

Cheshire West and Chester Council Frodsham Air Quality Action Plan

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

January 2018



Cheshire West
and Chester

Cheshire West and Chester Council

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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 (LAQM) framework. It outlines the action we will take to improve air quality in the Frodsham air quality management area (AQMA) between 2017 and 2020.

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. There is also often a strong correlation with equality issues, because areas with poor air quality are also often the less affluent areas^{1,2}.

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion³. Cheshire West and Chester Council is committed to reducing the exposure of people in the Frodsham AQMA to poor air quality in order to improve health.

We have developed actions within the Frodsham AQMA that can be considered under five broad topics.

- Traffic management
- Freight and delivery management
- Public information
- Promoting low emission transport
- Promoting travel alternatives

Our main priority is reducing congestion and emissions.

Our secondary priority is to raise awareness of the issue and through this assist with the third priority of promoting the uptake of low emission vehicles. 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

¹ Environmental equity, air quality, socioeconomic status and respiratory health, 2010

² Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006

³ Defra. Abatement cost guidance for valuing changes in air quality, May 2013

regional and central government on policies and issues beyond Cheshire West and Chester Council's direct influence.

Responsibilities and commitment

This AQAP was prepared by Cheshire West and Chester Council with the support and agreement of the following departments:

- Regulatory Services
- Area Highways team

It is supported by modelling and detailed assessment work undertaken by Atkins Ltd.

This AQAP has been approved by:

Maria Byrne

Director of Place Operations

This AQAP will be subject to an annual review, appraisal of progress and reporting to the Council's air quality steering group. Progress each year will be reported in the annual status reports (ASRs) produced by Cheshire West and Chester Council, as part of our statutory LAQM duties. Any formal decisions will be subject to the appropriate approval route.

If you have any comments on this AQAP please send them to Environmental Protection at: Regulatory Services, Wyvern House, The Drumber, Winsford, Cheshire, CW7 1AH.

- Telephone: 0300 123 7038
- Email: environmentalprotection@cheshirewestandchester.gov.uk

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1 Introduction

This report outlines the actions that Cheshire West and Chester Council will deliver between 2017 and 2020 in order to reduce concentrations of air pollutants and exposure to air pollution within the Frodsham AQMA; thereby positively impacting on the health and quality of life of residents and visitors to the Frodsham area.

It has been developed in recognition of the legal requirement on the local authority to work towards national 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 three years at the latest and progress on measures set out within this plan will be reported annually through Cheshire West and Chester Council's annual status report.

2 Summary of current air quality in Cheshire West and Chester

2.1 Local air quality management

The Frodsham AQMA, which is located at the junction of the B5439 Fluin Lane and the A56 (see

Figure 2.1), was declared on 27 November 2015 due to monitored and modelled exceedances of the annual mean nitrogen dioxide (NO₂) objective of 40 micrograms per cubic metre (µg/m³). The AQMA encapsulates a section of Fluin Lane between the A56 and Langdale Way and a small section of the A56.

Figure 2.1 – Location and extent of Frodsham AQMA



A total of 18 residential properties⁴ are located within the AQMA boundary including:

- Numbers 2, 4, 6 and 8 Fluin Lane
- Numbers 70, 70a, 72, 72a, 74, 76 and 78 High Street
- Manor Farm, Bridge Lane
- Numbers 7, 8, 9 10, 11 and 12 Manor Farm Court.

The AQMA was declared based on the results of a detailed assessment⁵, which was undertaken due to monitored exceedances of the annual mean NO₂ objective at a number of diffusion tube sites in the vicinity of the Fluin Lane / A56 junction (see Table 2.2). Dispersion modelling undertaken in order to inform the detailed assessment confirmed that exceedances of the annual mean NO₂ objective were confined to the area in the vicinity of the junction and along Fluin Lane but that it may extend beyond the current boundary on High Street towards Trinity Gardens. The key contributors to exceedances of the objective at this location were identified within the detailed assessment as being slow moving and queuing traffic during peak hours at approaches to the Fluin Lane / A56 junction, coupled with the assumed presence of a street canyon⁶ along Fluin Lane resulting in the reduced dispersion of emissions.

2.2 Local air quality monitoring

Measurements of pollutant concentrations can be made by deploying analytical instruments that measure continuously and record average concentrations over specified time intervals, or by using simpler sampling devices such as diffusion tubes, which absorb pollutants over a longer time period and are subsequently analysed at a laboratory to give an average concentration for the sampling period.

Cheshire West and Chester Council operates a number of continuous air quality monitoring stations, the closest of which to the Frodsham AQMA is an urban background site located on Langdale Way, Frodsham (approximately 0.4 km east of the AQMA), the location of which is shown in Figure 2.2. Monitoring results obtained at this site in recent years are summarised in Table 2.1, however it should be noted that monitoring only commenced at this site in April 2014.

⁴ Cheshire West and Chester Council, 2015. Air Quality Management Area Order 2015 (No1).

⁵ Cheshire West and Chester Council, 2014. Air quality detailed assessment for Cheshire West and Chester Council: Frodsham – Fluin Lane / A56, March 2014.

⁶ LAQM Technical guidance TG(16) - Defra

Table 2.1 – NO₂ Monitoring results at Frodsham continuous monitoring station

Site ID	Site name	Site type	Air quality criteria	2014	2015
Frodsham	Langdale Way, Frodsham	Urban background	Annual mean (µg/m ³)	17.6 ^a	14.4
			Number of exceedances of hourly mean standard (200 µg/m ³)	0	0
^a Data capture less than 75%, therefore result should be treated with caution. Source: ratified monitoring data provided by Cheshire West and Chester Council.					

Cheshire West and Chester Council also measures NO₂ using diffusion tubes at locations within and around the Frodsham AQMA. A summary of the data obtained between 2011 and 2015 at the diffusion tube sites closest to the Frodsham AQMA are presented in Table 2.2, the locations of which are illustrated in Figure 2.2.

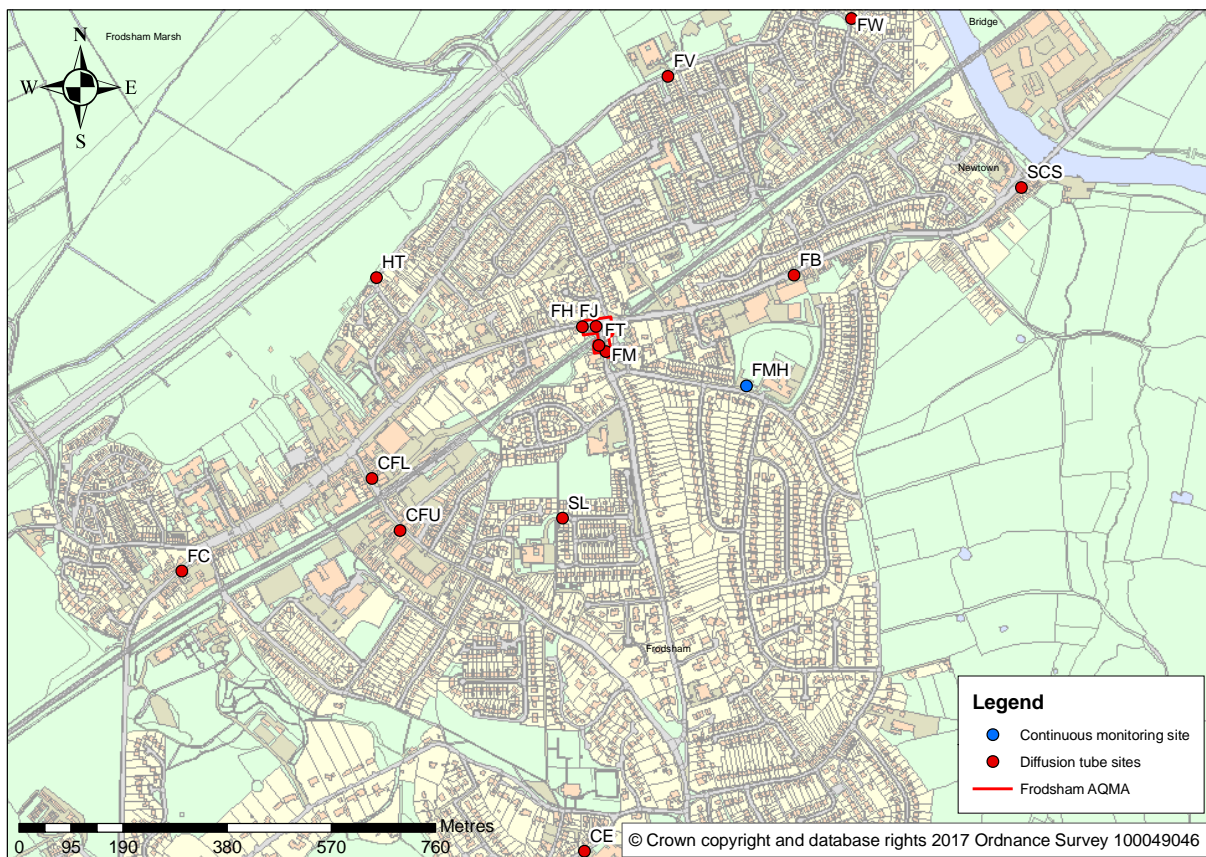
The monitoring results in Table 2.1 and Table 2.2 indicate that between 2011 and 2016:

- the annual mean NO₂ AQS objective was exceeded at three of the four diffusion tube sites in the Frodsham AQMA, namely:
 - site FH, High Street (72), in all years between 2012 – 2014 and 2016
 - site FJ, Fluin Junction, in all years between 2012 – 2016
 - site FM, Fluin Lane (rear of 10 Manor Farm Court), in 2012
- the annual mean NO₂ AQS objective was achieved at site FT, Fluin Lane (terrace), within the Frodsham AQMA, in all years during which monitoring was undertaken at this site (2014 - 2016)
- urban background NO₂ concentrations in the study area were well below the annual mean objective (40 µg/m³) in all years
- roadside NO₂ concentrations at locations in the study area, outside of the Frodsham AQMA, were below the annual mean AQS objective (40 µg/m³) in all years.

