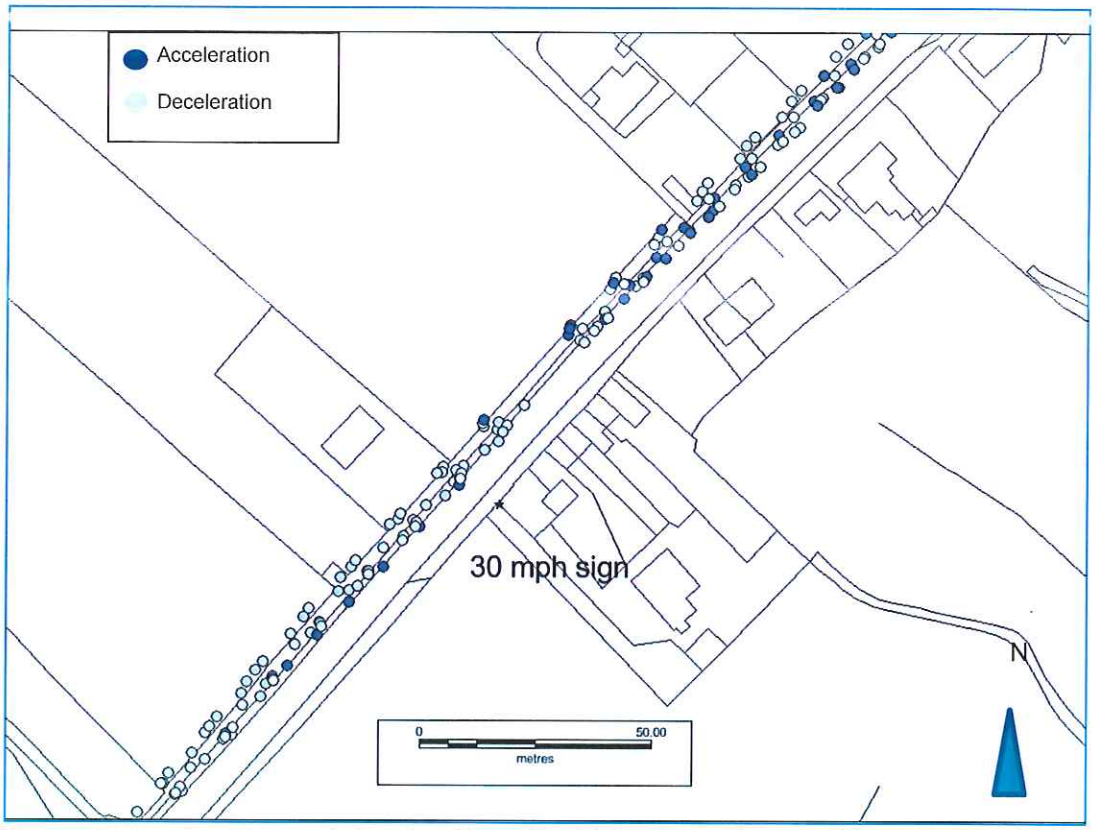


Figure 4: Acceleration and deceleration of vehicles travelling northbound close to the AQMA.

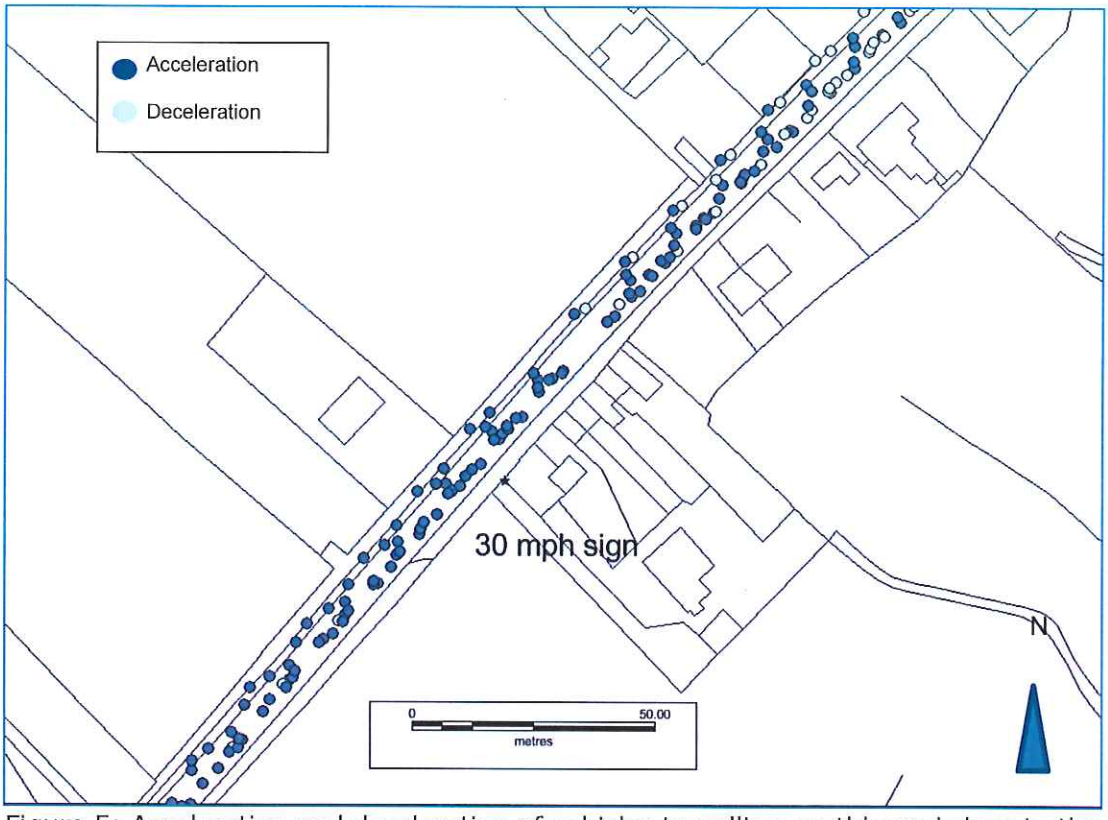


Figure 5: Acceleration and deceleration of vehicles travelling southbound close to the AQMA.

Emissions Profiles

Overview

This section provides the results of the emissions modelling to determine average emission profiles from the range of driving styles tested. By averaging the emissions within specific distance bands (i.e. every 15 meters) and then summing the result across the complete drive cycle(s), emissions from the light duty and heavy duty vehicles can be distinguished.

Table 2 summarises the results of the emissions modelling according to direction, time-of-day and driving style along the entire survey section of the A12. As expected, the typical driving style emissions are very similar to passive driving. In some cases a passive style of driving is not ideal in terms of emissions because the engine is not being optimised in terms of power demand. This means that driving very cautiously often means using a lower gear and hence the engine is working harder than required. Also, acceleration events may occur from a lower baseline speed which can ultimately cause high emissions. A passive form of driving however means that speed is generally lower which has safety benefits. Adopting an aggressive driving style would tend to increase emissions which would have an adverse effect on air quality.

Table 2: Total NO_x emissions along the A12, Stratford St. Andrew.

