

Appendix 4

Derby Local Air Quality Plan –

Full Business Case for tackling roadside nitrogen dioxide exceedances

26 March 2019

Monitoring and Evaluation Plan

1. Introduction

Derby's preferred scheme has been selected following the completion of a feasibility study including an extensive evidence base. At its core, the preferred scheme is focussed on a traffic management scheme to specifically address the single identified air quality exceedance in Derby in the shortest possible time. The preferred scheme also includes wider network management to support the redistribution of traffic on the network without creating new exceedances and proposed complementary measures also help to mitigate any negative impacts of the scheme, manage risk in achieving and maintaining compliance and contribute to wider air quality improvement.

This document sets out how the Council will observe and record changes in air quality and traffic variables as part of our scheme monitoring. It also proposes how we will understand the effectiveness of the different interventions through evaluation, also ensuring that no new exceedances are created as a result of implementation of the preferred scheme. It seeks to address the key requirements of the monitoring and evaluation process, as set out in the Monitoring and Evaluation Note provided by the Joint Air Quality Unit, JAQU, on 23 October 2018.

1.1 Document Update and Assumptions

This document has been updated between the Outline Business Case submission on 25 February 2019 and the Full Business Case submission on 26 March 2019, to take into account further evidence from detailed work that has been completed in the intervening period and reflect feedback from JAQU. Unfortunately, this document cannot take into account the detailed guidance that is anticipated to be published by JAQU's Central Evaluation Team in the weeks immediately following submission on the 26 March 2019. Assumptions have therefore had to be made about certain elements of this plan. For example, it has not been confirmed in what format data will need to be provided to JAQU for quarterly reporting.

Delivery of Derby's preferred scheme is imminent (subject to the necessary approvals and grant funding) and processes have begun to support this and ensure that it can be implemented to achieve compliance in the shortest possible time. This means that there is a risk that the pre-scheme monitoring and evaluation data capture is likely to have to be completed without full detailed confirmation of JAQU's requirements. While every effort will be taken to manage this risk and ensure we meet all JAQU's requirements, it may be that due to the need for timely data capture for pre surveys, there may be a requirement for additional work, for example of retrospectively re-formatting the data to meet JAQU's specifications.

There are also some outstanding queries over elements such as access to DVLA database information and the communication process and transfer of this data to a suitable format following Automatic Number Plate Recognition (ANPR) data capture. It is understood that it is likely that DVLA database usage will be provided to cities with charging CAZ schemes through a centralised system with a cost sharing basis yet to be determined. Derby has asked for this to be extended to other cities with relevant schemes that rely on this information for robust scheme analysis and reporting. There are significant costs for local authorities procuring this on an individual basis and, in the absence of confirmation of access via the proposed centralised agreement, this plan and the related financial information has had to include a assumed cost for this to ensure that the risk is managed and the potential costs are identified. If access to DVLA data provision via a centralised system can be confirmed, it is likely that this cost could be significantly reduced. However, if this is not confirmed and made available, it may be that the costs will, at least initially, need to be paid at an increased rate in order for Derby to avoid analysis and reporting delays. Council officers will continue to liaise with JAQU to manage this risk and agree the most

appropriate approach. Early feedback from JAQU following the FBC submission will be essential as we move forward to the technical specifications and procurement route process.

1.2 The Preferred Scheme

The Council's preferred scheme contains a primary abatement measure (to be funded by the Implementation Fund) and mitigation measures (to be funded by the Clean Air Fund) as follows:

1. A traffic management and wider network management solution, including required physical changes at key junctions (*abatement*) and alternative routes
2. Strategic electric vehicle (EV) charging infrastructure provision and supporting measures, for example traffic management measures to support EV usage
3. Clean Air Mobility Scheme (CAMS)

2. Key outcomes

The Council has identified that the key outcomes for monitoring and evaluation are:

2.1. Overall programme

- a. Improved air quality (both NO₂ and PM concentrations)
- b. Contribution to improved public health
- c. Improved asset management to ensure reliability and resilience of the route.

2.2 Traffic management and wider network management (Junction alterations, signals upgrades & UTMC)

- a. Changes in journey patterns due to traffic redistribution without creating new sites of roadside NO₂ exceedance
- b. Fewer journeys being taken through the area of exceedance by non-compliant motor vehicle
- c. Reduced vehicle emissions in the site of exceedance

2.3. Clean Air Incentive Scheme (CAIS) – Clean Air Mobility Scheme (CAMS)

- a. Greater proportion of trips made by low emission, active travel, sustainable transport trips
- b. Fewer trips made by car (petrol / diesel)

2.4. Electric Vehicle (EV) charging infrastructure and supporting measures

- a. Delivery of a network of electric vehicle charging infrastructure across Derby (to improve the viability of increased EV uptake)
- b. Increased use of electric vehicle infrastructure
- c. Contribution to increased use of electric vehicles

Table 1 provides an outline of essential measures to enable robust data collation and reporting of Derby's identified key outcomes. Each component is discussed further in subsequent sections of this document and this table should not be considered in isolation.