Table 2.2 – NO₂ diffusion tube results in Frodsham AQMA, 2011 - 2016 (µg/m³)

Site ID	Site name	Distance from AQMA (direction)	Site type	2011	2012	2013	2014	2015	2016
CE	Frodsham CE Primary School	0.9 km (S)	Roadside	-	-	15.5	14.5	-	-
CFL	Church Street (lower)	0.5 km (SW)	Roadside	-	-	33.1	31.9	29.4	31.7
CFU	Church Street (upper)	0.5 km (SW)	Roadside	-	-	27.4	-	-	-
FB	Bridge Lane	0.3 km (E)	Roadside	31.4	34.6	32.3	-	-	-
FC	Chester Rd (26)	0.8 km (SW)	Roadside	32.0	34.5	33.3	-	-	-
FH	High Street (72)	Within Frodsham AQMA	Roadside	-	45.5	40.3	41.7	39.7	46.2
FJ	Fluin junction		Roadside	43.1	47.6	44.7	42.6	41.3	42.2
FM	Fluin Lane (rear 10 Manor Farm Court)		Roadside	37.3	40.9	36.8	36.6	32.9	37.3
FT	Fluin Lane (terrace)		Roadside	-	-	-	36.3	33.9	36.3
FV	Frodsham Weaver Vale School	0.5 km (NE)	Roadside	-	-	21.7	21.4	21.3	-
FW	Woolley Close	0.7 km (NE)	Urban background	-	-	21.9	19.1	-	-
HT	Hawthorne Road (b)	0.4 km (NW)	Roadside	-	-	24.7	22.9	-	-
SCS	Sutton causeway south	0.8 km (E)	Roadside	-	-	34.6	34.5	30.8	-
SL	St Luke's Sch.	0.3 km (S)	Urban background	-	-	17.9	17.6	-	-

Figure 2.2 – Location of monitoring sites in vicinity of Frodsham AQMA



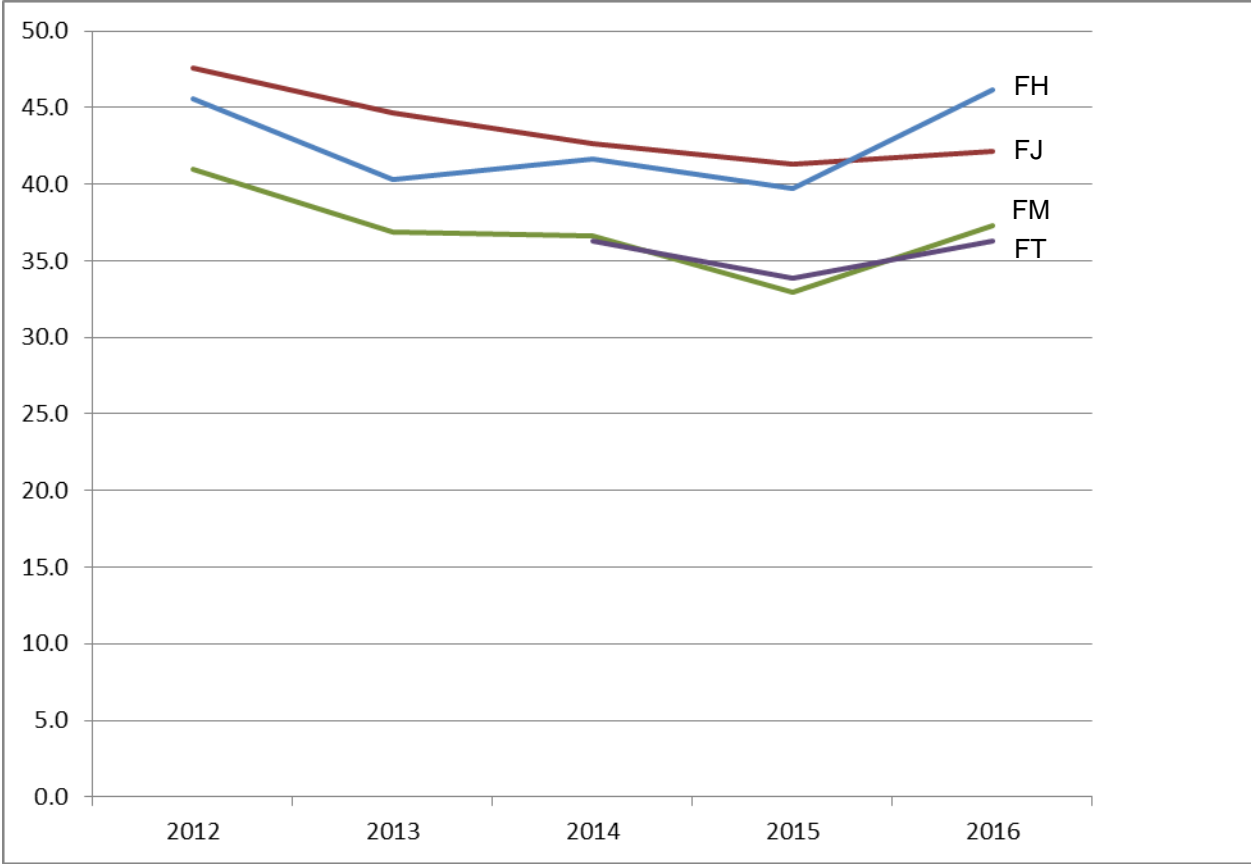
Map showing the locations of air quality monitoring sites in Frodsham as red and blue points on the map.

2.3 Monitored trends

Monitored annual mean NO₂ concentrations at the diffusion tube sites located within the Frodsham AQMA are shown in Figure 2.3. Monitoring data were available between 2011 and 2016 with the exception of site FT. These monitored trends in annual mean NO₂ concentrations indicate that:

- annual mean NO₂ concentrations at each monitoring site in the Frodsham AQMA are generally reducing over time with the exception of FH located on High Street; and as a result
- compliance with the annual mean NO₂ AQS objective (40µg/m³) is unlikely to be achieved at all locations by 2020 without intervention. (Prior to 2016 data being available, compliance at all monitoring locations by 2018 was predicted).

Figure 2.3 – Trends in annual mean NO₂ concentrations in Frodsham AQMA at monitoring sites FH, FJ, FM and FT



3 Cheshire West and Chester's air quality priorities

3.1 Planning and policy context

The Cheshire West and Chester local plan strategic policies document provides the overall vision, strategic objectives, spatial strategy and strategic planning policies for the borough to 2030.

STRAT 1 Sustainable development states that proposals should:

- provide for mixed-use developments which seek to provide access to homes, employment, retail, leisure, sport and other facilities, promoting healthy and inclusive communities whilst reducing the need to travel
- locate new housing, with good accessibility to existing or proposed local shops, community facilities and primary schools and with good connections to public transport
- support regeneration in the most deprived areas of the borough and ensure those reliant on non-car modes of transport can access jobs and services.

STRAT 10 Transport and accessibility states that:

- in order to minimise the need for travel, proposals for new development should be located so as they are accessible to local services and facilities by a range of transport modes
- new development will be required to demonstrate that appropriate provision is made for access to public transport and other alternative means of transport to the car
- proposals should seek to maximise use of sustainable (low carbon) modes of transport, by incorporating high quality facilities for pedestrians, cyclists and public transport and where appropriate charging points for electric vehicles; and
- proposals for new industrial and warehousing development should maximise opportunities to transport products by non-road modes of transport, so sites alongside the Manchester ship canal, Weaver navigation and rail network may be particularly suitable for freight use and these opportunities should be integrated into development proposals where feasible.

SOC 5 Health and well-being states that proposals will be supported that:

- promote safe and accessible environments and developments with good access by walking, cycling and public transport
- do not give rise to significant adverse impacts on health and quality of life (e.g. soil, noise, water, air or light pollution, and land instability, etc.) including residential amenity

The Local Plan (part two) will set out the non-strategic allocations and detailed policies, following on from the strategic framework set out in the Local Plan (part one). When adopted both documents will constitute the statutory development plan for Cheshire West and Chester and will replace all former Local Plans. It is proposed that Local Plan (part two) is submitted to Secretary of State for examination in 2018. Local Plan (part two) offers an opportunity to include improved policies specifically related to air quality and ultimately to improve planning outcomes.

Cheshire West and Chester Local Transport Plan (2011-2026)

Cheshire West and Chester Council's Local Transport Plan⁷ sets plans and priorities for transport from 2011 to 2026. The aim is to deliver and manage a well maintained, safe, integrated and sustainable transport network through effective travel planning.

The plan includes the following key themes:

- reducing carbon emissions – using travel plans to reduce single occupancy car use and promote multi occupancy travel
- right services, right place, right time – encouraging walking or cycling as all or part of journey to improve health and wellbeing
- a world class place to live and invest – a less congested network improves settlement attractiveness and improves business journey reliability, supporting economic investment

⁷ Cheshire West and Chester Council (2011) Local Transport Plan Integrated Transport Strategy 2011-2026

- supporting regeneration – ensuring new developments have adequate facilities to support sustainable journeys and aim to minimise traffic impact
- cycling and walking – promoting the benefits of walking and cycling and associated measures are achieved through travel plans.

These plans are supported by local planning supplementary planning documents (SPD) such as travel planning guidance and the others currently being developed for example the car parking standards SPD and parking strategy.

Taxi / private hire vehicle licensing

The Cheshire West and Chester council statement of licensing policy for Hackney carriages, private hire vehicles, drivers, and private hire vehicle operators⁸ details the vehicle requirements, the age policy. Under the mandatory age limits, Hackney carriages must be under five years old, or new at first registration in the Chester zone. No Hackney carriages older than 15 years are permitted. Private hire vehicles must be under five years old and will not be permitted when they are over 10 years old. Hackney carriage and private hire vehicle licences will usually be granted for 12 months. This means that newly licensed vehicles will be Euro 5 emission standard (made after September 2009), and Euro 6 standard in the Chester zone (made after September 2014). These policies provide control over the emission standards of these vehicles operating in the borough.

Low emission strategy

In addition to the above the council issued its Low Emission Strategy for public consultation in October 2017 with a view to publishing it in March 2018. The strategy takes a long-term integrated approach to air quality allowing us to identify priority areas in order to reduce emissions throughout the borough including the town of Frodsham. The strategy will identify key actions which can be developed in more detail and be incorporated into this AQAP.

⁸ Cheshire West and Chester council (2016) Statement of licensing policy for Hackney carriages, private hire vehicles, drivers, and private hire vehicle operators – 17 August 2016 (version eight)

3.2 Source apportionment

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

A source apportionment exercise was carried out by Atkins Ltd on behalf of Cheshire West and Chester council in 2016 (see Appendix C). This exercise concluded that:

- local road traffic makes the most significant contribution to annual mean NO₂ concentrations at receptors where exceedances of the annual mean NO₂ AQS objective occur (56-68%)
- cars make the most significant contribution to annual mean NO₂ concentrations at all modelled receptors (37-46%)
- light goods vehicles (LGV) make the second largest contribution to annual mean NO₂ concentrations at all receptors (8-11%)
- buses are expected to make a relatively important contribution to annual mean NO₂ concentrations at modelled receptors adjacent to the A56 (6-9%), but a less significant contribution at modelled receptors on Fluin Lane (4-5%)
- rigid heavy goods vehicles (HGV) make a relatively important contribution to annual mean NO₂ concentrations at receptors adjacent to Fluin Lane (4-5%), but a less significant contribution at modelled receptors on the A56 (2-3%)
- at a number of receptors where exceedances of the annual mean NO₂ AQS objective are modelled to occur, emissions from queuing traffic make an important contribution (nine per cent).

3.3 Required reduction in emissions

Reductions in local road traffic oxides of nitrogen (NO_x) emissions of up to 21% are required in order to achieve the annual mean NO₂ AQS objective (see appendix C).

3.4 Key priorities

Based on the source apportionment exercise, in order to most effectively reduce annual mean NO₂ concentrations within the Frodsham AQMA the following key priorities were identified:

- reduce emissions from cars and LGVs in the study area

- reduce congestion at the A56 / Fluin Lane junction which consequently should reduce emissions.

Whilst buses were modelled to make a relatively important contribution to annual mean NO₂ concentrations at receptors along the A56 within the Frodsham AQMA, it should be noted that the Arriva X30 service, which accounts for a significant proportion of the buses which travel along the A56 through the Frodsham AQMA, comprises of a fleet of compressed natural gas (CNG) buses. These buses are estimated to result in 36 to 56% lower NO_x emissions than conventional Euro IV buses (national atmospheric), therefore additional measures aimed at reducing emissions from buses within the Frodsham AQMA are not considered appropriate at this stage.

Long term, and in line with the emerging low emission strategy, the renewal of the national fleet will see older vehicles replaced with newer vehicles meeting Euro 6 (or Euro VI for HGVs) standard as a minimum and a reduction in emissions as a consequence. The renewal of the national fleet will also see a higher proportion of low emission vehicles and in particular, electric vehicles with zero tailpipe emissions. Presently the government target is that all cars and vans sold in the UK should be zero emission by 2040. To deliver this locally it is necessary to ensure information is available to residents to ensure that

- they are able to make informed decisions about vehicle purchases
- they are aware of incentives and promotion schemes to buy electric vehicles
- they are aware of ways in which they can reduce emissions from their current vehicles.