Direction (Period)	Driving style	Total NOx emissions (g)	
		Light Duty Vehicles (cars, taxis, LGVs)	Heavy Duty Vehicles (HGV, Buses and Coaches)
EB (AM)	Typical	0.18	3.57
WB (AM)	Typical	0.22	4.04
EB (PM)	Typical	0.20	3.70
WB (PM)	Typical	0.19	3.45
EB (AM)	Passive	0.22	4.17
WB (AM)	Passive	0.20	3.89
EB (PM)	Passive	0.23	3.84
WB (PM)	Passive	0.24	3.78
EB (AM)	Aggressive	0.33	5.35
WB (AM)	Aggressive	0.34	5.15
EB (PM)	Aggressive	0.25	3.91
WB (PM)	Aggressive	0.30	4.24

The results in Table 2 suggest that the lowest emissions occur in the afternoon (PM) period in the southbound direction (i.e. out of the village), by adopting a typical driving style. The second lowest emissions occurred in the northbound direction in the morning (AM) period again when adopting a typical driving style. On the whole this is fairly reassuring because it suggests that the general traffic situation may be optimum in terms of emissions throughout the survey section.

This summary table does not provide an indication of where these emissions occur along the A12. This is an important issue in terms of dealing with managing the situation within the AQMA. A detailed analysis of these emissions is provided in the tables in the sections following. Figures showing these emission profiles for the typical driving style are given in Figures 6 to 13.

Figures 6 to 13, which follow, show average speed (in km/h) verses NO_x emissions – separately for light duty vehicles (LDV) and heavy duty vehicles (HDV) for north and southbound journeys along the drive cycle. The figures indicate the position of the speed limit sign, AQMA, fuel station and the bend in road in both directions.

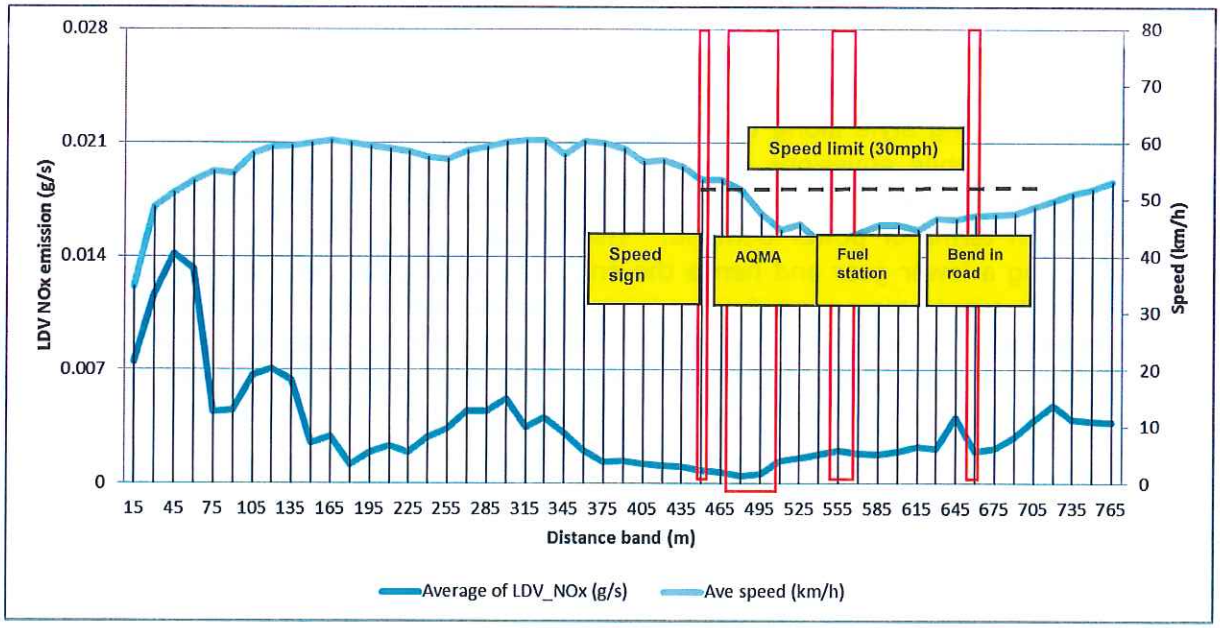


Figure 6: LDV emissions and average speed profile across the drive cycle, typical driving (AM period), northbound.

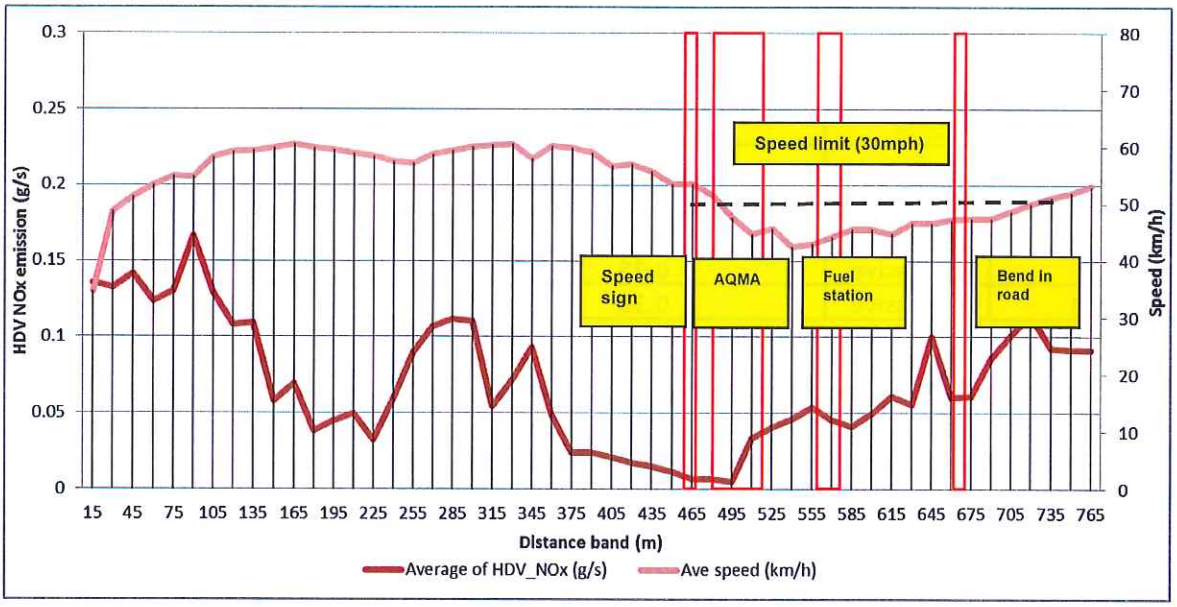


Figure 7: HDV emissions and average speed profile across the drive cycle, typical driving (AM period), northbound