Table 1 - Methods of monitoring and evaluation for reporting on key outcomes

Key Outcome	Method	Funding status
Improved air quality (both NO ₂ and PM concentrations)	Diffusion tubes, emissions monitoring and air quality modelling for NO ₂ using ANPR data, verified with Automatic Traffic Counter (ATC) co-location in immediate vicinity of exceedance to ensure robust outputs. PM concentrations will be provided through the emissions monitoring. Data will be provided quarterly for the area of exceedance and the surrounding areas that are most directly affected, with annual reporting including air quality modelling and reporting on the wider network.	Existing network of 71 diffusion tubes require no funding. A further 10 required to ensure area of exceedance and immediate vicinity are adequately covered. Emissions monitoring, ANPR data processing, transport database creation and management and air quality modelling require funding.

Key Outcome	Method	Funding status
Contribution to improved public health	Relevant public health data, such as hospital admission figures to be agreed with Central Evaluation Team.	Third party data should have no cost implication. However, it should be noted that the preferred scheme will be one of many contributing factors to public health data trends.
Improved asset management to ensure reliability and resilience of the route	Reporting on delivery of junction modifications and relevant resurfacing.	Part of implementation fund scheme. No additional funding required.
Changes in journey patterns	ANPR cameras and ATCs. This will use the network of new ANPR cameras required as part of the management of preferred scheme (implementation fund) and the existing network of 45 ATCs plus six new ATCs requested to ensure robustness of data capture by co-locating with ANPRs in and around the area of exceedance. Further analysis of ANPR data using DVLA databases will also support more detailed interrogation of the data to help to understand trends.	The network of ATCs require funding to be retained and maintained to support the preferred scheme but costs are relatively minimal as they are already in place. Six new ATCs are required alongside the ANPR cameras around the area of exceedance for the co-location study. DVLA data processing costs and analysis also require funding.

Key Outcome	Method	Funding status
No new areas of exceedance	As above, the network of ANPR cameras and ATCs, coupled with quarterly emissions analysis and reporting will ensure that key impacted routes can be monitored to ensure no new exceedances are created and risks are managed using the preferred scheme if analysis indicates concerning trends. Diffusion tube data will also be used and the transport database and air quality modelling will provide a detailed analysis of the components contributing to the air quality trends to allow targeted action as appropriate.	As above, the network of ATCs require funding to be maintained, plus the six new ATC sites, ANPR data analysis and the quarterly emissions monitoring will provide data on roads to which traffic has redistributed as a result of the preferred scheme. Diffusion tubes require funding only for new locations and funding is required for the air quality modelling and the supporting transport database that will allow the predictions to be compared with reality and the scheme to be refined when determining factors have been fully explored.
Fewer journeys being taken through the area of exceedance by non-compliant motor vehicle	ANPR and ATC data supported by analysis of the ANPR data capture using DVLA database and analysis will provide vehicle numbers, type and emissions information for reporting. The transport database will provide useful quarterly monitoring for Stafford Street and the surrounding area. Existing cycling ATCs will also help to determine if there is a shift towards this mode.	As above, existing ATCs require maintenance funding plus the six new ATCS are required in the strategic areas, ANPR cameras data will require funding for processing and a transport database will require funding to support quarterly monitoring.

Key Outcome	Method	Funding status
Reduced vehicle emissions in the site of exceedance	Diffusion tubes, emissions monitoring and air quality modelling for NO ₂ using ANPR data, verified with ATC co-location in immediate vicinity of exceedance to ensure robust outputs. PM concentrations will be provided through the emissions monitoring. Data will be provided quarterly for the area of exceedance and the surrounding areas that are most directly affected, with annual reporting including air quality modelling and reporting on the wider network.	Existing network of 71 diffusion tubes. A further 10 required to ensure area of exceedance and immediate vicinity are adequately covered. Emissions monitoring, ANPR data processing, transport database creation and management and air quality modelling require funding.
Greater proportion of low emission, active travel, sustainable transport trips	ANPR and ATC data analysis and emissions monitoring will provide trend data about vehicle volume, type and emissions. Cycling ATCs, public transport data, car club usage data and EV charging infrastructure and EV usage data will also support reporting on this outcome.	ANPR data processing and emissions monitoring require funding. Third party data will not require additional funding. Surveys to determine trends in EV usage will require additional funding.
Fewer trips made by car	ANPR and ATC data analysis and the transport database will provide trend data about vehicle volume, type and emissions. Cycling ATCs, public transport data, car club usage data and EV charging infrastructure and EV usage data will also support reporting on this outcome.	ANPR data processing and the transport database require funding. Third party data will not require additional funding. Surveys to determine trends in EV usage will require additional funding.
Delivery of a network of electric vehicle charging infrastructure	Recording as part of implementation fund scheme delivery.	No additional funding required.