Additionally there is a need to help facilitate the creation of electric vehicle charging point and associated infrastructure to support this.

4 Development and implementation of Cheshire West and Chester's AQAP

4.1 Consultation and stakeholder engagement

In developing/updating this AQAP, we intend to work 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.

Consultation has taken place with the following stakeholder engagement:

- Local community – residents and commerce through a range of media including
 - Council website
 - email
 - local newspaper
 - public meetings
 - direct mail to residents within the AQMA
 - local Councillors
 - Town Council website

Appendix A provides details of the consultation responses and how these have been considered and where appropriate, incorporated into this action plan.

Table 4.1 – Consultation undertaken

Yes/No	Consultee
Yes	the Secretary of State
Yes	the Environment Agency
Yes	the Highways Agency
No	all neighbouring local authorities – not applicable
Yes	other public authorities as appropriate, such as public health officials
Yes	bodies representing local business interests and other organisations as appropriate

4.2 Steering group

The Council formed a cross-service officer air quality steering group in September 2016 which includes officers from Environmental Protection, Public Health, Planning, Local Plans, Highways, Legal Services, Climate Change and Strategic Transport. The steering group is chaired by the Director of Place Operations. This steering group will discuss and agree the need to form a specific Frodsham air quality steering group and identify any external partners businesses and local community groups that should be engaged in the process.

5 AQAP measures

As part of this study a number of possible air quality action plan measures were developed and qualitatively assessed, in conjunction with representatives of Cheshire West and Cheshire Council, in terms of their likely impact on local air quality and feasibility. The results of this assessment are summarised in appendix B.

Based on the results of this assessment, two potential action plan measures were taken forward for more detailed assessment, namely:

- Option TI02 - Improve existing priority junction with additional capacity (i.e. right turn facilities on A56). See sketch 5150929-ATK-HW01-GA-DR-D-OPT2-P1 in appendix D.
- Option TI03 - Signalise Fluin Lane and increase the number of approach lanes on A56 High Street (incorporating right turn lanes). See sketch 5150929-ATK-HW01-GA-DR-D-OPT3-P1 in appendix D.

The results of this detailed assessment are described in more detail in appendix C, however in summary:

- Option TI02 is modelled to help alleviate queuing on Fluin Lane and reduce annual mean NO₂ concentrations at receptors where exceedances of the annual mean NO₂ AQS objective are modelled to occur by up to 0.5µg/m³.
- Option TI03 is modelled to help alleviate queuing on Fluin Lane, although additional queues are generated along the A56 as a result. These changes are modelled to result in reductions in annual mean NO₂ concentrations at receptors along Fluin Lane (of up to 0.7µg/m³) but an increase in annual mean NO₂ concentrations at receptors adjacent to the A56 (or up to 3.1µg/m³).

Option TI03 was been ruled out for further consideration however the modelling inputs will be tested via a video survey before dismissing this option completely.

- Option TI02 is therefore considered to be the better option in terms of air quality impacts as there are expected to be reductions in annual mean NO₂ concentrations without any increase in pollutant concentrations elsewhere. However it is considered that despite the modelling work, the implementation of TI02 may actually result in adverse effects not capable of being addressed within the model. In particular there is a real concern that the introduction of the lanes, whilst undoubtedly improving flows on the A56 may make it harder to exit Fluin Lane. Consequently this option will not be considered further.

Further to appendix consideration is also being given to Option TI12 - Build-out (chicane) on Fluin Lane northbound to reduce capacity and relocate queueing traffic outside of AQMA. See sketch 5150929-ATK-HW01-GA-DR-D-OPT4-P1 in appendix D. There are some potential safety issues that need to be investigated regarding this option but it has not yet been ruled out and will be explored further in 2018.

Table 5.1 shows the proposed Frodsham AQAP measures. It contains:

- a list of the actions that form part of the plan and associated measure number (as per Appendix B where relevant).
- expected benefit in terms of pollutant emission and/or concentration reduction
- the timescale for implementation
- how progress will be monitored.

The following information will be added to Table 5.1 as work progresses:

- the estimated cost of implementing each action is identified in appendix B but refined estimates will be added as part of the process of establishing the feasibility of each measure
- the responsible service/organisation that will deliver this action.

The Council is the lead authority for implementing these measures and formal progress reporting will be through the annual status reports published on the Council website each year.

Table 5.1 – Air quality action plan measures

Measure number	Measure	EU category	EU classification	Planning phase	Implementation phase	Key performance indicator	Target pollution reduction in the AQMA	Progress to date	Estimated completion date	Comments
1	Undertake a video camera survey of the Fluin Lane and A56 Junction and the Bears Paw Junction.	Traffic management	Urban traffic control (UTC), congestion management, traffic reduction	Early 2018	2018	Measured annual mean NO ₂ concentrations in AQMA	Not applicable	Work has not yet started. Planning phase to commence immediately	Winter / Spring 2018	The video survey is critical to informing a number of measures and reappraising the modelled assumptions
2	Chicane – limit queueing traffic in AQMA, potentially slowing speeds and creating safer road environment (T112).	Traffic Management	UTC, congestion management, traffic reduction	January - April 2018	To be confirmed	Measured annual mean NO ₂ concentrations in AQMA	To be determined	Initial safety audit completed.	To be determined	Variation on measure T112 in Appendix B. Whilst there are a few concerns with this option it has not yet been fully explored and cannot be dismissed.

Measure number	Measure	EU category	EU classification	Planning phase	Implementation phase	Key performance indicator	Target pollution reduction in the AQMA	Progress to date	Estimated completion date	Comments
3	Adoption and roll-out the Council's proposed Low Emission Strategy to support specific measures and reduce background levels.	Policy guidance and development control	Low emissions strategy	2015-2017	March 2018 onwards	Adoption of strategy	Yes, borough wide	Draft report under produced	March 2018	The implementation of the LES will deliver reductions in NO ₂ borough wide reducing background levels. Measures specific to Frodsham have been given their own measure number.
4	The introduction of electric vehicle (EV) charging points through planning conditions.	Policy guidance and development control	AQ planning and policy guidance	2016	2017 / 18	Adoption of policy	Yes, borough-wide	Inclusion in local parking standards guidance	2018 subject to delays in the Local Plan part 2 process and final approval of the proposed policy.	Detailed policy in Local Plan part two will require new development to incorporate EV charging infrastructure.

Measure number	Measure	EU category	EU classification	Planning phase	Implementation phase	Key performance indicator	Target pollution reduction in the AQMA	Progress to date	Estimated completion date	Comments
5	To ensure the installation of EV charging points in Frodsham.	Promoting low emission transport	Procuring alternative refuelling infrastructure to promote EV recharging	Early 2018	2018	Completion of installation. And then: percentage time operational - time taken to effect repairs.	Negligible but increasing to significant overtime	Funding has been identified for a scoping assessment of borough needs.	Initially 2018 – ongoing thereafter to meet current demands.	The objective is to work with a preferred service provider to operate and manage an EV charge point network and specifically to ensure EV infrastructure in Frodsham.
6	Explore opportunities for retrofitting buses with NO ₂ abatement technology (EI01)	Vehicle fleet efficiency	Vehicle retrofitting programmes	2017-18	2018	Installation of retrofit measures on buses travelling through the AQMA	Low	Funding exists that can be used to deliver this measure.	2018	This measure is dependent on the bus operators' support and we do not currently have the powers to obligate operators to engage with us.
7	Increasing public awareness of local air quality issues and providing publicity/ education (BC03)	Public information	Via the internet / other mechanisms	2017-18	2018	To be determined	Low	Work not commenced	Ongoing	To be delivered through the LES but with additional local requirements being considered for Frodsham and other areas with AQMAs.

Measure number	Measure	EU category	EU classification	Planning phase	Implementation phase	Key performance indicator	Target pollution reduction in the AQMA	Progress to date	Estimated completion date	Comments
8	Explore traffic regulation order (TRO) options for height and weight restrictions for HGVs travelling through the AQMA and Church Street. NM01/02/04	Traffic management	UTC, congestion management, traffic reduction	2018	2018	To be determined	1 µg/m ³	Work not started	To be determined	This measure is to further explore the possibility of restricting HGVs on Fluin Lane and or preventing left hand turn from A56 into Fluin Lane on highway safety grounds.
9	Undertake Bears Paw junction assessment study with view to improve junction efficiency. (Option TI10)	Traffic management	UTC, congestion management, traffic reduction	2018	2018	Undertake detailed survey of options to improve traffic through flow.	Low	Qualitative assessment confirmed potential for further exploration.	To be determined	This is in part subject to measure 8 above and assessing the potential to increase green time at Church Street/A56 traffic lights

Measure number	Measure	EU category	EU classification	Planning phase	Implementation phase	Key performance indicator	Target pollution reduction in the AQMA	Progress to date	Estimated completion date	Comments
10	Undertake an origin and destination survey to identify commercial users of the route. This information can then allow direct liaison with firms.	Freight and delivery management	Route management plans/ strategic routing strategy for HGVs	Complete	Spring 2018	Completion of survey	Yes, borough wide	Not started	Spring 2018	This measure will use an origin and destination survey to enable targeting of specific companies using Fluin Lane on a frequent basis and will feed into the awareness raising measure.
11	Encourage schools with regard to the development and maintenance of school travel plans – (option BC01)	Promoting travel alternatives	School travel plans	2018	To be determined	Successful implementation of travel plan	Low	To be determined	To be determined	Must be school led as the Council no longer has the capacity to lead on travel plans. Exploratory discussion with schools will be scheduled.

Measure number	Measure	EU category	EU classification	Planning phase	Implementation phase	Key performance indicator	Target pollution reduction in the AQMA	Progress to date	Estimated completion date	Comments
12	Explore the potential extension of the Langdale Way 20mph zone programme to Fluin Lane/A56 junction (NM05)	Traffic management	Reduction of speed limits, 20mph zones	2017 – early 2018	To be determined	Implementation of 20mph zone	Low	Work not yet started	To be determined	This is an option for part or all of Fluin Lane but not the A56. It reduces emissions for vehicles accelerating up Fluin Lane through the AQMA and supports sustainable travel through safer roads.
13	To explore installation of a box junction on the A56 across St Hilda's Drive and Fluin Lane.	Traffic management	Other	Winter / spring 2018	To be confirmed	To be confirmed	TBC To be confirmed	Not yet started	To be confirmed	There is potential to hold traffic back from the junction allowing the easier exit of Fluin Lane at peak times and holding traffic away from properties affected on the A56.
14	Explore the potential to relocate the bus-stop outside No. 68 High Street.	Traffic management	Other	Early 2018	To be determined	Completion of assessment	Low	Work not yet started	March 2018	Relocation can only be considered towards Rock Drive but will reduce queuing traffic and associated emissions within AQMA.

Measure number	Measure	EU category	EU classification	Planning phase	Implementation phase	Key performance indicator	Target pollution reduction in the AQMA	Progress to date	Estimated completion date	Comments
15	To extend monitoring along High Street towards the Bears Paw junction to confirm extent of exceedance on A56.	Traffic management	UTC, congestion management.	December 2017	January 2018	Attainment of sufficient data to enable comparison against the nitrogen dioxide annual average air quality objective.	Not applicable	Diffusion monitoring tubes installed at Trinity Gardens and Rock Cottage.	Ongoing from January 2018	This measure will address the uncertainty as to the extent of the exceedance along High Street (A56).
16	To liaise with Highways England to improve driver information at Junction 12 westbound on M56 reducing traffic diverting along A56.	Traffic management	Other	2018	To be determined	Not applicable	Limited potential	Not started	January 2018	Explore with Highways England how delays on the M56 are communicated to motorway users and whether additional measures are available to divert traffic from M56 further downstream.