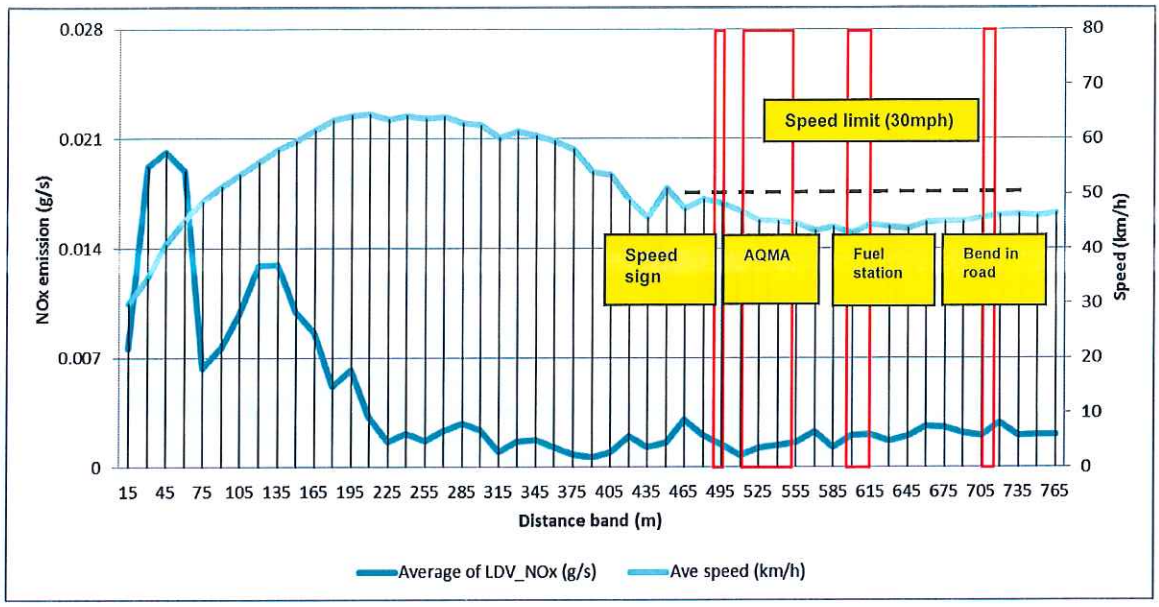


Figure 8: LDV emissions and average speed profile across the drive cycle, typical driving (PM period), northbound.

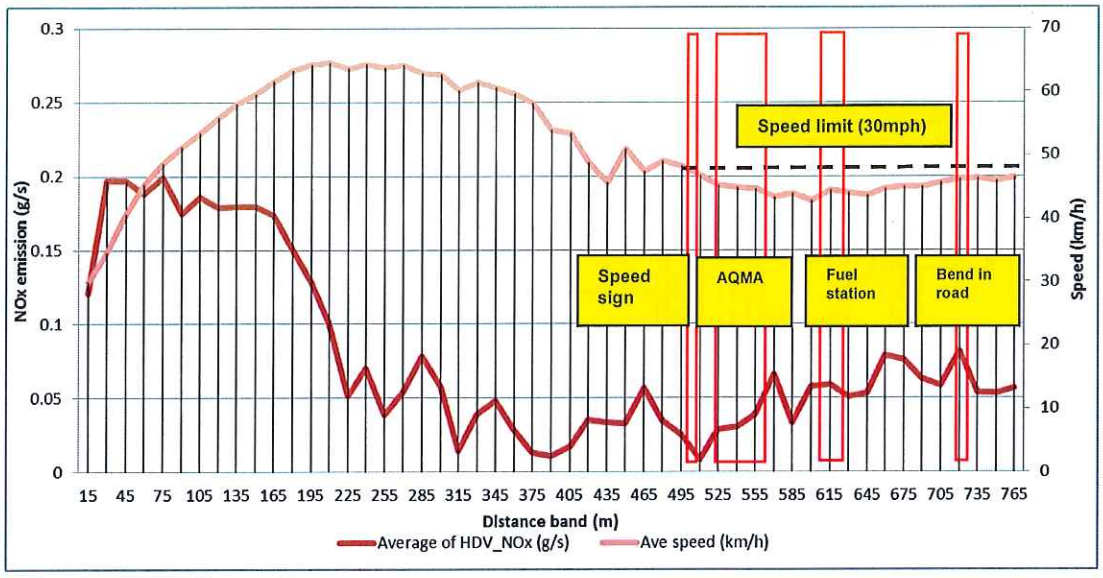


Figure 9: HDV emissions and average speed profile across the drive cycle, typical driving (PM period), northbound.

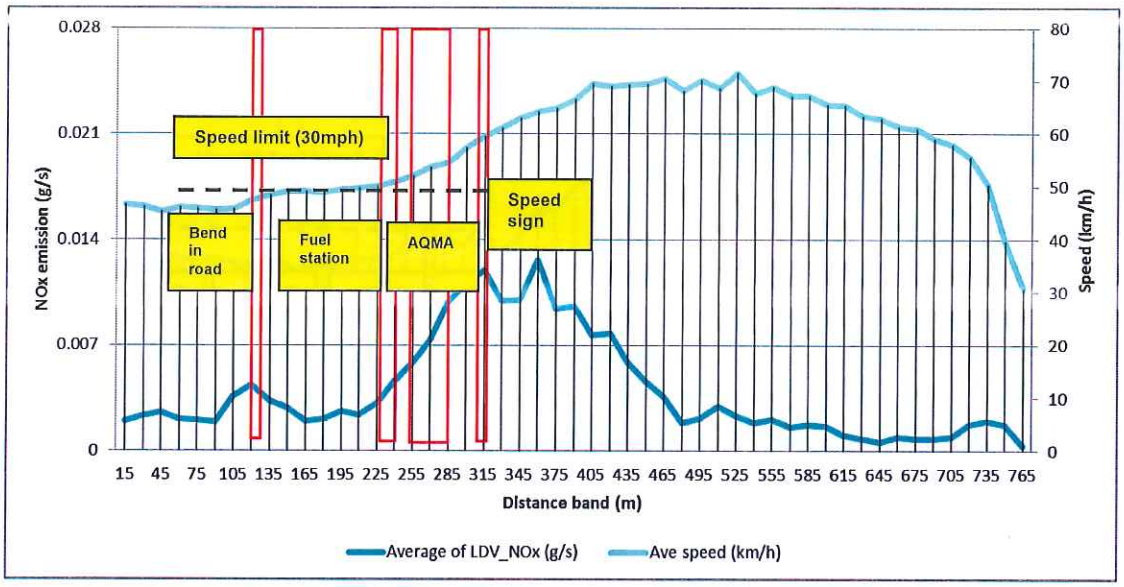


Figure 10: LDV emissions and average speed profile across the drive cycle, typical driving (AM period), southbound.

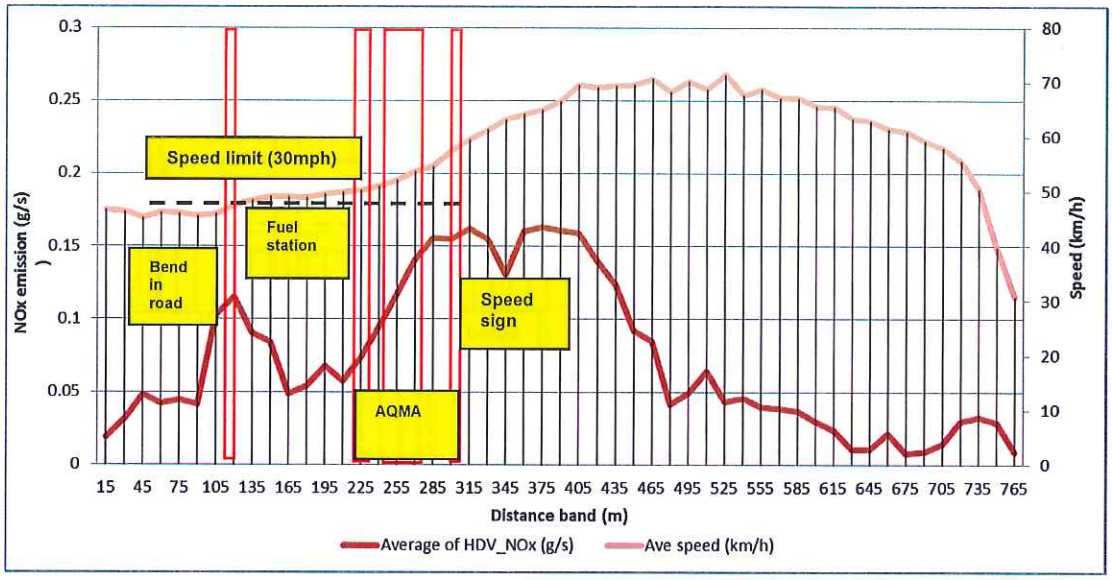


Figure 11: HDV emissions and average speed profile across the drive cycle, typical driving (AM period), southbound.