Key Outcome	Method	Funding status
Increased use of electric vehicle infrastructure	Data from EV infrastructure provider and Derby City Council. Qualitative information from surveys of users to determine habits and reasons for usage will supplement this data.	No additional funding required for usage data capture. Surveys require moderate additional funding but benefit from the wider stakeholder engagement and consultation plan, so specific costs are low.
Contribution to increased use of electric vehicles	Data from EV infrastructure provider, Derby City Council. Data from ANPR cameras about use of EV traffic management infrastructure. Qualitative information from surveys of users to determine habits and reasons for usage will supplement this data. It should be noted that the preferred scheme with CAF measures will most likely be one of many contributing factors in making a change to EV vehicles. Causality is difficult to determine but surveys will be devised in collaboration with other local authorities and the central evaluation team to ensure usefulness and consistency. For CAMs users, surveys will be part of the process of receiving funding, primarily funded by CAF.	No additional funding required for usage data capture. ANPR data processing requires funding to enable use of EV traffic management infrastructure to be understood. Surveys require moderate additional funding but benefit from the wider stakeholder engagement and consultation plan, so specific costs are low.

3. Derby's Monitoring and Evaluation overview

The data collected will be used to assess the ongoing success of the preferred option. Traffic flow data capture will be continuous, as part of the preferred scheme delivery, to support network wide dynamic traffic management. This will allow the scheme to be closely monitored on an ongoing basis and adapted where necessary if potential issues or improvements are identified. The wider network management improvements have been specifically designed to be a dynamic system that can be used to react to any emerging issues.

Feedback and analysis of Clean Air Fund (CAF) measures will also help to identify key areas of success and modify scheme elements where appropriate to ensure that delivery targets continue to be met.

3.1 Data collection

Data collected will enable reporting on traffic flows and NO₂ concentration on a quarterly basis. Quarterly data, as required by JAQU, will also be assessed by the Council. As data is collated over time it will become possible to compare monthly traffic flow averages year on year, detailing annual patterns and it will be easier to understand overall progress on a rolling basis.

3.2 Data reporting

Derby City Council will share recorded traffic flow and NO₂ concentration data with JAQU every three months as required. The specifications for this data provision have not yet been determined as we are awaiting confirmation from JAQU. Associated estimates of the time and costs of producing these outputs must therefore remain with a high level of uncertainty and are consequently subject to change following further feedback from JAQU.

JAQU has specified that the preferred scheme should be in place for a year after compliance is predicted to be achieved without intervention. It is assumed that monitoring data will also need to be provided to JAQU throughout this period and the Council will also continue to monitor and evaluate over this timeframe. In the single exceedance location on Stafford Street, natural compliance is predicted in 2024. The scheme and associated monitoring will therefore continue until the end of the 2025 calendar year.

3.3 Existing Data Availability

Table 2 sets out the availability of existing monitoring and evaluation data and additional opportunities for data capture that are anticipated to be provided as part of the implementation of Derby's preferred option. Figures 1 and 2, provided at the end of this document, illustrate plans of the current and proposed approximate locations of ATCs, ANPR cameras and diffusion tubes.

Table 2 - The availability of existing and expected monitoring

Metric	Type	Data Frequency	Quantity	Control
NO ₂ concentrations	Diffusion tube	Monthly	Network of 71 diffusion tubes focussed on the previously identified AQMAs	Local
Traffic volume & composition of type / euro standard (to be funded as part of preferred scheme delivery)	ANPR (from summer 2019)	Real-time as required and AADT calculations as appropriate. Fleet composition data to be extracted over a neutral period of one to two weeks and processed annually.	(Subject to agreement with JAQU as part of the preferred scheme bidding process) This will include six sites in the key core area to facilitate the traffic management scheme and 10 sites to ensure wider network coverage plus a number of additional mobile sites. Wider area cameras to have the flexibility for relocation to allow more detailed analysis in areas of interest. See figure 1 & 2.	Local
Cycle flows	Automatic counters with optional additional manual counts	Real-time	2 in vicinity of Stafford Street area and key area of re-routing.	Local