Appendix A: Response to consultation

The Council published the Fluin Lane AQAP consultation on 5 May 2017, which closed on 4 August 2017. As well as publishing the consultation documents on the council website and publicising the consultation through the Council's social media pages, the consultation was also promoted through the Frodsham edition of the Chester Chronicle and the Town Council website. A series of public drop-in sessions were held at the Frodsham Community Centre on Fluin Lane on 15 June 2017, 20 July 2017 and 31 July 2017. These events were attended by 21 members of the public and suggestions and feedback were recorded during the sessions. In addition to this 13 written responses were received. A summary of all comments received is provided below.

Comments received

General observations

1. The bus stop outside 68 High Street (A56) can cause queueing traffic. Whilst there are not many buses, at certain times of the day the impact can be considerable and the bus stop should be considered within any proposed changes to the highway.
2. Train emissions should not be ruled out. A number of trains pass under the bridge and this number may increase with the opening of the Halton curve. As they pass into the tunnel beneath Fluin Lane, a visible exhaust plume can often be seen rising up and on to Fluin Lane.
3. Queueing on Fluin Lane is bad in the morning between 08.00 and 09.30 and goes back as far as Langdale Way with some additional queueing on Langdale Way itself. It is even worse in the afternoon between 15.00 and 18.00 and can extend beyond the community centre.
4. Queueing traffic has become much worse over recent years and it is affecting many people locally making it a significant issue.
5. Traffic is particularly bad throughout Frodsham on Fridays and Saturdays when there is a lot of traffic heading for Wales.
6. There is a need to ensure that there is good communication with residents throughout and beyond the process.
7. The encouragement of modal shift to more environmentally friendly means of transport should be afforded a higher priority.
8. More journey analysis is required to develop a regional transport strategy to inform the process.
9. The issue needs to be considered in terms of the wider picture including congestion and parking.
10. Consideration should be given as to how the proposed M56 Junction 11A might alter existing traffic patterns.
11. There needs to be local enforcement to support any measures introduced and existing prohibitions.
12. The opening of the Halton curve will attract more traffic to the area resulting in even worse air quality.

Specific recommendations for the AQMA

13. A number of recommendations were made that the Council should reconsider options for a mini-roundabout on the junction of Fluin Lane and the A56. It would be beneficial for traffic exiting Fluin Lane. Any such roundabout should have stop lines on the access points.
14. A number of recommendations were made supporting the proposed reduction in the speed limit on Fluin Lane from 30mph to 20mph. No objections to this proposal were received.
15. A number of responses were received supporting the proposal to use traffic regulation orders to prohibit HGVs on Fluin Lane.
16. Traffic lights at the bottom of Fluin Lane should not be discounted; part-time on demand signals should be considered.
17. One response expressed doubts as to how the proposal to introduce dedicated right hand turn lanes on the A56 could improve air quality on Fluin Lane.
18. A number of responses supported the proposed travel plan measure. Further comments were received around the revision of school travel plans to promote sustainable transport.
19. A number of responses identified the need to create a safer environment for pedestrians and cyclists to encourage more parents to walk their children to school or similarly to encourage more cycling.
20. One response recommended the creation of a pelican crossing by the Community Centre to make crossing Fluin Lane safer.
21. Traffic control measures such as the proposed chicane should be designed to provide safe pedestrian crossing.
22. One response expressed confusion as to how the proposed chicane would work and provide improvements and highlighted the potential for poorly planned measures to worsen traffic emissions.
23. It was highlighted that there are often cars parked throughout the day in the area identified for the chicane. Despite this there is plenty of space for two cars to pass each other and so to be effective any such proposal will need to ensure that the width of the carriageway is narrowed sufficiently.
24. Support for measure number 6, raising awareness, was received supporting the proposal to provide good information to residents to inform them of the issue and potential actions that they can take to reduce pollution within the AQMA.

Specific recommendations for the A56

25. Traffic lights could be installed further down the A56 by Sutton Causeway to hold and regulate the flow of traffic along the A56 at peak times.
26. Improved real-time signage at M56 Junction 12 westbound to prevent traffic diverting erroneously from the M56 – relates to slowing of traffic as a result of traffic joining the M56 around the next bend, causing drivers to mistakenly think there is a serious delay ahead.
27. Double yellows along A56 may assist in improving flow.

28. The existing pedestrian crossing on the A56 should be upgraded to a toucan crossing.
29. There is a need to explore the inter-relationship between the M56 peak periods and traffic on the A56.
30. The installation of a box junction across the Fluin Lane and St Hilda's Drive junctions. If long enough it would reduce slow moving traffic in AQMA on A56 and possibly improve the opportunity for drivers exiting Fluin Lane to join the A56.

Specific recommendations for the Bears Paw junction

31. The traffic signals at the Bears Paw junction do not provide adequate green time for A56 traffic.
32. Delaying the timing of the pedestrian phase of the lights will allow more traffic through the junction.
33. Make parts of Church Street one way.
34. Allow west bound A56 traffic to turn left at the same time traffic exits Church Street.
35. The removal of speed humps on Howey Lane would encourage more traffic to use it and therefore reduce the pressure on the Bears Paw junction. This should be used in conjunction with road traffic orders to prevent larger vehicles going down there except for access.

Fluin Lane air quality action plan

The AQAP consultation document dated 5 May 2017 contained a proposal to undertake further assessment of the measures listed in Table 5.1 of the document and is reproduced as table 5.1a below. The consultation exercise formed part of this process and the text in the box below each individual measure details how the consultation process has influenced this assessment.

Table 5.1a – Air quality action plan measures (further assessment)

Measure number	Measure	Target NO ₂ reduction in the AQMA	Progress to date	Comments
1	Alteration to layout of Fluin Lane / A56 junction	1 µg/m ³ (microgram per cubic metre)	Options TI02 (right hand turn) and TI03 (traffic lights and junction widening) have been developed and assessed, with TI03 excluded for further consideration	A further option is currently being considered in terms of likely feasibility before a final decision is made on which option to progress.
<p>Reassessment of measure one - In summary a number of measures were considered at the scoping stage that involved alterations to the junction including the introduction of traffic lights, a mini-roundabout and a standard roundabout and dedicated right-hand turn lanes on the A56 into St Hilda's Drive and Fluin Lane. All measures other than the introduction of traffic lights and right-hand lanes were screened out. There is not sufficient space for a standard roundabout or a double roundabout and the alignment for a mini-roundabout does not work given it is a staggered crossroads raising road safety concerns. The introduction of traffic lights and the dedicated right-hand turn lanes were taken forward for detailed air quality modelling. The introduction of traffic lights was subsequently screened out as not appropriate because of the adverse effect on air quality on the A56. However it is proposed that a video camera survey is undertaken to enable the queueing in the area at the Fluin Lane junction and the Bears Paw junction to be more accurately assessed and understood and the traffic light modelling output will be reassessed on completion of this survey. This measure will be revised accordingly.</p> <p>The introduction of right hand turn lanes on the A56 into Fluin Lane and St Hilda's Drive was considered separately as measure number two below.</p>				

Measure number	Measure	Target NO ₂ reduction in the AQMA	Progress to date	Comments
2	Alteration of junction - option TI02	1 µg/m ³	Initial modelling work completed	Option TI02, the introduction of right hand turn lanes on the A56, has been modelled and theoretically will deliver improvements to both Fluin Lane and the A56.
<p>Reassessment of measure two - this option proposes the introduction of dedicated right hand turn lanes on the A56 into St Hilda's Drive and Fluin Lane. Doubts were raised during the consultation process as to how this would work in practice and specifically that it may actually hinder traffic exiting Fluin Lane by allowing traffic on the A56 to flow faster. Further consideration has been given to this and whilst it is noted that it will improve flow on the A56 and consequently improve air quality along the A56 which is one of our objectives, there is doubt that the modelled improvements at Fluin Lane will be realised and indeed it may even have an adverse effect. In addition to the high level of uncertainty around the potential benefits, this proposal requires the widening of the highway and the relocation of a number of services which greatly increases the cost, given this it is not considered value for money and is duly deleted from the action plan.</p>				
3	Build out / chicane – option TI12	To be determined	Initial safety audit completed.	Variation on measure TI12 in Appendix B, To be fully explored.
<p>Reassessment of measure three - Many questions were raised during the consultation process querying how this measure would work in practice and how it would reduce nitrogen dioxide levels on Fluin Lane. We would agree with these comments and in particular that this option is poorly defined but if a workable and safe version can be introduced then potentially it would improve air quality on Fluin Lane by holding traffic further back from the junction and away from the residential properties at 2 to 8 Fluin Lane. Feedback did highlight that the road is so wide adjacent to 2 to 8 Fluin Lane that even if there are parked cars there in front of the properties, cars are able to queue alongside them without obstructing traffic turning onto Fluin Lane from the A56, In addition to above, feedback was received suggesting that the chicane may be used as a traffic calming measure to help create a safe environment for pedestrians and may even incorporate a crossing facility of some description. On the basis of the above we consider that there is still merit in exploring this option further and accordingly this measure will remain within the action plan for further assessment.</p>				
4	Low Emission Strategy	Yes, borough wide	Draft report under development	Will deliver improvements in PM ₁₀ as well.

Measure number	Measure	Target NO ₂ reduction in the AQMA	Progress to date	Comments
<p>Reassessment of measure four - The Low Emission Strategy (LES) is currently undergoing a public consultation exercise which ends on 12 January 2018. At the time of writing the draft Action Plan for Fluin Lane it was not known for certain what measures would be detailed within the LES. As such there are a number of individual measures within this Action Plan that are identified within the LES. These measures (below) are measure five (electric vehicle charging points through planning conditions), measure six (publicity/education/awareness-raising), measure nine – working with freight and delivery management and measure 11 (consideration of 20mph zone at Fluin Lane junction). Other measures detailed within the LES that are considered relevant to the Fluin Lane AQAP but not presently included are as follows:</p> <p>1. LES measure (M) action 27 – to increase the electric vehicle public charging network across the borough.</p> <p>Increasing the public charging network supports measure five. The number of electric vehicles (EVs) in England is expected to increase significantly over the coming decade and this will need to be supported by a network of public charging points. As more and more combustion engine vehicles are replaced locally with EVs there will be a significant improvement in air quality and as per the LES this needs to be supported. The need for a large number of public charging points to support and increase the uptake of electric vehicles in Frodsham is likely to be low as much traffic is local and home charging will be the preferred method of charging for most people, certainly for those with off-road parking. Public charging points are primarily aimed at drivers who come from further afield and need the security of a public charging point at their end destination. It is also important to note that vehicle range is now increasing and is expected to continue to do so over the coming years. Consequently as range increases the need for such vehicles to use public charging points will reduce accordingly.</p> <p>Introducing EV charging infrastructure in Frodsham will provide negligible emission reductions in the short term but will help promote EV options and assist with awareness-raising as well as meeting a small but growing need in the short to medium term. This will be introduced as a new action.</p> <p>2. LES measure (R) action number 41 – exploring funding opportunities for retrofitting buses to support the local operator.</p> <p>Retrofitting of bus engines with catalytic reduction technology was originally discounted as a possible measure because there are few buses entering the AQMA and the Arriva buses using the route already ran on compressed natural gas. However it is understood that this service may change and be operated out of another depot and as a consequence of this the buses on this route will likely change to diesel. The proposed LES measure to retrofit bus engines with improved abatement may now be considered appropriate for Fluin Lane and will be considered further as a new action.</p>				