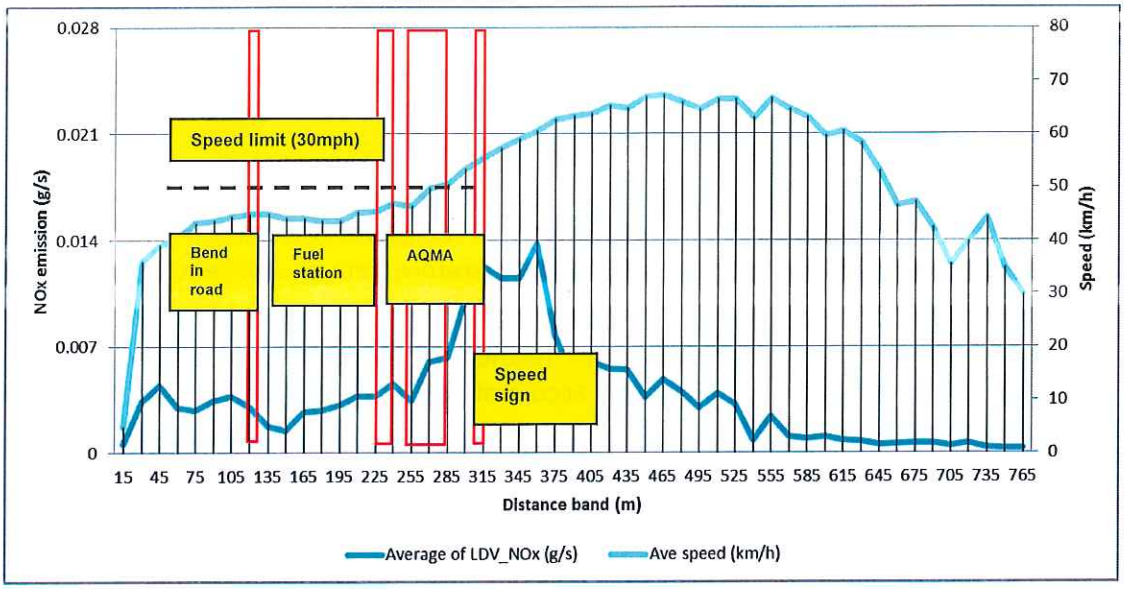


Figure 12: LDV emissions and average speed profile across the drive cycle, typical driving (PM period), southbound.

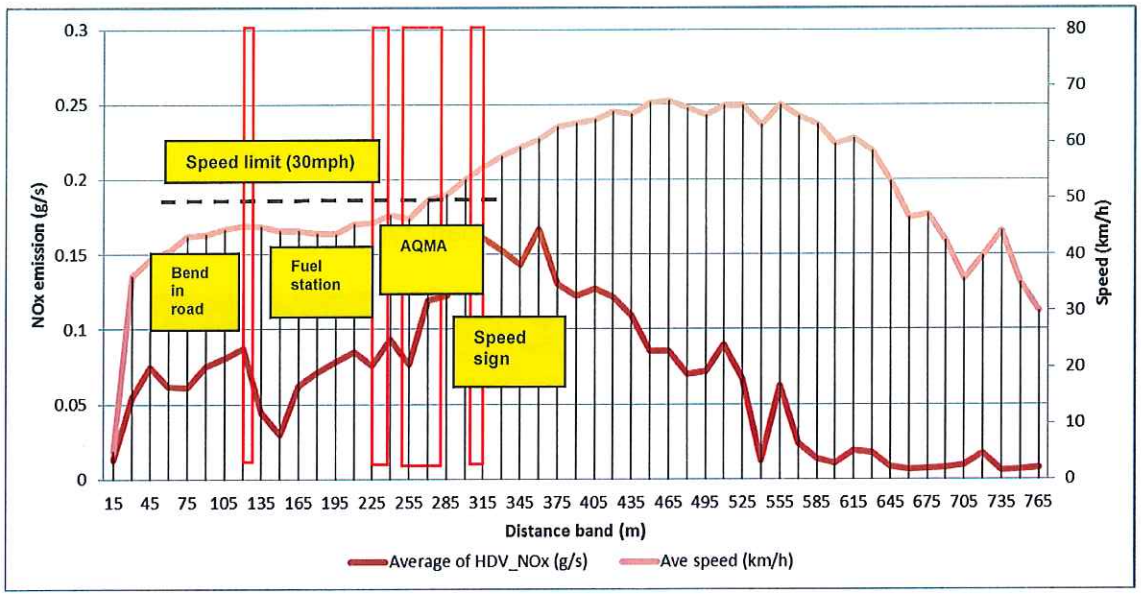


Figure 13: HDV emissions and average speed profile across the drive cycle, typical driving (PM period), southbound.

This detailed analysis was conducted primarily to answer the following questions:

1. Do vehicles turning right into and out of the fuel station in the southbound direction result in higher rates of accelerations and speeds and therefore result in an increase in emissions towards the AQMA?
2. Whether different driving styles result in different emissions at various points in the road. If so, can a suitable measure be identified to encourage a particular driving style with lower emissions and therefore reduce concentrations at the AQMA?
3. Would moving the speed limit sign further south out of the village result in vehicles reducing their tendency to accelerate past the AQMA and therefore could this reduce emissions?

Typical driving style

Morning traffic, northbound direction (Table 3)

The results show that vehicle speed reduces towards the 30 mph sign and then goes below 30 mph once in the AQMA and then gradually rises towards the bend in the road the other side of the village. Between the speed sign and the bend in the road the vehicle speed stays below or near to 30 mph.

On passing the 30 mph speed sign, emissions for light and heavy vehicles appear to be at their lowest point (10% and 20% of the maximum NOx value respectively) approaching the AQMA and then begin to rise in line with increased speed through the survey section.

Table 3: Summary of statistics at points in the road, typical driving (AM period), northbound.

	Typical driving (AM)		
		% of Max NOx value	
Northbound	Average Speed (mph)	LDV	HDV
Speed Sign	33	5%	4%
AQMA	28	10%	20%
Fuel Station	28	13%	25%
Bend in road	29	20%	52%

Afternoon traffic, northbound direction (Table 4)

A very similar speed profile to that of the morning period is observed although speeds are slightly higher through the survey section. The traffic speed appears to comply with the 30 mph through the survey section. NOx emissions are consistently lower than in the morning period particularly for light vehicles. The heavy vehicle emissions profile is similar to that of the morning period but NOx levels at three of the reference sites are slightly lower.

Table 4: Summary of statistics at points in the road, typical driving (PM period), northbound.