Metric	Type	Data Frequency	Quantity	Control
*Bus patronage	Bus operator ticket sales	Annual	Published once per year	Tertiary (industry)
*Ebike usage figures, e.g. number of users and average mileage, as available	Operator data	Available monthly. Annual reporting proposed.	Currently 200 Ebikes over 30 docking stations.	Tertiary (industry) and Derby City Council in partnership
*Car Club data e.g. number of users, regularity of usage and mileage per user, as available	Existing and future suppliers	Available periodically. Annual reporting proposed.	Car Club operating across Derby.	Tertiary (industry) and Derby City Council in partnership
*EV charging infrastructure delivery and usage	Data from infrastructure provider and Derby City Council	Annual	City wide data were DCC have ownership / managed	Tertiary (industry) and Derby City Council in partnership
*uptake of supporting traffic management schemes for EVs	Derby City Council	Annual	(Subject to agreement with JAQU as part of the preferred scheme bidding process)	
*Council House EV fleet uptake e.g. number of users, regularity of usage and mileage per user, as available	Operator data	Annual	Single site, 5 EVs	Tertiary (industry) and Derby City Council in partnership

Metric	Type	Data Frequency	Quantity	Control
*CAMS Mobility credit uptake	Operator data	Annual	Regular (at least annual) report from the assured partner running the mobility credit scheme to detail numbers of vehicles permanently removed from fleet, number of grants allocated and how the grants have been used. (<i>Subject to agreement with JAQU as part of the preferred scheme bidding process</i>)	Tertiary (industry) and Derby City Council in partnership
Public Health data, see section 5.2, data selected in consultation with Central Evaluation Team	Derby City Council	Annual	Regular, in consultation with Public Health Team and Central Evaluation Team.	Local

*Metrics associated primarily with CAF measures. The extent and purpose of CAF funding awarded will determine which of the metrics remain relevant for reporting.

4. Additional Monitoring and Evaluation Requirements

The key monitoring and evaluation activities that require additional funding are described in more detail in section 4.1 to 4.7. This explains the reason for their selection and importance in Derby's ability to achieve and provide robust and evidence based reporting on the extent to which different factors contribute to key project outcomes.

4.1 Continuous monitors and analysers

Following consultation with colleagues in the Council's Environmental Health Team and feedback from JAQU, continuous monitors or continuous analysers have not been proposed as preferred measures for evaluation and monitoring. This is because there are none currently in place and for a robust overview several would be needed in strategic locations to understand changes both to the area of exceedance and key areas of traffic redistribution. This would incur a relatively high cost and there are also practical issues of finding a suitable site with opportunities for electrical connection, for example.

It is, instead, proposed to supplement the existing network of 71 diffusion tubes with ten more in locations that will enhance data capture in and around the exceedance site, including roads most likely to incur measurable traffic redistribution. However, in the absence of continuous monitoring, it is proposed that diffusion tube data must be supplemented with emissions monitoring. This will utilise ANPR data and annual air quality modelling to allow detailed analysis of the contributors to changes in air quality, helping to determine the reasons for changes and allowing feedback to enable modifications to the preferred scheme and CAF prioritisation if it is considered that changes could or should be made following analysis of traffic and emissions trends. Diffusion tube data and limitations are further discussed in section 4.2.

4.2 Network of diffusion tubes

As a result of feedback from JAQU on the draft Monitoring and Evaluation Plan, the extent of the network of diffusion tubes has been reviewed. There are currently 71 diffusion tubes in Derby, predominantly focussed around the air quality management areas (AQMAs). Ten additional tubes have been proposed to supplement the current network, in Stafford Street and on roads to which considerable traffic redistribution is predicted as a result of the scheme, including Uttoxeter Old Road.

It is considered that the proposal is appropriate and proportionate, enabling the diffusion tubes to be used for monitoring but also to support the essential air quality modelling that will aid better understanding of the scheme and form part of the continual feedback loop to optimise scheme delivery.

4.2.1 Limitations of diffusion tubes

The Council does not have any real time air quality monitors. A bid to JAQU for a new roadside continuous analyser through the feasibility study was unsuccessful in 2016. There is one existing real time monitor in Derby located on Bass' Recreation Ground adjacent to A601 Holmes Bridge. This does not belong to the Council and is too far removed from the exceedance location to be of use in monitoring the primary objective of the project i.e. Achieving compliance in the shortest time possible.

JAQU have advised that the use of diffusion tubes is suitable for monitoring and evaluation purposes for this project in preference to more costly real time monitors.

However, it should be noted that diffusion tube monitoring is not considered appropriate in terms of compliance monitoring against the EU Directive (2008/50/EC) and the transposed UK Regulations (The Air Quality Standards Regulations 2010). Part A of Annex I of Directive 2008/50/EC clarifies the *data quality objectives for ambient air quality assessment* against the Limit Values, confirming that for “*fixed measurements*”, a maximum uncertainty of 15% is permitted for measurements of NO₂. NOx/NO₂ diffusion tubes are stated under DEFRA Guidance Document TG(16) as having an uncertainty of +/-25%. Such a level of uncertainty is only permitted under Part A of Annex I for “*indicative measurements*”, suggesting that diffusion tubes are not appropriate for compliance monitoring against the Directive.