Measure number	Measure	Target NO ₂ reduction in the AQMA	Progress to date	Comments
5	Electric vehicle charging points through planning conditions	Yes, borough-wide	Inclusion in local parking standards guidance.	Policy in Local Plan part one and draft part two
<p>Reassessment of measure five - Measure five relates to the inclusion within Part 2 of the Local Plan (currently under consultation) for new development, both commercial and residential, to incorporate a minimum level of electric vehicle (EV) charging infrastructure. The detailed policy proposal has now been submitted for inclusion in part two and this is being considered within the Local Plan formation framework.</p>				
6	Publicity/education – option BC03	Low	Work not yet commenced	
<p>Reassessment of measure six - Support for this action was expressed by residents during the consultation process and it is also considered an important feature of the draft LES and builds on the National Institute for Health and Care Excellence (NICE) guidance issued in June 2017 highlighting the importance of awareness raising. An awareness raising campaign for the Borough is likely to be brought forward under the LES but it is recognised that there needs to be a local focus in the case of Frodsham because of the AQMA. As the borough wide approach is developed, due consideration will be given to how this is applied within Frodsham.</p>				
7	Explore TRO options – option NM01/NM02/NM05	1 µg/m ³	Work not yet commenced	This measure is to further explore the possibility of restricting HGVs on Fluin Lane or prohibiting a right hand turn on to the A56
<p>Reassessment of measure seven - The use of traffic regulation orders to restrict HGV use of Fluin Lane was generally supported by residents during the consultation process and has the added benefit that it has the potential to reduce emissions on both the A56 and Fluin Lane. It was identified that it would be necessary to start routing vehicles from as far afield as the A54 and A556 directing them onto the A49 and A533 or else onto the A55 and M53. This option will now be explored in detail with consideration given to placing height and weight restrictions on additional roads to mitigate any detrimental effect that this may have on Church Street. The action has been revised to restrict HGVs from Fluin Lane and Church Street except for access.</p>				

Measure number	Measure	Target NO ₂ reduction in the AQMA	Progress to date	Comments
8	Bears Paw junction feasibility - option TI10	1 µg/m ³	Qualitative assessment confirmed potential for further exploration.	This is subject to measure seven and assessing the potential to increase green time at Church Street/A56.
<p>Reassessment of measure eight - There was strong support for the need to improve the efficiency of this junction. Responses were received which suggest that the lights are not performing as well as they can. Reducing queueing at this junction will potentially reduce the relative attractiveness of Fluin Lane for some drivers. Consequently further assessment work is proposed to enable potential improvement measures to be identified and considered.</p>				
9	Freight and delivery management via TROs – Option NM03.	Yes, borough wide.	Grant application submitted to Defra 2016.	This measure is subject to funding approval from Defra – scheme presently placed on the grant reserve list.
<p>Reassessment of measure nine - This option cannot be considered any further as the Defra grant bid was unsuccessful. However a large amount of commercial traffic (notwithstanding HGVs) uses this junction. In response to comments received an ‘origin destination survey’ is proposed which will help establish which companies are routinely using this route and whether there is scope to reduce that usage. This will also tie in with targeting the awareness raising campaign. The measure will be revised accordingly.</p>				
10	Development / maintenance of School travel plans – option BC01	Low	To be decided.	This will require schools to actively participate as the Council no longer has the capacity to lead on travel plans for anything but new developments
<p>Reassessment of measure 10 - A number of responses identified the need for school traffic to be targeted indirectly³ by improving the road experience for walkers and cyclists. The schools were consulted over the action plan but neither local primary school commented. The Council no longer has any dedicated resource for travel planning. It is noted that measures detailed elsewhere such as measure three and 11, will help make a safer environment for pedestrians and cyclists and further consideration should be given to measures that could be introduced that would help reduce vehicle speeds and make the road a safer environment. This measure will be revised accordingly.</p>				

Measure number	Measure	Target NO ₂ reduction in the AQMA	Progress to date	Comments
11	Explore extension of 20 miles per hour zone programme to Fluin Lane junction.	Low	Work not yet commenced.	This measure is considered undesirable as reduction of speed limits on A-roads is not generally considered appropriate but nonetheless should be explored further.
<p>Reassessment of measure 11 - This measure links to measure 10 above and there have been no objections to this proposal although doubts have been raised as to whether it will be effective or not. There are air quality benefits, particularly for reducing emissions from vehicles turning into Fluin Lane and accelerating up the hill and there are incidental air quality benefits if it improves road safety and it results in the substitution of vehicles journeys for pedestrian and cycle journeys through the AQMA.</p>				

Additional actions/analysis

This section addresses matters that were raised through the consultation process that required additional consideration.

1. The impact of the bus stop on traffic outside 68 High Street has not been considered to date and as a result of the consultation the potential to relocate to a location where it has less impact on traffic will now be advanced by way of a new measure. It is noted that social factors and physical constraints will be significant and will have to form part of any considerations.
2. Following consultation the Council agreed to revisit the potential of a mini-roundabout. The installation of a mini-roundabout had been screened out at an earlier stage in the action plan formation process. The staggered nature of the crossroads makes alignment very difficult for vehicles exiting St Hilda's Drive and the likelihood is that it would increase queueing on High Street and Bridge Lane and particularly so if stop lines were imposed. Whilst it is our view that it would enable traffic to exit Fluin Lane more easily and improve air quality within Fluin Lane itself, the overall net effect would be detrimental to air quality as the amount of traffic on the A56 is so much greater. The awkward realignment that would be required of St Hilda's Drive would make turning left safely on to the A56 very difficult as it would effectively force longer vehicles to have to run into oncoming traffic raising significant road safety concerns. This measure is ruled out on both air quality and road safety grounds.

3. Traffic lights have not been considered on a part-time basis as proposed in the consultation feedback however they will be considered within the context of the revised measure one.
4. Emissions from trains will not be considered further at this point due to the limited numbers that pass beneath the AQMA and the very limited scope to influence rail emissions.
5. The modelling work suggests that the boundary of the AQMA may need to be extended on the A56 and further monitoring points are required. The installation of additional monitoring locations will therefore form a new measure in the AQAP.
6. It was suggested that Howey Lane could be better used to reduce traffic at the Bears Paw junction. However after further consideration of this with the Highways team, this is ruled out on the grounds of highway safety.
7. The installation of traffic lights further along by Sutton Causeway to hold and regulate the flow of traffic along the A56 at peak times is not without merit. The problems arise however with the distance between the two locations and the number of junctions between there and Fluin Lane and the number of properties on the A56. These factors combine to increase the uncertainty of the benefits that such a measure will deliver and it has been advised against by the Highways team.
8. The installation of a box junction and yellow hatching extending from the footbridge to the pedestrian crossing and possibly beyond.
9. The Council will consult with Highways England around potential measures that can improve driver information regarding traffic potentially exiting the westbound M56 at Junction 12; this will be added as a new measure.
10. It is not considered that any significant benefits would be delivered from imposing double yellow lines along the length of the A56 as we have not seen any evidence that parked vehicles are creating any traffic issues. This proposal is ruled out based on current understanding of the issue.

Appendix B: Assessment of possible action plan measures

Table B-1 – Action plan measures considered (ranked in order of potential air quality impact and likely feasibility)

Reference	Intervention type	Intervention	Potential beneficial effects	Potential impact on air quality in local area (0 = negligible 1 = small 3 = medium 5 = large)	Likely feasibility / acceptability (0 = not feasible 1 = unlikely / low 2 = likely / medium 3 = very likely / high)	Cost (- 3 = very high (£250k+) -2 = high (£100k - £250k) -1 = medium (£20k - £100k) 0 = low (£0 - £20k)	Details regarding feasibility / acceptability and likely consequential effects
T102	Transport infrastructure	Improve existing priority junction with additional capacity (i.e. right turn facilities on A56). See sketch 5150929-ATK-HW01-GA-DR-D-OPT2-P1.	Would potentially assist traffic in flowing more freely on all arms of the junction. Provision of right turn facilities on the A56 in both directions would reduce the need for through traffic to slow/stop to allow right turn manoeuvres to take place thereby reducing congestion	3	2	-2	Dependent up traffic modelling to prove deliverability and benefits. Considered unlikely to have any significant adverse effects on traffic conditions
NM04	Network management	Banning certain turning movements	Would reduce traffic using Fluin Lane.	3	1	-1	The right turn out and left turn into Fluin Lane would need to be banned and this would be difficult to implement with physical measures. Also would need to be considered with improvements at the Bears Paw junction.
T112	Transport infrastructure	Build-out (chicane) on Fluin Lane northbound to reduce capacity and relocate queueing traffic outside of AQMA.	Would potentially reduce congestion / queuing within the AQMA.	3	1	-2	Will require complimentary measures to reduce northbound traffic on Fluin Lane and also capacity improvements on the A56. Potentially Bears Paw signals may need improvements to accommodate additional traffic which will re-route from Fluin Lane. Will remove on-street parking on Fluin Lane and may also need improvements to Langdale Way junction. Would need to be subject to road safety audit which may prove problematic due to proximity to junction.
T103	Transport infrastructure	Signalise Fluin Lane and increase the number of approach lanes on A56 High Street (incorporating right turn lanes). See sketch 5150929-ATK-HW01-GA-DR-D-OPT3-P1.	Potential opportunity to manage and reduce queue lengths on all arms of the junction.	1	2	-2	Subject to traffic modelling proving compliance and ability to be incorporated into tactical diversion routes.

Reference	Intervention type	Intervention	Potential beneficial effects	Potential impact on air quality in local area (0 = negligible 1 = small 3 = medium 5 = large)	Likely feasibility / acceptability (0 = not feasible 1 = unlikely / low 2 = likely / medium 3 = very likely / high)	Cost (- 3 = very high (£250k+) -2 = high (£100k - £250k) -1 = medium (£20k - £100k) 0 = low (£0 - £20k)	Details regarding feasibility / acceptability and likely consequential effects
TI07	Transport infrastructure	Signalise Fluin Lane and keep the number of lanes as existing.	Opportunity to manage queue lengths on all arms of the junction and incorporate pedestrian crossings.	1	2	-2	Subject to traffic modelling proving compliance, although unlikely to provide favourable results the scheme would be cheaper to implement than other signalisation intervention (TI03).
TI10	Transport infrastructure	Improvements to A56/ Church Street (Bears Paw junction).	Improvements to capacity here would offer the opportunity to downgrade the Fluin Lane junction and reduce traffic.	1	2	-2	Would need careful consideration and probably would need to be implemented in conjunction with other measures to divert traffic from Fluin Lane.
EI01	Environmental interventions	Reduce emissions from buses by working in partnership with bus operators to improve bus fleet (e.g. bus quality partnership).	Would potentially reduce emissions from buses	1	2	-3	Would take time and money to implement. The Council to explore additional sources of funding.
PI01	Physical interventions	Purchase and remove the first property on corner of Fluin Lane/Main Street (on the right hand side, direction Kingsley) in order to create space and improve visibility.	Would remove residential property from AQMA and potentially improve visibility for traffic on Fluin Lane.	1	2	-3	Purchasing and demolishing property likely to be prohibitively expensive. Potential effect on congestion and emissions difficult to quantify.
NM01	Network management	Vehicle weight restrictions on Fluin Lane	Would significantly reduce the number of HGVs using Fluin Lane.	1	1	0	Lack of suitable alternative routes for the largest of vehicles would receive objections and make implementation and enforcement problematic.
BC01	Behavioural change	Develop travel plans for local schools / businesses likely to use junction during peak hours	Could assist to reduce volume of traffic at Fluin Lane junction during peak hours and associated congestion. The travel plan would suggest measures through which reductions could be achieved and mechanisms for implementing the measures.	1	1	-1	Relatively low cost and easy to implement. Will require ongoing commitment from Council officers to work with schools and businesses however internal resources are limited
NM05	Network management	Traffic calming along A56 and Fluin Lane	Potential to dissuade some vehicles from using this route and also smooth traffic flow on A56 creating more opportunities for vehicles to exit Fluin Lane.	1	1	-2	Could result in increased congestion and emissions in other areas
TI01	Transport infrastructure	Provide a mini-roundabout at Fluin Lane junction (see sketch 5150929-ATK-HW01-GA-DR-D-OPT1A-P1)	Would potentially reduce extent of queuing traffic on Fluin Lane by improving access onto A56 for	1	1	-2	Unlikely to provide capacity improvements within modelling or to adhere to design standards.