	Typical driving (PM)		
		% of Max NOx value	
Northbound	Average Speed (mph)	LDV	HDV
Speed Sign	29	15%	29%
AQMA	29	4%	4%
Fuel Station	27	7%	17%
Bend in road	28	11%	32%

Morning traffic, southbound (Table 5)

The gradient of the speed profile is fairly flat and vehicles appear to be below the 30 mph speed limit up to the bend in the road but then the speed begins to increase towards the 50 mph speed limit sign from the fuel station through the village. This gradual increase in speed from the fuel station has a gradual impact on NOx emissions. In terms of the percentage of the maximum NOx value the relative impact at the AQMA is higher than observed in the northbound direction. This is particularly evident for heavy vehicles where the maximum NOx value observed along the survey section occurs at the 50 mph speed limit sign.

Table 5: Summary of statistics at points in the road, typical driving (AM period), southbound.

	Typical driving (AM)		
		% of Max NOx value	
Southbound	Average Speed (mph)	LDV	HDV
Speed Sign	36	87%	95%
AQMA	32	46%	72%
Fuel Station	31	19%	35%
Bend in road	28	28%	63%

Afternoon traffic, southbound (Table 6)

The speed profile is similar to the northbound direction whereby vehicle speed remains well below the 30 mph speed limit, although there still seems to be a trend where speed generally increases from the bend in the road towards the 50 mph speed limit sign. Again there appears to be a slight dip in the speed as vehicles pass the fuel station and then an increase towards the AQMA.

This driving behaviour has a commensurate impact on NOx emissions. Emissions increase slightly as the vehicle accelerates out of the bend, decreases slightly on approach to the fuel station and then there is a general increase in the NOx emissions as the vehicle accelerates towards the 50 mph sign. There would appear to be a slight dampening effect of the acceleration events during this period of the day. This is seen by comparing the percentage of the maximum NOx emission value at the four marker locations with the morning period. It is also observed that the average speed at each of the marker locations is slightly lower than in the morning. The distribution of the

emissions according to the survey drive cycle is fairly balanced apart from the speed sign where vehicles accelerate more so.

Table 6: Summary of statistics at points in the road, typical driving (AM period), southbound.

	Typical driving (PM)		
		% of Max NOx value	
Southbound	Average Speed (mph)	LDV	HDV
Speed Sign	33	73%	86%
AQMA	29	25%	46%
Fuel Station	28	27%	51%
Bend in road	28	27%	48%

Passive Driving Style

This section discusses the conclusions drawn if a more passive driving style were to be adopted. By definition a passive driving style suggest something slightly more benign than what might be termed "typical". In other words the surveyor attempts to adopt a style considered to be on the cautious side.

Table 7 to Table 10 provide the average speed at the various marker locations which would be expected to be below the village speed limit of 30 mph. The only deviation from this being an exceedance observed passing the 50 mph speed limit sign (i.e. in the southbound direction).

As described previously, the passive style of driving did not result in reducing overall emissions through the surveyed section. However it does have an effect on emissions at the four marker locations. In terms of the percentage of the maximum NOx value, passive driving would appear to have a greater impact in the southbound direction (i.e. when compared to the typical style). At the AQMA the NOx emission with respect to the maximum value reduced by over 25%. There was no discernible effect in the northbound direction at the AQMA. This would suggest that if vehicle speeds were to be managed in a passive sense in the southbound direction **only**, then this would effectively reduce emissions at the AQMA. This is a reasonable conclusion to have some form of traffic calming in one direction only, but how could this be achieved without introducing further acceleration events which would have an adverse effect on emissions? This could be achieved by installing average speed cameras or vehicle activated cameras to encourage smoother driving styles.

Table 7: Summary of statistics at points in the road, passive driving (AM period), northbound.

	Passive driving (AM)		
		% of Max NOx value	
Northbound	Average Speed (mph)	LDV	HDV
Speed Sign	29	7%	15%
AQMA	28	11%	33%
Fuel Station	28	7%	21%
Bend in road	28	12%	37%

Table 8: Summary of statistics at points in the road, passive driving (PM period), northbound.

Northbound	Passive driving (PM)		
		% of Max NOx value	
	Average Speed (km/h)	LDV	HDV
Speed Sign	30	11%	32%
AQMA	29	8%	24%
Fuel Station	27	9%	28%
Bend in road	27	18%	50%

Table 9: Summary of statistics at points in the road, passive driving (AM period), southbound.

Southbound	Passive driving (AM)		
		% of Max NOx value	
	Average Speed (mph)	LDV	HDV
Speed Sign	32	49%	76%
AQMA	29	20%	42%
Fuel Station	27	21%	46%
Bend in road	28	13%	40%

Table 10: Summary of statistics at points in the road, passive driving (PM period), southbound.

Southbound	Passive driving (PM)		
		% of Max NOx value	
	Average Speed (km/h)	LDV	HDV
Speed Sign	32	92%	99%
AQMA	28	14%	33%
Fuel Station	28	15%	36%
Bend in road	26	11%	32%

Aggressive Driving Style

The aggressive style of driving was found to result in the highest emissions across the entire surveyed area. This is understandable as emissions are essentially the result of acceleration events; the harder the acceleration, the higher the emissions and the longer the acceleration event the higher the emissions.

At each reference location, the results show that the aggressive form of driving style actually had a positive effect on the percentage of the maximum NOx value compared to typical driving. The results are actually slightly more encouraging than adopting a passive style of driving at the AQMA in northbound direction in the morning and evening periods. A similar pattern is also shown for light and heavy duty vehicles in the southbound direction.

In the northbound direction the percentage of the maximum NOx value at the speed sign is low (similar to typical) which indicates that vehicles are decelerating at this point (see

Table 11 and Table 12). In the southbound direction, aggressive acceleration resulted in NOx emissions value being 100% (i.e. maximum) for light duty vehicles in the morning period and 100% for HDVs in the evening at the speed limit sign (see Table 13 and Table 14). This clearly indicates the tendency for vehicles to accelerate hard up to the speed sign and that this acceleration event is included within the AQMA.

These prolonged deceleration events in the northbound direction were found to actually reduce emissions compared to acceleration events and could then potentially improve air quality. However, the Council is unlikely to promote aggressive styles of driving as on the grounds of safety alone, promoting this type of driving can be discounted.

Table 11: Summary of statistics at points in the road, aggressive driving (AM period), northbound.

	Aggressive driving (AM)		
		% of Max NOx value	
Northbound	Average Speed (mph)	LDV	HDV
Speed Sign	39	2%	6%
AQMA	27	2%	7%
Fuel Station	25	9%	36%
Bend in road	29	9%	37%

Table 12: Summary of statistics at points in the road, aggressive driving (PM period), northbound.

	Aggressive driving (PM)		
		% of Max NOx value	
Northbound	Average Speed (km/h)	LDV	HDV
Speed Sign	40	2%	9%
AQMA	28	1%	4%
Fuel Station	25	9%	40%
Bend in road	28	10%	37%

Table 13: Summary of statistics at points in the road, aggressive driving (AM period), southbound.

	Aggressive driving (AM)		
		% of Max NOx value	
Southbound	Average Speed (mph)	LDV	HDV
Speed Sign	31	100%	97%
AQMA	27	14%	43%
Fuel Station	26	6%	17%
Bend in road	21	7%	23%

Table 14: Summary of statistics at points in the road, aggressive driving (PM period), southbound.