Furthermore, Annex III outlines the requirements for the assessment of ambient air quality and the location of sampling points for the measurement of a number of pollutants, including NO₂. Part C of Annex III confirms the requirements for *microscale siting of sampling points*. Within this section, reference is made to “*the flow around the inlet sampling probe*” and “*the sampler’s exhaust outlet*” among other things. It is clear that these are specific references to ‘active’ sampling techniques (where air is pumped or drawn through the sampler at a known volume). Clearly such requirements would not apply to diffusion tube monitoring which is a ‘passive’ sampling technique and which have no ‘inlet probe’ or ‘exhaust outlet’. Consequently, Annex III also seems to clarify that diffusion tubes should not be used for the assessment of ambient NO₂.

The above-mentioned Annex III, Part C requirements are transposed directly into Part 3 of Schedule 1 of the Air Quality Standards Regulations 2010 and therefore presumably apply equally to the UK Regulations as they do to the EU Directive.

Relying solely upon diffusion tube monitoring is therefore not considered to be compliant with EU Directive 2008/50/EC or the Air Quality Standards Regulations 2010, which require a greater level of data confidence in conjunction with automatic monitoring techniques.

4.3 Vehicle Emissions monitoring

The Council intends to provide quarterly vehicle emissions monitoring data, including NO₂ and particulates, which also have known health implications. The emissions data will also allow the contribution of the traffic flow to the measured diffusion tube data to be better understood. The emissions monitoring will use ANPR data using one week of data per quarter from six sites (the core monitoring area of Stafford St, Uttoxeter Old, Uttoxeter New Road and Friar Gate area).

This will involve ‘real world’ emissions data capture using a remote sensing system to develop a detailed database of emission factors for vehicles by make and model. This data can be combined with ANPR data to provide an estimate of the ‘real world’ emissions generated by traffic at that camera’s location. This in effect gives a direct measurement of vehicle emissions.

Using this approach, an estimate of traffic emissions at each ANPR site can be provided on a quarterly basis for reporting to JAQU. This would be done as follows:

- use 1 week of representative ANPR data for each quarter
- link the ANPR data to vehicle data
- combine the vehicle data with an emissions database to provide ‘real world’ emissions for this average week
- break down results by vehicle type and Euro standard as necessary to provide a source apportionment of emissions at each site

It is proposed that this will be carried out for one quarter in 2019 prior to implementation of the scheme and then quarterly from 2020 to 2024 after implementation of the scheme. In 2019 there will be additional work required to set up the data collection and processing system that will then be used on a quarterly basis.

4.4 ATCs and ANPR

While every effort will be made to ensure the best use of the most appropriate equipment, it is widely acknowledged that ANPR cameras do not usually achieve 100% data capture. For

this reason, co-location studies are planned with new ATC equipment in key locations in the core area to allow calibration of the ANPR outputs, including on Stafford Street and Uttoxeter Old Road, where it is essential that data capture, including fleet mix and emissions data, is robust and fully understood. Existing ATCs on the wider network will be used to support data collection and ANPR calibration as required, dependant on the allocation of sufficient funding to maintain these ATCs.

The use of ATCs and ANPR cameras will also help us to understand and react to the influences of any unforeseen events, for example, disruption to the network due to emergency work by utility providers in the event of burst gas or water mains, which can extend over several weeks. Coupled with emissions data this will enable greater resilience to disruption over time and modifications following accurate assessment of the ability of the scheme to manage the air quality in Stafford Street and on routes to which traffic has redistributed as a result of the scheme.

4.5 DVLA data processing and analysis

DVLA processing and analysis is explored in section 1.1. The proposed ANPR cameras will provide a significant amount of data for processing, which will be essential for understanding trends in fleet mix and vehicle emissions in key areas. It is hoped that the cost of data collection and processing can be reduced if access to the DVLA database is provided through the centralised system for CAZs proposed by JAQU, on a similar basis to that proposed for cities with charging CAZs.

4.6 Transport database and Annual Air Quality Modelling

In addition to monitoring data it will be essential to undertake air quality modelling, underpinned by associated transport inputs, to ensure that the preferred scheme is performing as anticipated and enable full exploration of any deviation from expectations. This will allow us to understand the relative importance of key modelling inputs such as fleet mix, traffic volumes, emissions assumptions and canyon effects. Achieving a thorough understanding of the contributions of different factors to the success of the scheme will also support the dynamic nature of the traffic management solution, enabling evidence based scheme modification to ensure optimisation of the approach.