Reference	Intervention type	Intervention	Potential beneficial effects	Potential impact on air quality in local area (0 = negligible 1 = small 3 = medium 5 = large)	Likely feasibility / acceptability (0 = not feasible 1 = unlikely / low 2 = likely / medium 3 = very likely / high)	Cost (- 3 = very high (£250k+) -2 = high (£100k - £250k) -1 = medium (£20k - £100k) 0 = low (£0 - £20k)	Details regarding feasibility / acceptability and likely consequential effects
			Vehicles turning right.				To accommodate within the existing highway boundary it results in a very awkward alignment. Road safety would also be a consideration on a primary route with this form of junction. Would potentially result in increased congestion along A56
T111	Transport infrastructure	Remove St Hilda's Drive arm from junction by providing a new access route to this estate or improving the junction of A56 / Ship Street	This would offer more scope for improving capacity at the Fluin Lane junction and thereby reducing queueing traffic on Fluin Lane and the A56.	1	1	-3	This would attract large costs associated with acquiring the necessary land and constructing and new linkages.
T105	Transport infrastructure	Provide a double mini-roundabout	Would potentially allow traffic to keep flowing on all arms of the junction	1	0	-3	Insufficient distance between minor arms to accommodate the arrangement without third-party land-take.
T104	Transport infrastructure	Provide a conventional roundabout (see sketch 5150929-ATK-HW01-GA-DR-D-OPT1B-P1)	Would potentially allow traffic to keep flowing on all arms of the junction	1	0	-3	Would require significant amount of third-party land to be able to accommodate (see sketch 5150929-ATK-HW01-GA-DR-D-OPT1B-P1 for minimum size). Considered to be undeliverable.
T116	Transport infrastructure	Build a relief road for the whole of the Ship Street area (this would reduce traffic exiting opposite Fluin Lane and further down opposite Morrison's). The Ship Street area has seen significant development in recent years with no corresponding improvements to road infrastructure, access routes etc.	Would potentially reduce traffic flows in AQMA	1	0	-3	Likely to be prohibitively expensive
T117	Transport infrastructure	Convert the Ashton Drive underbridge to a one-way exit road for the Ship Street area traffic	Would potentially reduce traffic flows in AQMA	1	0	-3	Likely to be prohibitively expensive
BC03	Behavioural change	Advertising campaigns to raise awareness of sustainable travel and AQMA	Could assist to reduce volume of traffic at junction and queueing during peak hours by making road users aware of air quality problems and alternative routes	0	2	0	Could assist other measures in reducing some car based trips to work, shops, school etc. but would need investment over a long period of time to offer tangible benefits.

Reference	Intervention type	Intervention	Potential beneficial effects	Potential impact on air quality in local area (0 = negligible 1 = small 3 = medium 5 = large)	Likely feasibility / acceptability (0 = not feasible 1 = unlikely / low 2 = likely / medium 3 = very likely / high)	Cost (- 3 = very high (£250k+) -2 = high (£100k - £250k) -1 = medium (£20k - £100k) 0 = low (£0 - £20k)	Details regarding feasibility / acceptability and likely consequential effects
TI06	Transport infrastructure	Improve existing priority junction by improving visibility from Fluin Lane	Potentially cheaper than incorporating right turn facilities on the A56 and could offer capacity improvements to Fluin Lane traffic	0	2	-1	Effect on congestion and emissions uncertain, no capacity improvements afforded to the A56 traffic
NM02	Network management	Signage strategy	Offers some potential to reduce non-local trips from further afield	0	1	-1	Would need to be implemented in conjunction with in-car navigation systems to achieve real benefits.
NM03	Network management	Review or implement strategic freight strategy	Potential to reduce HGV trips through the junction	0	1	-1	Would only offer long-term benefits once the strategy is implemented. Also requires buy-in from operators.
BC02	Behavioural change	Personalised travel planning	Could assist to reduce volume of traffic at junction and queueing during peak hours by making road users aware of alternative routes	0	1	-1	Potential for short term improvements but would need to be spread over a wide area to have even a small impact.
EI03	Environmental interventions	Make use of HGV vehicle routing agreements through the planning process	Could offer the opportunity to limit future HGV movements through the junction.	0	1	-1	Would not offer any reductions in existing traffic
TI19	Transport infrastructure	Box junction at the Main Street/Fluin Lane junction to remove queuing traffic at that point and reduce the impact of emissions	Would prevent vehicles from queuing across the Fluin Lane arm of the junction whilst the pedestrian crossing is in operation allowing some vehicles to exit Fluin Lane.	0	1	-1	Unlikely to allow many vehicles to leave Fluin Lane as the queues on the A56 are short-lived whilst the pedestrian is crossing.
EI04	Environmental interventions	Anti-idling measures (e.g. signage, campaigns)	Would reduce emissions from idling vehicles within AQMA	0	1	-1	Benefits only likely to arise when vehicles are stationary for longer than a minute
TI08	Transport infrastructure	Remove/relocate controlled pedestrian crossing	Reduces the opportunity for queues to build-up on the A56	0	1	-1	Uncertain effect on congestion and emissions. Would reduce pedestrian accessibility in local area.
EI02	Environmental interventions	Work with local haulage companies to renew fleet of HGVs	Would potentially reduce emissions from HGVs	0	1	-1	Would improve the situation but would be difficult to get buy in from enough operators to achieve results.
TI15	Transport infrastructure	Reconsider the location of both pedestrianised crossings (on Main Street near Fluin Lane and by Gates' garage)	Considered unlikely to result in a reduction in congestion or emissions (see TI08)	0	1	-1	Uncertain effect on congestion and emissions. Would reduce pedestrian accessibility in local area.
TI09	Transport infrastructure	Shared space/public realm scheme	Would offer potential opportunity to create a gateway into Frodsham	0	1	-3	Potential to include ancillary environmental enhancements such

Reference	Intervention type	Intervention	Potential beneficial effects	Potential impact on air quality in local area (0 = negligible 1 = small 3 = medium 5 = large)	Likely feasibility / acceptability (0 = not feasible 1 = unlikely / low 2 = likely / medium 3 = very likely / high)	Cost (- 3 = very high (£250k+) -2 = high (£100k - £250k) -1 = medium (£20k - £100k) 0 = low (£0 - £20k)	Details regarding feasibility / acceptability and likely consequential effects
			from the east and could incorporate measures to improve air quality through slowing vehicle speeds thereby smoothing the flow of traffic.				as tree planting.
T113	Transport infrastructure	Remove all traffic lights (including those at the Bears Paw junction) and replace with a series of mini-roundabouts (to reduce back-up as far as the garden centre).	Considered unlikely to result in a reduction in congestion or emissions.	0	1	-3	Potential safety and accessibility issues
T114	Transport infrastructure	In combination with above, relocate crossing points away from the Main Street/Church Street junction.	Considered unlikely to result in a reduction in congestion or emissions.	0	1	-3	Potential safety and accessibility issues
T118	Transport infrastructure	Develop motorway side cycle routes from Frodsham to Helsby high school.	Considered unlikely to result in a reduction in congestion or emissions.	0	0	-3	Effect likely to be minimal

Appendix C: Frodsham AQMA air quality study

Source apportionment exercise

For each modelled receptor, source apportionment has been undertaken in accordance with the methodology described within Box 7.5 of technical guidance LAQM.TG16 in order to determine the relative contribution of the following emission sources to modelled annual mean NO₂ concentrations:

- Regional background, local background and local road traffic (Table C-1);
- Vehicle type i.e. cars, LGVs, rigid HGVs, articulated HGVs and buses (Table C-2);
- Queuing and free flowing traffic (Table C-3).

Table C-1 Relative contribution of background and traffic sources at receptors

Receptor	Annual mean NO ₂ concentration (µg/m ³)	Relative contribution (%)		
		Regional background	Local background	Local road traffic max contribution
1 Manor Farm Court	45.1	9%	23%	68%
2 Manor Farm Court	43.9	10%	23%	67%
25 St Hilda's Drive	36.8	12%	28%	61%
7 Manor Farm Court	43.8	10%	23%	67%
2 Fluin La	35.9	12%	28%	60%
8 Fluin La	34.0	13%	30%	58%
74 High St	45.8	9%	22%	68%
68 High St	43.3	10%	23%	67%
56 High St	34.7	12%	29%	58%
83 High St	32.5	13%	31%	56%
79 High St	36.0	12%	28%	60%
73 High St	37.8	11%	27%	62%
Fraser House	40.6	11%	25%	64%
1 Belvedere	34.6	12%	29%	58%
Manor Farm	45.7	9%	22%	68%
12 Manor Farm Court	40.0	11%	25%	64%
1 Bridge La	36.0	12%	28%	60%

Notes: Exceedances of annual mean NO₂ AQS objective (40 µg/m³) shown in **bold**

The results in Table C-1 indicate that regional background sources (which the Council has no influence over) are estimated to contribute between nine and 13% of annual mean NO₂ concentrations at modelled receptors, local background sources⁹ (over which the Council may have some influence) between 22 and 31% and local road traffic sources between 56 and 68%. Local road traffic is therefore estimated to make the most significant contribution to annual mean NO₂ concentrations at modelled receptors, in particular at those receptors where exceedances of the annual mean NO₂ AQS objective are modelled to occur (where the estimated contribution of local road traffic to annual mean NO₂ concentrations is between 64 and 68%). Emissions from local road traffic should therefore be the principal source for the Council to target within the AQAP.

Table C-2 Relative contribution by vehicle type at receptors

Receptor	Annual mean NO ₂ concentration (µg/m ³)	Relative contribution (%)				
		Cars	LGVs	Rigid HGVs	Articulated HGVs	Buses
1 Manor Farm Court	45.1	46%	11%	3%	2%	7%
2 Manor Farm Court	43.9	45%	11%	3%	2%	6%
25 St Hilda's Drive	36.8	41%	10%	3%	1%	6%
7 Manor Farm Court	43.8	46%	10%	5%	3%	4%
2 Fluin La	35.9	39%	9%	4%	2%	5%
8 Fluin La	34.0	38%	9%	4%	2%	4%
74 High St	45.8	45%	10%	3%	2%	9%
68 High St	43.3	44%	10%	2%	1%	9%
56 High St	34.7	39%	8%	2%	1%	8%
83 High St	32.5	37%	8%	2%	1%	8%
79 High St	36.0	40%	9%	2%	1%	8%
73 High St	37.8	41%	9%	2%	1%	9%
Fraser House	40.6	43%	11%	3%	2%	6%
1 Belvedere	34.6	39%	9%	3%	1%	7%
Manor Farm	45.7	46%	10%	5%	2%	5%
12 Manor Farm Court	40.0	44%	9%	4%	2%	4%
1 Bridge La	36.0	40%	10%	3%	1%	6%

Notes: Exceedances of annual mean NO₂ AQS objective (40 µg/m³) shown in **bold**

The results in Table C-2 indicate that:

- Cars are estimated to make the most significant contribution to annual mean NO₂ concentrations at all modelled receptors (between 37 and 46%);
- LGVs are estimated to make the second largest contribution to annual mean NO₂ concentrations at all modelled receptors (between 8 and 11%);

⁹ Local background sources include emissions from major and minor roads, domestic and industrial combustion, aircraft and rail across the wider study area.