	Aggressive driving (PM)		
		% of Max NOx value	
Southbound	Average Speed (mph)	LDV	HDV
Speed Sign	33	94%	100%
AQMA	30	10%	35%
Fuel Station	29	9%	30%
Bend in road	26	9%	36%

Appendix B: Response to Consultation

Table A.1 – Summary of Responses to Consultation and Stakeholder Engagement on the AQAP

Consultee	Category	Response
District Councillor	Local authority	I think I made my comments at the briefing we had regarding the situation in Stratford St. Andrew - and I suppose my only thought was how it could be improved knowing one of the reasons for the build-up of pollution being the cars entering and exiting the garage and the necessary car engine operations needed to slow down or speed up as the case may be. I think moving the 30 mph signs was one suggestion - but .....As always an excellent piece of work.
Stratford St Andrew Parish Council	Local authority	The 50mph sign going south out of the village is right next to this row of cottages and it is our view that when drivers see this sign they speed up towards it thus increasing emissions. We have written before about this matter, there is no buffer zone between the 30mph limit and 50mph limit thus giving drivers insufficient time to slow down adequately before reaching the village. It also means they speed up before they are out of the village proper. This is the case both southbound and northbound in both Stratford St Andrew and Farnham.
Member of the Public, Long Row, Stratford St Andrew	Member of the Public	As occupiers of the above cottage we are extremely worried about the above. As Mrs Lavender pointed out, and of course we are well aware, the traffic starts speeding up outside our cottages, because of the badly placed 50 mile per hour road sign. In the short time, wouldn't it be prudent to move this sign further down the A12, then hopefully the traffic will not accelerate outside out cottages? ... Obviously, because of the air pollution, no extra traffic should be allowed through this part of the village, and perhaps Sizewell should be made aware of this, on our behalf.

Response to draft Action Plan Consultation in August / September 2017		
Farnham with Stratford St Andrew Parish Council	Local authority	The Farnham with Stratford St Andrew Parish Council agrees with the action to move the 30 mph sign further south at least 200 metres out of the village at a cost of £20,00 to be completed Autumn 2017. The PC has concerns over the effective re-locating of the 30mph sign. The PC notes that a location has already been decided on and would welcome information as to where the proposed site is – at least 200 metres from the village boundary or at least 200 metres from where the sign is now? The PC agrees that potential Planning applications within the AQMA are not likely to have a large impact on air quality except for the SZC planning application. The PC is concerned that the impact on the air quality in AQMA and Stratford and Farnham as a whole from the SZC planning application will prove to be far greater than current studies indicate. The PC is not convinced that Mitigation measures could be sufficient to maintain the annual mean objective for air quality. Out of the long term and aspirational measures included in the AQAP, the Parish Council considers that the Average speed camera system throughout Stratford St Andrew and Farnham, is the most effective option. This needs to move from aspirational to actioned asap if monitoring after the sign has been moved continues to indicate that the annual mean objective is not being consistently achieved. The PC requests that it is included amongst the bodies that receive the results of regular annual monitoring and hopes that the first monitoring will be scheduled as soon as possible after the repositioning of the sign. The other long term and aspirational measure which would mitigate the entire problem is the four village by pass
District Councillor	Local authority	Most interesting report – and I am pleased that the Felixstowe AQMA has been revoked and that the proposed action for Stratford St. Mary by simply moving the 30 mph sign will be successful.

Action Plan Appraisal Report from Defra with response from Suffolk Coastal District Council

This Appraisal Report covers the draft Air Quality Action Plan submitted by Suffolk Coastal District Council for the Stratford St Andrew AQMA. The Plan sets out information on air quality obtained by the Council as part of the Local Air Quality Management process required under the Environment Act 1995 and subsequent Regulations.

The Plan states that it will be reviewed annually, with progress reports also issued annually, both to the Council and to Defra through the ASR system.

The core actions suggested by the Council and set out in the report have considered local source apportionment and emissions reductions have been modelled. These are:

1. Re-locate the 30 mph speed limit sign to 200 metres outside of the village.
2. Review and consider planning applications on the basis of air quality impact
3. Longer term measures include the inclusion of speed activated signs, speed cameras and the possible construction of a bypass around St Andrew's village. In addition, reducing the emissions from the possible expansion of the Sizewell site is also considered.

The Council is advised to take consideration of the further commentary in the finalisation of its action plan.

Commentary

Summary: The draft plan is well presented and proportionate to the small area covered by the AQMA. Acknowledgement is given that the main measure may or may not achieve the required result and that further action may be required. It would have been useful to see the outputs from the drive cycle study that was conducted that is referred to in the Action Plan, to help the ascertain more information on the likely impact of the measure. In addition, including information on the non-air quality impacts of the measure would have been informative.

Supporting data: The draft plan summarises in a good succinct manner the nitrogen dioxide concentrations that have been recorded in Stratford St Andrew and the local issues.

To support the development of measures, source apportionment has been presented. For traffic contributions, an estimate of the split between private hire and private vehicles would have been useful for diesel car emissions.

Level of ambition: The Council are limited in what they can realistically achieve given the location of the problem and therefore what has been suggested is a reasonable way forward at the current time. However, it is noted that the target pollution reduction in the AQMA is only 2μg/m^3 and yet it appears that a higher reduction may be required for the annual mean

nitrogen dioxide objective to be met, as in 2015 NO_2 concentrations of 43 and 44µg/m^3 were recorded at the STA1 and STA8 sites respectively. Therefore, if the re-location of the 30mph speed limit sign does not have the desired effect, the Council are encouraged to take steps as soon as possible to implement further actions.

Analysis: As mentioned previously it would have been useful to see the outputs from the drive cycle study. In addition, it would have been useful to include some information on the non-air quality impacts of the measures. Cost information is provided and this is welcomed.

Monitoring progress: Key indicators are provided for each of the measures. However, these could be more robust as at present it states, "reduction in NO_2 concentrations". It would be good to see more of a firm indicator.

Additional impacts: No information is provided on the co-impacts of the measures presented, i.e. their impact on other environmental or social issues other than air quality. This could help make the case for the Core and supporting measures. These could be on a qualitative basis and demonstrate how the Plan contributes towards broader social and environmental goals for the local authority area.

This commentary is not designed to deal with every aspect of the Action Plan. It highlights a number of issues that should help the local authority in maintaining the objectives of its Action Plan, namely the improvement of air quality within the AQMA.

Issues specifically related to this appraisal can be followed up by returning the attached comment form to Defra, Welsh Assembly Government, Scottish Government or DOE, as appropriate – or by emailing the form to reportappraisal@ttr-ltd.com.

For any other queries please contact the Local Air Quality Management Helpdesk:

Telephone: 0800 0327 953

Email: LAQMHelpdesk@uk.bureauveritas.com

Appraisal Response Comment Form

Contact Name:	
Contact Telephone number:	
Contact email address:	

Comments on appraisal/Further information:

Thank you for your comments on our draft Action Plan for Stratford St. Andrew, we have liaised with the Consultants who undertook this piece of work on our behalf (TRL). We have provided a response to those comments of relevance together with additional information where needed, as follows;

Appraisal comment:

It would have been useful to see the outputs from the drive cycle study that was conducted that is referred to in the Action Plan, to help the ascertain more information on the likely impact of the measure.

SCDC response:

The outputs from the drive cycle study were presented in the Further Assessment undertaken for this AQMA. We will amend the text in the final Action Plan to reference the results summary and include the data within an appendix. This alteration will be made to the final Action Plan following the Public Consultation.

Appraisal comment:

For traffic contributions, an estimate of the split between private hire and private vehicles would have been useful for diesel car emissions.