This will also help us to understand the influence and accuracy of assumptions in the modelling to date, such as whether nationally provided future vehicle fleet emission

assumptions were reflective of the situation in Derby and the extent to which this affected the accuracy of modelling forecasts overall. Understanding the reason for any differences between predicted and observed outcomes will support the determination of an appropriate scheme modification to redress the balance.

This type of information should also be very helpful for the Central Evaluation Team and other local authorities in refining their schemes and understanding risks and could help in exploring the differences between observed and predicted data at a national level.

Supporting work, included in the transport database and modelling support costs in Table 4, will include developing a database that will take the information from the six core ANPR cameras and co-located ATCs (as proposed in Table 4) in Stafford Street and the key areas of traffic redistribution. This data will be processed into flows, speed and vehicle type/fleet mix data for use in the subsequent air quality modelling based on routing derived from a process of number plate recognition. This will provide a single set of information for each route.

For quarterly reporting the database will be run based on a representative set of the ANPR data from the previous three months and produce the data required for air quality modelling. A report will summarise the traffic impacts of the scheme during that period compared to the previous observed information and also include trend plots since the implementation of the scheme for each route.

A wider area database will be created for annual monitoring including network wide ANPR and traffic data.

The annual air quality modelling will use local data to underpin modelling assumptions wherever possible. Traffic flow data for the target core area will be derived from ANPR, provided as AADT by vehicle class for each road link to go into model. ANPR data will be linked to vehicle details to derive updated local fleet composition on an annual basis. The modelling will also make use of the increased network of diffusion tubes data in key locations, including bias corrected NO₂ data for links for model verification and adjustment.

Speed data will be taken annually from Traffic Master data, if possible, for links of interest, or potentially derived from ANPR if the Traffic Master data is not available.

The central core area in the vicinity of Stafford Street will be modelled and updated annually, but the rest of the model will remain as in 2020 to ensure the background is representative without having to renew the whole modelled area each year. PCM receptors will be inserted along all updated links. Results will only be reported for the updated core area.

This methodology is intended to build on the principles and agreed methodologies for modelling in the feasibility study and provide the most accurate possible modelled representation of air quality in Derby, focussed on the area of predicted exceedance.

Both the specialised quarterly emissions monitoring and annual modelling will be provided through external consultant support via appropriate procurement processes.

4.7 Surveys and focus groups for qualitative analysis - public perception, stakeholder engagement and communication

The monitoring and evaluation of public perception on air quality will be key in determining people's response, acceptance and engagement with Derby's plan for tackling roadside NO₂. Understanding public perception is critical to inform the design process in determining appropriate measures and an important component of behavior change which plays a major role in the public response to air quality.

In addition to the quantitative measures set out within the monitoring and evaluation plan the Council proposes to supplement this with qualitative data collection. The implementation of the preferred scheme, including CAF funded measures will benefit from a stakeholder engagement and communications plan, as set out in the full business case. Minimal additional monitoring and evaluation funding (£12.5k) is required to lock in the benefits of the proposed engagement activities and fund qualitative surveys for reporting purposes, for example on the uptake of EV vehicles and use of EV infrastructure and to help to determine the role of the preferred scheme and CAF measures in making EV based choices.

The methodology for measuring public perception will primarily focus on surveys to assess perceived local air pollution, perceived health risks and views on the Local Air Quality Plan and supporting mitigation measures. Supplementary face to face Focus groups will also be conducted amongst key representative groups to gather further qualitative monitoring and evaluation for the scheme and this will include but not be limited to stakeholders and residents in areas most likely to be affected by the preferred scheme. The survey data will be collected before, post implementation and post mitigation in order to measure the impact of implementation and the success of the mitigation measures. Public perception of local air quality in Derby will be monitored and reported at these key project stages as an indicator of scheme success and can be used to shape and develop interventions to promote awareness and behavior change.

Surveys will also be carried out as part of the CAMS element of the CAF proposal as part of the process for releasing funds. The survey data will be collected online as part of the

standard application process for those eligible for CAMS. The baseline data and subsequent online follow up survey collected from individuals will enable the impact and effectiveness of CAMS funding to be measured. Three monitoring surveys and three focus groups have been included in the marketing and communications cost as part of the Clean Air Fund (CAF) Bid. If the CAF bid for this activity is not successful this will be an additional cost to the scheme Monitoring and Evaluation, as identified in Table 4.

Table 3 below outlines how we will monitor our marketing and communications activity for the project. We will use the measures set out below to ensure that our activity remains effective through robust monitoring and evaluation of all qualitative elements. The table is also included in the LAQP Stakeholder Engagement and Communications Plan (Appendix 8 in the Business Case).