- Buses are expected to make a relatively important contribution to annual mean NO₂ concentrations at modelled receptors adjacent to the A56 (between 6 and 9%), but a less significant contribution at modelled receptors adjacent to Fluin Lane (4-5%); and
- Rigid HGVs are estimated to make a relatively important contribution to annual mean NO₂ concentrations at receptors adjacent to Fluin Lane (between 4 and 5%), but a less significant contribution at modelled receptors adjacent to the A56 (2-3%).

Table C-3 Relative contribution of free-flowing and queuing traffic at receptors

Receptor	Annual mean NO ₂ concentration (µg/m ³)	Relative contribution (%)	
		Free-flowing traffic	Queuing traffic
1 Manor Farm Court	45.1	66%	2%
2 Manor Farm Court	43.9	66%	1%
25 St Hilda's Drive	36.8	59%	2%
7 Manor Farm Court	43.8	60%	7%
2 Fluin Lane	35.9	51%	9%
8 Fluin Lane	34.0	50%	8%
74 High Street	45.8	60%	9%
68 High St	43.3	66%	1%
56 High St	34.7	58%	0%
83 High St	32.5	55%	0%
79 High St	36.0	60%	0%
73 High St	37.8	62%	0%
Fraser House	40.6	64%	0%
1 Belvedere	34.6	52%	7%
Manor Farm	45.7	61%	7%
12 Manor Farm Court	40.0	58%	6%
1 Bridge Lane	36.0	59%	1%

Notes: Exceedances of annual mean NO₂ AQS objective (40 µg/m³) shown in **bold**

The results in Table C-3 indicate that free flowing traffic is estimated to make the most significant contribution to annual mean NO₂ concentrations at all modelled receptors (between 50 and 66%). At some receptors however, emissions from queuing traffic are estimated to make a relatively important contribution (up to 9%), in particular at a number of receptors where exceedances of the annual mean AQS objective are modelled to occur. Given that these queues are only modelled to occur during relatively short periods (i.e. between the hours of 08:00 – 10:00 and 15:00 – 19:00 Monday to Friday), reducing congestion within the AQMA and therefore the extent and / or duration of these queues could result in a reduction in annual mean NO₂ concentrations at these receptors.

Level of improvement required

In order to determine the level of improvement required to meet the annual mean NO₂ AQS objective, the percentage reduction in local road traffic NO_x emissions required to meet the AQS objective has been estimated at each modelled receptor where an exceedance is modelled to occur. This analysis has been undertaken in accordance with the methodology described in box 7.6 of LAQM.TG16, the results of which are shown in Table C-4.

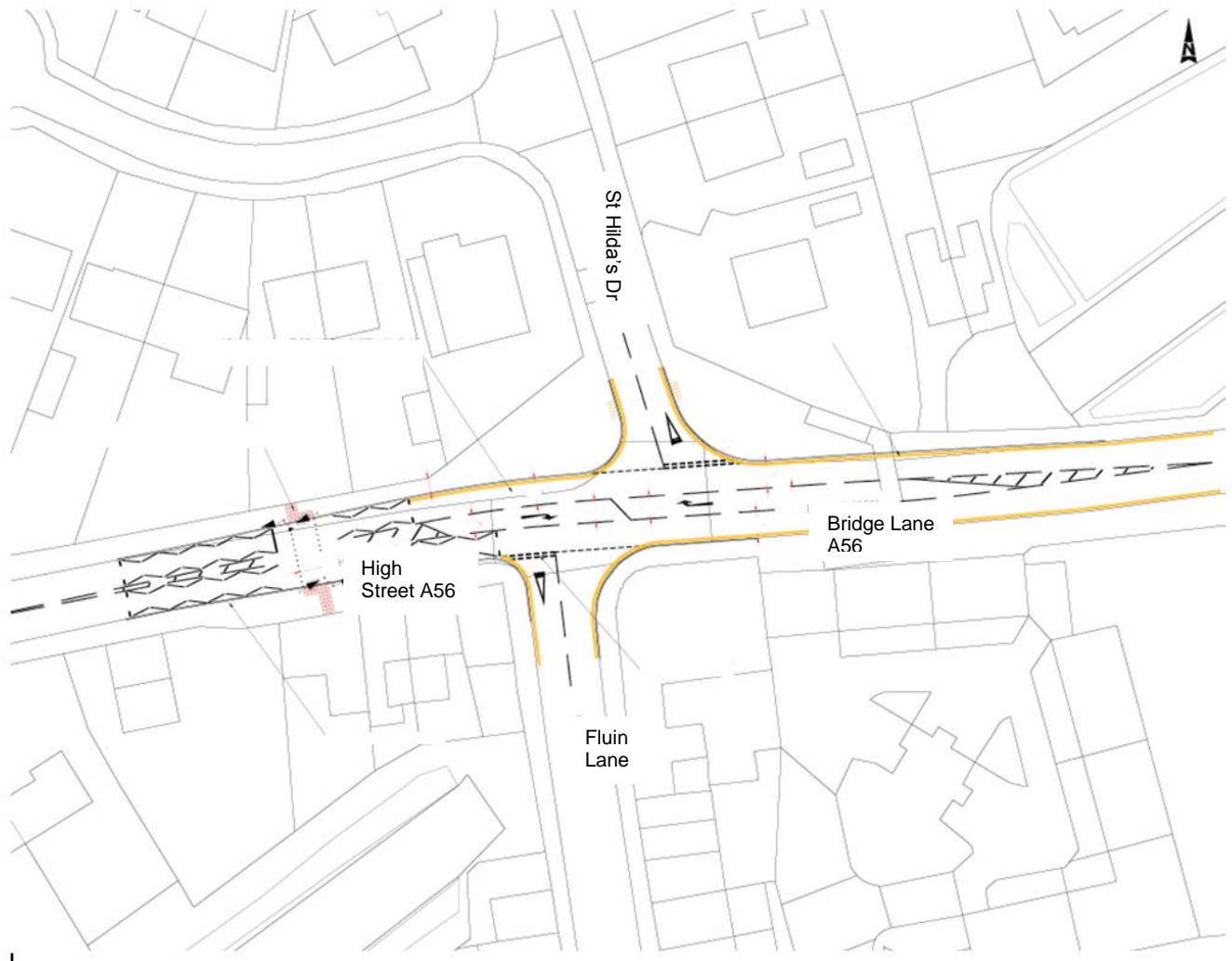
Table C-4 Reduction in NO_x emissions required to meet AQS objective

Receptor	Annual mean NO ₂ concentration (µg/m ³)	Reduction in local road traffic NO _x emissions required to meet AQS objective
1 Manor Farm Court	45.1	19%
2 Manor Farm Court	43.9	15%
7 Manor Farm Court	43.8	15%
74 High St	45.8	21%
68 High St	43.3	13%
Fraser House	40.6	3%
Manor Farm	45.7	21%

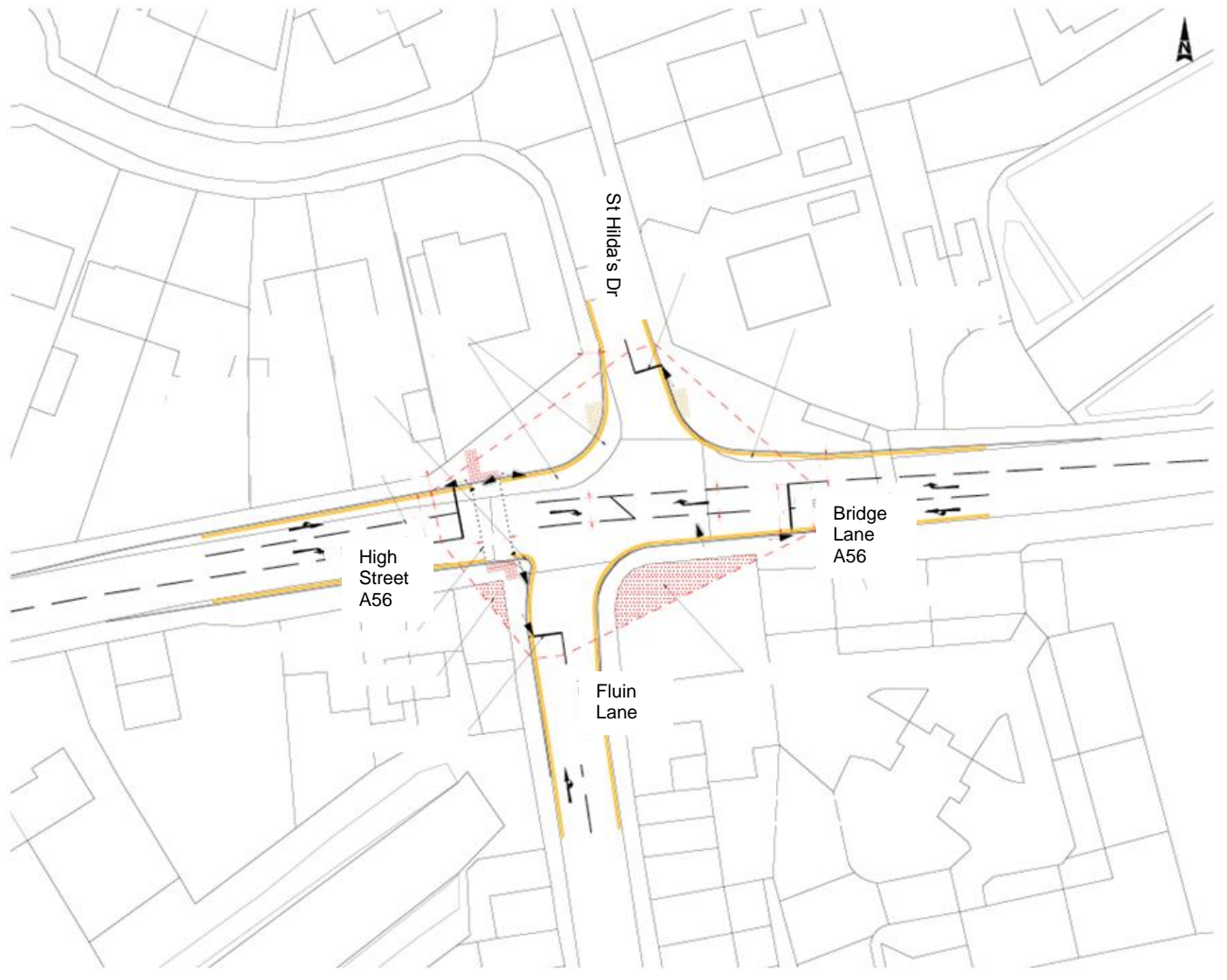
The results shown in Table C-4 indicate that reductions in local road traffic NO_x emissions of up to 21% are required in order to achieve the annual mean NO₂ AQS objective at modelled receptors. Whilst reductions in local road traffic emissions are expected to occur over time due to improvements in the local vehicle fleet, as older, more-polluting vehicles are gradually replaced with newer vehicles which meet more stringent vehicle emissions, the results in Table C-4 indicate that additional action is likely to be required in order to meet the annual mean NO₂ AQS objective within the Frodsham AQMA over the shorter term.