SCDC response:

We do not have this data for this location.

Appraisal comment:

It is noted that the target pollution reduction in the AQMA is only 2µg/m^3 and yet it appears that a higher reduction may be required for the annual mean nitrogen dioxide objective to be met, as in 2015 NO_2 concentrations of 43 and 44µg/m^3 were recorded at the STA1 and STA8 sites respectively. Therefore, if the re-location of the 30mph speed limit sign does not have the desired effect, the Council are encouraged to take steps as soon as possible to implement further actions.

SCDC response:

The latest monitoring data (2016 recently bias corrected) highlights that the current margin of exceedance has reduced again to 2µg/m^3 at STA8 in the AQMA. This reduction supports the adoption of the main Action Plan measure of relocating the speed limit sign, which together with future emissions reductions from the introduction of newer cleaner vehicles, should result in the early achievement of the air quality objectives in the AQMA.

Appraisal comment:

Key indicators are provided for each of the measures. However, these could be more robust as at present it states, "reduction in NO_2 concentrations". It would be good to see more of a firm indicator.

SCDC Response:

We collected speed data within the AQMA as part of the Further Assessment and will repeat this process post implementation of measures 1, 3, 4, 5, and 6 in order that 'reduction in vehicle speeds' can also be added as another key performance indicator for these Action Plan measures. A second key performance indictor for Measure 7 (possible bypass) will also be added – 'reduction in traffic flows within the AQMA'. These alterations will be made to the final Action Plan following the Public Consultation.

Appendix C: Reasons for Not Pursuing Action Plan Measures

Table C.1 – Action Plan Measures Not Pursued and the Reasons for that Decision

Action category	Action description	Reason action is not being pursued (including Stakeholder views)
Traffic Management	Move the A12 road westwards by 1 metre.	Modelling shows that this would be unlikely to result in a measurable reduction in NO_2 concentration at the receptor and there would be a high cost associated with this
Other	Painting the buildings or roads/pavements with Titanium dioxide	Results from other studies show that there is inconclusive evidence that this measure would reduce NO_2 concentrations in this type of environment. Concerns also raised by Suffolk County Council regarding durability of the paint and the potential to reduce skid resistance on the road surface.

Appendix D: Additional modelling to consider Sizewell C

As part of the Council's Air Quality Further Assessment (Savage and Turpin, 2015), the impact of measures to reduce acceleration events leaving the village in the southbound direction were tested based on data from a drive cycle survey. The modelling assessment showed that the annual mean NO_2 objective could potentially be achieved by moving the existing 50 mph sign 200 metres out of the village and installing average speed cameras in both directions.

Traffic along the A12 is predicted to increase in the future and this may be further exacerbated if the current proposals for the Sizewell C nuclear power station go ahead. Therefore to consider the potential impact this could have on annual mean NO_2 concentrations within the AQMA, additional modelling was conducted for the planned peak construction year of 2024. By then, the traffic flow without Sizewell C is predicted to increase to more than 18,000 vehicles per day (from approximately 15,000 in 2014) and the additional traffic associated with Sizewell is given in Table D.1. This has been estimated based on information given by WSP as part of initial modelling conducted in 2014. It is noted that there ongoing refinements to these data, so these figures are considered to be indicative only.[7]

Table D.1. Indicative additional traffic data on the A12 at Stratford St. Andrew due to Sizewell C for peak construction year, 2024

Vehicle type	Additional daily traffic
HGVs	375
Buses	210
LGVs	300
Cars	330
Total	**1215**

These data were used to re-compile the fleet weighted emissions to re-model annual mean NO_2 concentrations within the AQMA for the year 2024. Based on the drive

[7] Personal communication, David Deakin, Aecom on behalf of EDF Energy

cycle data from the further assessment, the model was re-run firstly assuming that no new signs or cameras are installed and then assuming that these are in place in this year (i.e. drivers adopt a more passive style with less acceleration events).

Initially, a conservative approach was taken using Defra's recommended method. The vehicle fleet for 2024 was taken from Defra's Emission Factor Toolkit (EFT) which assumes that the national vehicle fleet will be much cleaner. For example, all articulated heavy goods vehicles are predicted to be Euro VI emission standard. In addition, the contribution from the background pollution is predicted to decline. The background maps provided by Defra have recently been revised in July 2016 based on 2013 monitoring data[8], these estimate that the nitrogen oxide (NO_x) concentration in Stratford St. Andrew will be 7.9 µg/m^3 and the NO_2 concentration would be 6.1 µg/m in 2014. This is a large reduction compared to the 2014 background value of 15.5 µg/m^3 for NO_x and 10.7µg/m^3 for NO_2 that was used in the original further assessment modelling[9] (undertaken using the previous set of Defra background maps). The results of this conservative modelling based on these assumed improvements to future fleet, changes to traffic flows and reductions in background contribution are shown in Table D.2.

Table D.2. Predicted modelled annual mean NO_2 concentration in 2024 at site STA1

Situation	Annual mean NO_2 concentration (µg/m^3)	
	No signs or cameras (typical driving)	With signs/cameras (passive driving)
With Sizewell	21.1	19.0
No Sizewell	20.9	18.9

These results show that the impact of the increased total traffic associated with Sizewell C would be an increase of NO_2 concentrations of less than 0.5 µg/m^3 within the AQMA (i.e. 1 percent increase). Despite an increase in total daily traffic flow of approximately 5 percent (with an increase in HGV flow of 2 percent), this is a relatively small increase in concentrations. This is to be expected with the overall level of traffic flow on the road and constant background concentration. Table D.2.

[8] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2013
[9] https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2011

also shows that if the measures proposed in the action plan were in place by 2024, then these could contribute to a reduction of around 2-3 $\mu g/m^3$. However, in all situations, this modelling approach predicts that the annual mean NO_2 objective would be easily met within the AQMA in 2024 (also see Figure D.1).