Table 3 – Marketing and Communications Evaluation

Outputs	Out-Takes	Outcomes	Organisational Impact
Volume of media coverage (Proactive and reactive)	Number of stakeholders actively engaged	Project and key message awareness levels	Ensure reputation of Derby and the Council is protected and strengthened
Item of stakeholder comms produced e.g. Newsletter/ mailshot, surveys	Engagement rates with web and social content, click through rates, average view length time	Network disruption minimised	
Number of events delivered	Media sentiment		
Channels used (i.e. owned, earned, paid or shared)	Engagement rates with communications and resources package (Mailshots/ Newsletter) click through rates and views.		
Unique people reached with social media, web content, and surveys			
Average reach per social media post/ newsletter and mailshot views			
Average impressions per post			

Table 4 sets out the options for fulfilling additional monitoring and evaluation requirements, including preferred options and a cost overview. Table 5 provides an annual breakdown of the subset of preferred monitoring and evaluation activities that will require specific additional funding. A full financial breakdown of costs is provided in the financial case, which also includes associated staff fees, inflation and risk adjustment. This document should be read in conjunction with the Full Business Case and, in particular, with the Financial Case.

Table 4 - Proposals / options to address the gaps in the currently available monitoring data

Option	Cost excl. inflation & risk adjustment)	Coverage	Data Quality	Decision	Funding Source
Install a new continuous analyser	£16k initial then £1300 annually	One site on Stafford Street	Good – continuous readings with uncertainty of +/- 10%	Discounted – JAQU has suggested that diffusion tube data will be adequate at a much lower cost.	Shortfall – discuss with JAQU as set out in guidance
Other continuous monitors e.g. EDAR or NDIR	Variable depending on chosen technology.	One site on Stafford Street	Average continuous readings of emissions	Discounted – does not monitor concentrations, new technology insufficiently tested/accepted	Shortfall – discuss with JAQU as set out in guidance
Install and service 10 new sites for diffusion tube data collection.	£4,050 in total project lifetime	Stafford Street key areas of predicted re-routing	Poor if used in isolation but could complement ANPR data. Monthly readings with uncertainty of +/-25%	Preferred following discussion with JAQU. Cost effective option with adequate information if placed at appropriate intervals.	Shortfall – discuss with JAQU as set out in guidance

Option	Cost excl. inflation & risk adjustment)	Coverage	Data Quality	Decision	Funding Source
Emissions monitoring (see section 4.3 of this plan)	£168,000	6 sites for seven days per quarter	Good	Preferred to understand emissions	Shortfall – discuss with JAQU as set out in guidance
Traffic volume ATCs	£90,000 over total project lifetime (five years)	45 existing sites across the network to be kept live for this purpose. This proposal will also cover the cost of maintenance and management of the six new ATCs for the co-location study, detailed below.	Good. Real-time.	Preferred to ensure wider network coverage of data collection for dynamic network management	Shortfall – discuss with JAQU as set out in guidance
Traffic volume ATC co-location	Six new sites adjacent to ANPR at £10k per site £60,000	Stafford Street and Uttoxeter Old Road as the key areas of predicted re-routing	Good, continuous	Preferred to enable greater accuracy of flow data on the most important area and validate ANPR data.	Shortfall – discuss with JAQU as set out in guidance
Data collection / analysis incl. DVLA look up, processing and reporting	£1,050,000 over the lifetime of the monitoring if DVLA data is not made available through JAQU – 150k per	Related to the network of ANPR cameras required for the traffic management scheme	Good	Preferred – essential to understand the fleet mix and monitor changes	Dependent on whether DVLA data is made available through JAQU in line with expectations for schemes with charging CAZ areas. The first period

Option	Cost excl. inflation & risk adjustment)	Coverage	Data Quality	Decision	Funding Source
	year				of data collection may still be required if access to DVLA data does not meet the timeframe for delivery of this scheme.
Transport database and modelling support	£120,120 over the lifetime of the project	Quarterly and annual reporting	Good. Comparable to modelling to date to ensure progress is as expected and explore any reasons for deviation.	Preferred. Essential to understand the reason for changes and support the feedback of information for scheme modification	Shortfall – discuss with JAQU as set out in guidance
Air Quality modelling	£81,900 over the lifetime of the project	Annual modelling	Comparable to modelling to date to ensure progress is as expected and explore any reasons for deviation.	Preferred. Essential to understand the reason for changes and support the feedback of information for scheme modification	Shortfall – discuss with JAQU as set out in guidance
Surveys and focus groups for qualitative analysis	£12,500	Scalable and affected in grant awarded for CAF	Good	Preferred, especially to understand motivations for choices and the effectiveness of the initiatives in this. Also useful	Shortfall – discuss with JAQU as set out in guidance

Option	Cost excl. inflation & risk adjustment)	Coverage	Data Quality	Decision	Funding Source
				for the Central Evaluation Team	

Note: The values above do not include inflation and are not risk adjusted. Please see the financial case of the FBC for full details included costs with inflation and risk adjusted.