Appendix D: Sketches of possible measures

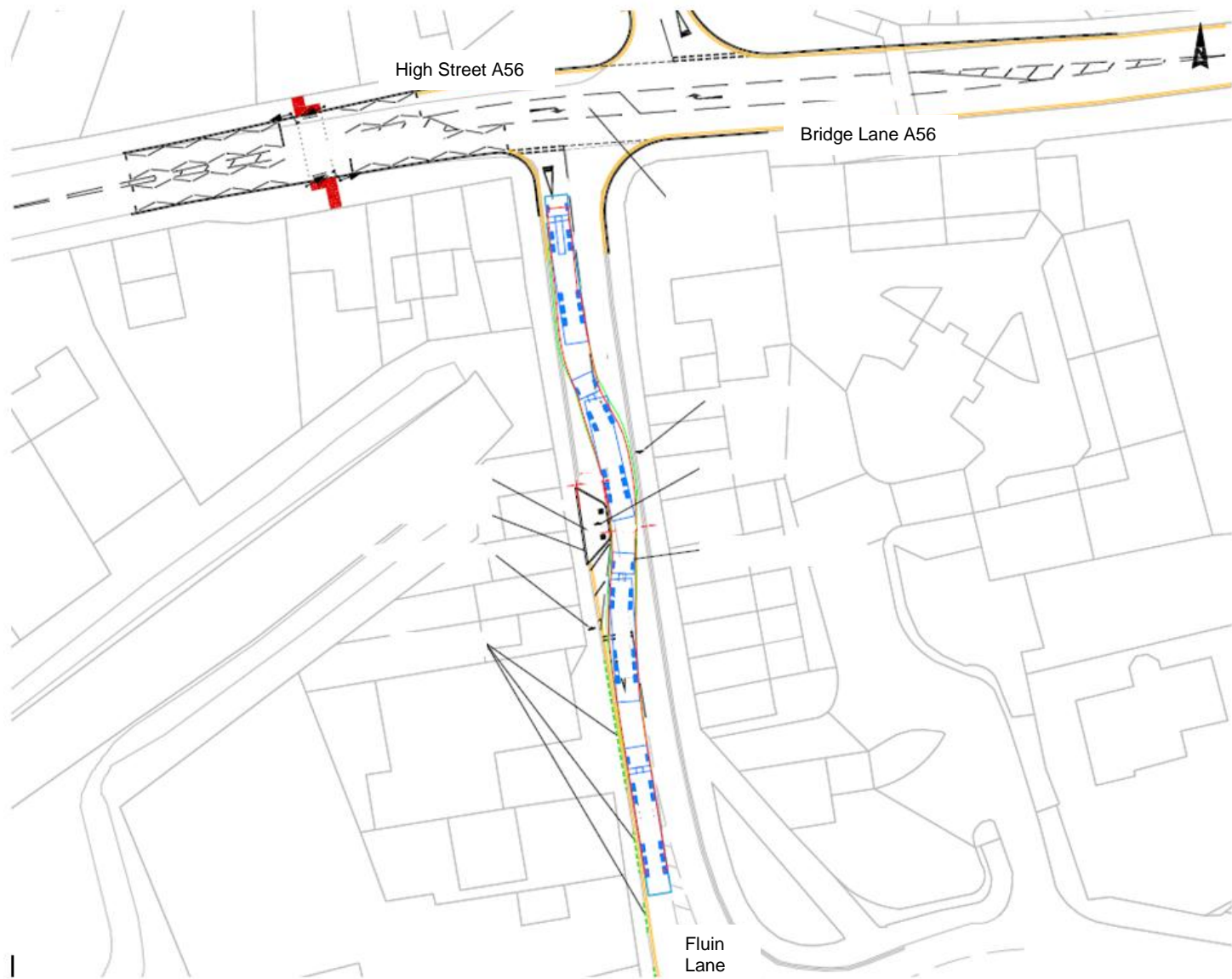
Measure 2 (TI02) – Drawing of the Fluin Lane / A56 junction showing an amended road layout introducing a right-turn facilities on the A56.



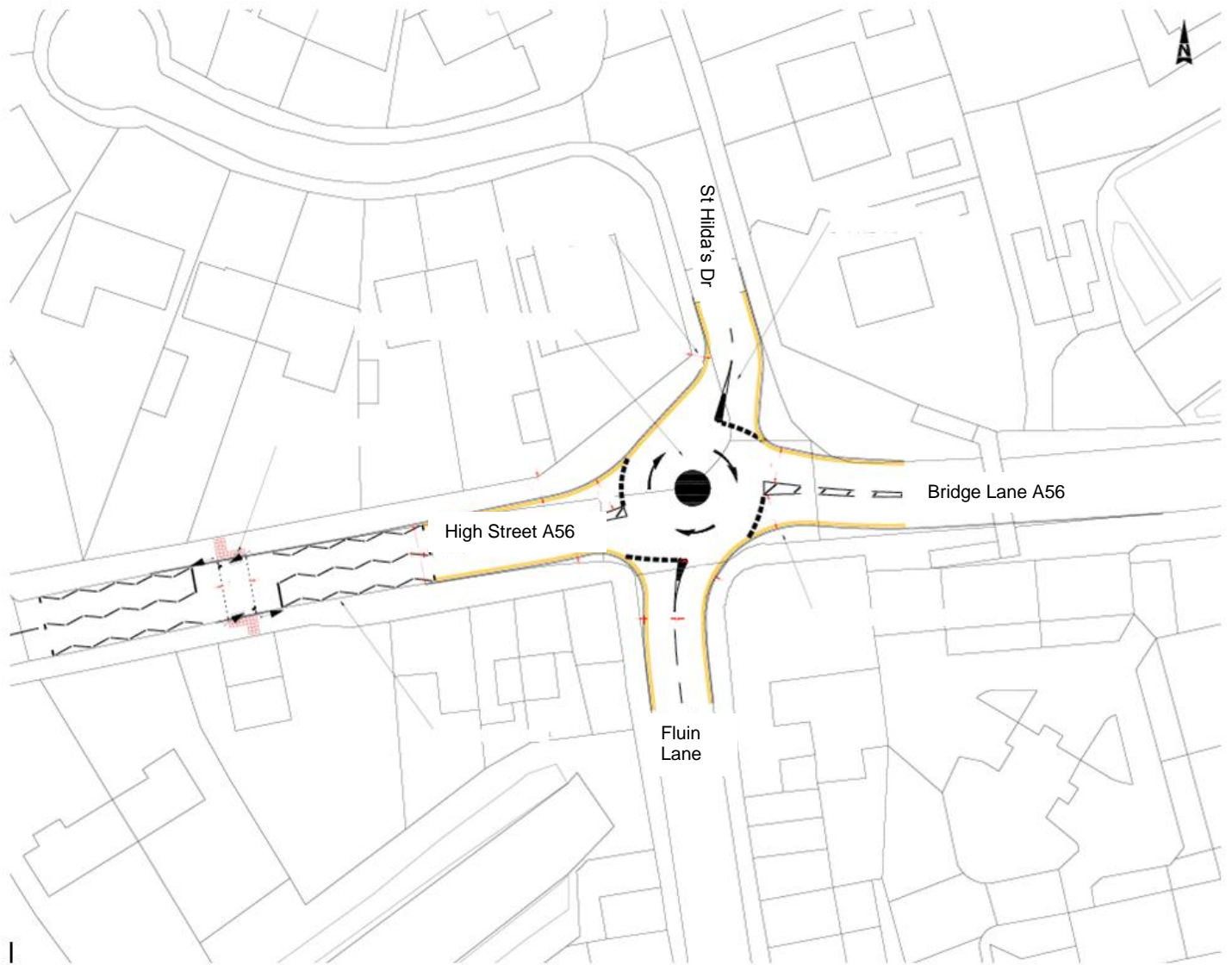
Measure 1 (TI03) – Drawing of the Fluin Lane / A56 junction showing the signalisation of the junction.



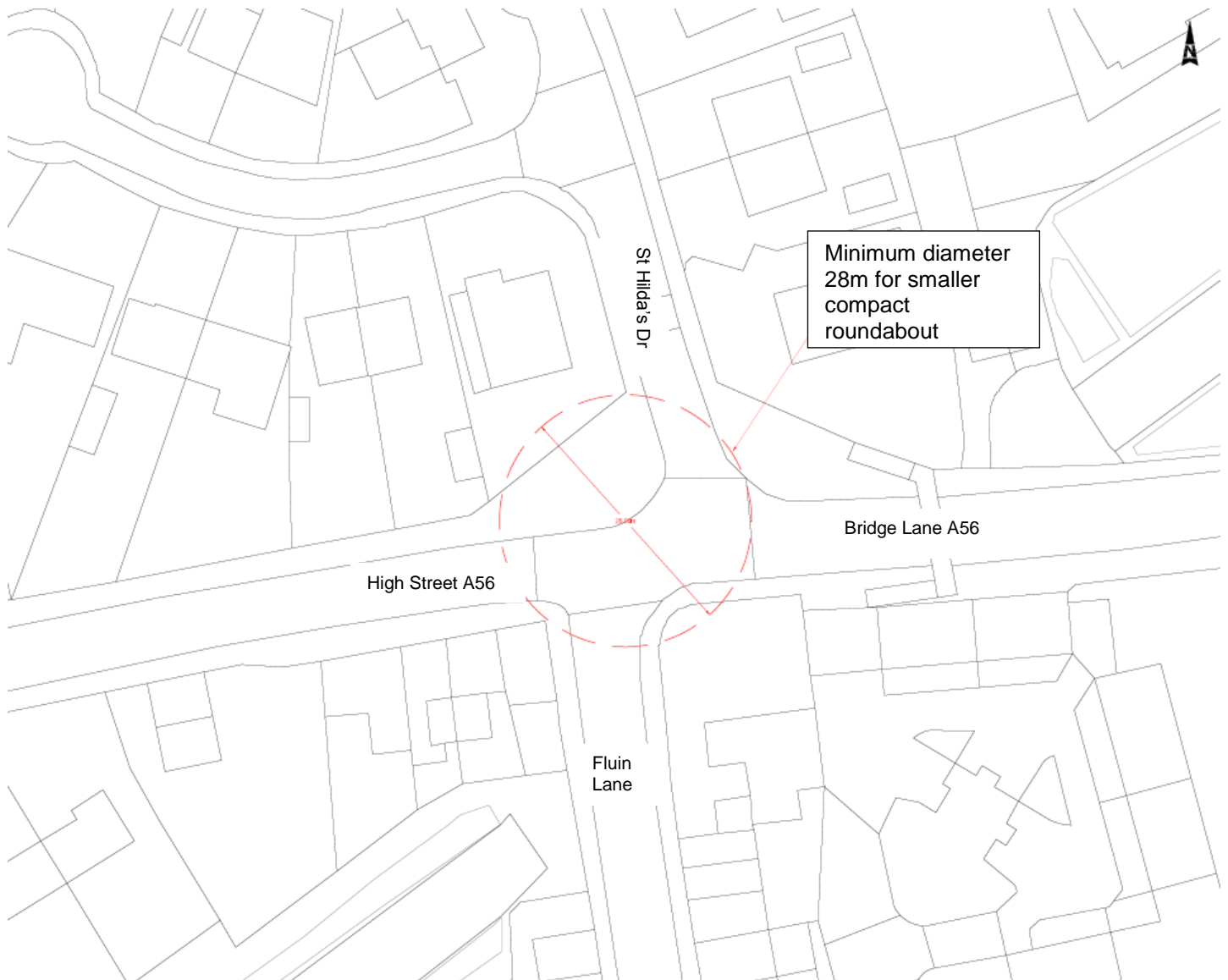
Measure 3 (T112) – Drawing of the Fluin Lane / A56 junction showing the option for a chicane on Fluin Lane



Drawing TI01 – Drawing of the Fluin Lane / A56 junction showing a mini roundabout



Drawing TI04 – Drawing of the Fluin Lane / A56 junction showing insufficient space for a conventional roundabout.



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
EU	European Union
LAQM	Local air quality management
LAQM.TG16	LAQM technical guidance 2016
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
TRO	Traffic regulation order