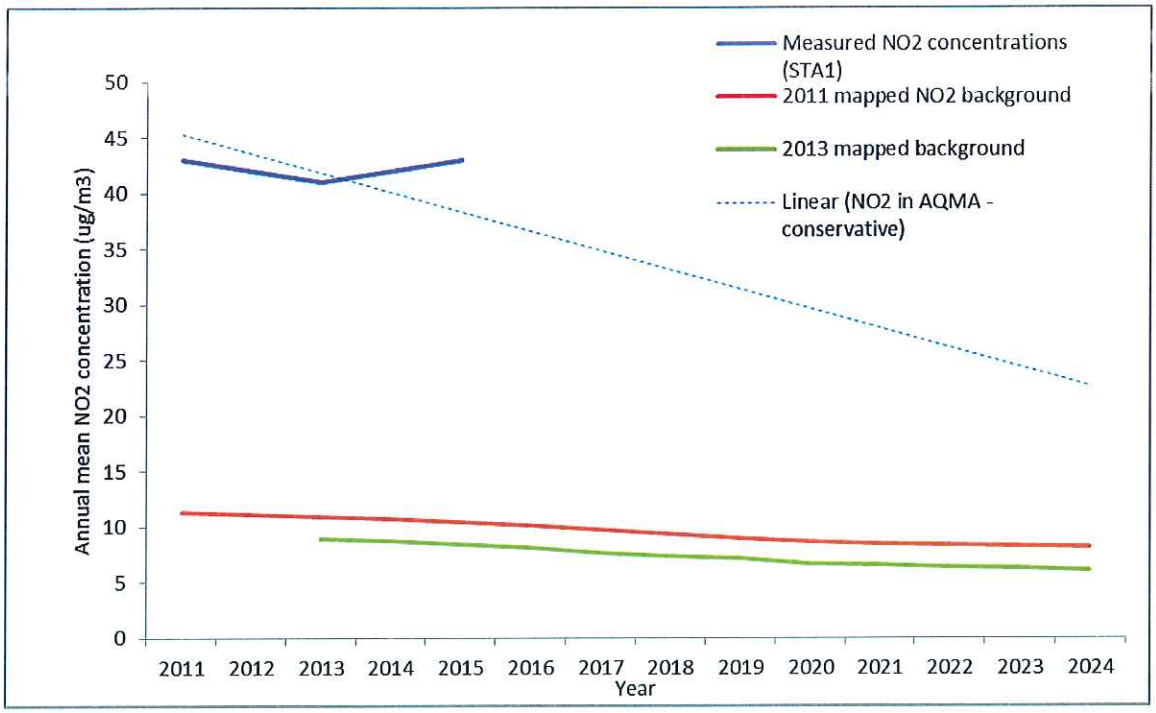


Figure D.1. Conservative modelled reduction in NO_2 concentration (dotted line) within the AQMA in 2024 compared to predicted background concentrations and existing measured concentrations.

The results provided above make use of Defra's currently approved method, i.e. based on their assumed fleet and projected improvements in background concentrations. However, caution should be taken when considering these results. Figure D.1 illustrates that the predicted future modelled NO_2 concentrations are not in line with the predicted reduction in background concentrations (based on either the 2011 or 2013 monitoring data) or the existing monitoring results within the AQMA which are not declining. Recent evidence has shown that on-road NO_x emissions from diesel vehicles do not meet the set Euro 5/V and Euro 6/VI emission standards, particularly for light duty vehicles. To take this into account, the model was re-run to consider a worst-case situation as outlined below:

- Background concentrations were considered to decline more in line with the 2011 background maps which were used in the previous modelling (i.e. NO_2 concentration will be 8.1 µg/m^3 in 2024 as shown in Figure D.1.)
- NO_x emissions from Euro 5 diesel cars and LGVs were 3 times higher and Euro 6 were 2 times higher than previously assumed.
- HGV NO_x emissions stayed the same for Euro V and Euro VI vehicles.
- No further changes were made for the future vehicle fleet breakdown as without any data on the local fleet, it is assumed that the fleet will renew in line with national predictions.

The results of the worst case scenario are given in Table D.3. These show that the modelled concentrations in 2024 based on the more worst-case assumptions will be below the objective but noticeably higher than in the more conservative approach. These reductions from the worst case modelling appear to be more in line with the background reductions as shown in Figure D.2 compared to the conservative predictions.

Table D.3. Worst case modelled annual mean NO_2 concentration in 2024 at site STA1

Situation	Annual mean NO_2 concentration (µg/m^3)	
	No signs or cameras (typical driving)	With signs/cameras (passive driving)
With Sizewell	34.4	31.3
No Sizewell	34.2	31.1

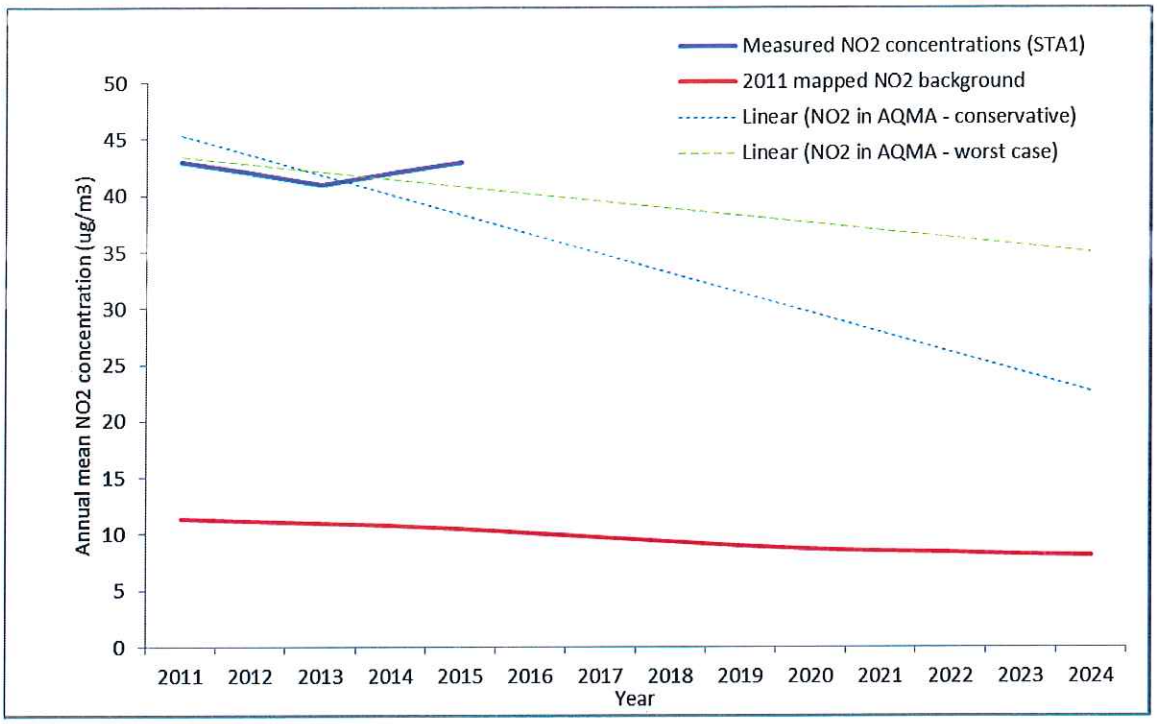


Figure D.2. Worst case modelled reduction in NO_2 concentration (green dotted line) within the AQMA in 2024 compared to the more conservative prediction

Appendix E: Steering Group members

The Steering Group members for this action plan are given in the table below.

Name	Job title
Councillor Carol Poulter	Ward Councillor for Stratford St. Andrew and Cabinet Member for the Green Environment, Suffolk Coastal District Council
Councillor Andrew Reid	Ward Member for Wilford Division covering Stratford St. Andrew, Suffolk County Council
Daniel Pont replaced by Viviane Garland	Farnham with Stratford St Andrew Parish Council
Deborah Tayler	Clerk to Farnham with Stratford St. Andrew Parish Council
Andrew Reynolds	Environmental Protection Manager, Environmental Protection, Suffolk Coastal District Council
Denise Lavender	Environmental Protection Officer, Environmental Protection, Suffolk Coastal District Council
Louise Burns	Environmental Protection Officer, Environmental Protection, Suffolk Coastal District Council
David Chenery replaced by Steven Merry	Assistant East Area Highways Manager, Resource Management, Suffolk County Council
Suzanne Buck replaced by Steven Merry	Transport Policy & Development Manager, Transport Strategy, Strategic Development, Suffolk County Council
Steven Merry	Transport Policy & Development Manager, Resource Management, Suffolk County Council
Lisa Chandler	Sizewell C Planning Project Advisor, Sizewell project Team, Suffolk Coastal District Council
Phillip Perkin	Principal Planner (Major Projects), Development Management, Suffolk Coastal District Council

Glossary of Terms

Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
AQS	Air Quality Strategy
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
EFT	Emission Factor Toolkit
EU	European Union
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less

References

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