A breakdown of associated staff fees to provide sufficient resource for monitoring and evaluation and provision of required quarterly data to JAQU is provided in the financial case.

Table 5 provides an annual breakdown of the proposed monitoring and evaluation activities that will not be provided through existing or scheme specific funding. Table 5 does not detail associated staff fees, inflation or risk adjustment, which are described briefly in the supporting text but are provided in the full financial breakdown in the financial case of the Full Business Case that this document supports.

It should be noted that costs are higher in 2019 than in subsequent years because of the set up costs, including database creation and ATC installation as identified.

Table 5 - Annual breakdown of additional monitoring and evaluation activities not provided by the implementation of the preferred scheme or existing projects

Note: these figures do not include inflation and are not risk adjusted.

Measure	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Diffusion tubes , 10 new tubes and maintenance	600	600	600	600	600	600	450	4,050
Quarterly emissions monitoring at six sites collecting one week of data. £6k initial set up with £6k reporting each quarter	30,000	24,000	24,000	24,000	24,000	24,000	18,000	168,000
Traffic volume ATC data	15,000	15,000	15,000	15,000	15,000	15,000	-	90,000
Additional ATC. Installation of asset: Six sites adjacent to ANPR @ £10k per site in vicinity of Stafford St and Uttoxeter Old Road (24/7 data)	60,000	-	-	-	-	-	-	60,000

Measure	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	Total
Data collection, processing and summary reports by third party Inclusive of any DVLA look up costs. One week per quarter of euro standards / fleet breakdown plus data processing & reports, £10k per month DVLA look up fee plus data processing	150,000	150,000	150,000	150,000	150,000	150,000	150,000	1,050,000
Consultant's input into annual reports - Transport database and modelling support: Requirement for modelling and other outputs for submission to JAQU on quarterly / annual basis	31,380	14,790	14,790	14,790	14,790	14,790	14,790	120,120
Consultant's input into annual reports - AQ modelling: Requirement fAQ modelling (annual) £11,700 per year	11,700	11,700	11,700	11,700	11,700	11,700	11,700	81,900
Qualitative monitoring and evaluation of the scheme, including focus groups and surveys at key project stages.	-	2,500	2,500	2,500	2,500	2,500	-	12,500
		Total	£1,586,570					

The total additional cost for monitoring and evaluation measures is £1,586,570, not including inflation or risk adjustment. Associated staff fees over the period of the project to 2025 are £282,774, bringing the total to **£1,869,344**.

The total cost of monitoring and evaluation is £2,129,167 over the lifetime of the project, including inflation and risk adjustment. A more detailed overview of this is provided in the financial case of the Full Business Case document.

However, it should be noted that more than half of the additional monitoring and evaluation cost is to ensure appropriate access and data processing of ANPR data including utilising DVLA data. As outlined in section 1 of this document, if JAQU provide access to this data and costs of processing are reduced, this would have an impact on the total additional funding required for monitoring and evaluation. As JAQU have been unable to confirm this, costs provided reflect a robust approach to ensure data capture and reporting can adequately support feedback into scheme refinement and sufficient detail about key factors driving or limiting the success of the scheme following implementation.

5. Further Qualitative assessment

5.1 Public Health in Derby

Road transport is estimated to be responsible for up to 70% of the harm associated with air pollution. There is a growing evidence base that demonstrates long term exposure to air pollution is harmful at levels well below current air quality limits / targets and is causing a significant morbidity and mortality burden in Derby. By far the largest disease burden attributable to environmental exposure and management of chemicals is related to exposure to air pollution.

The local mortality burden attributed to particulate matter (PM2.5) air pollution in Derby City is calculated as being equivalent to 131 deaths and an associated loss to the population of 1,425 life-years. The impact of air pollution affects the whole population, however it disproportionately affects those living in environments close to main transport routes, the most deprived communities, children, older people and those with pre-existing medical conditions such as heart disease and respiratory conditions.

5.2 Public Health Data

The Council will utilise available public health data to supplement the monitoring and evaluation data collected in order to help assess the Local Air Quality Plan's impact on health. This will include the indicators measured through the Public Health Outcomes Framework (PHOF) and the resulting information available in the data tool. PHOF analyses many key indicators of public health including 3.01 which measures "Fraction of mortality attributable to particulate air pollution". PHOF data will also enable Derby to benchmark and compare outcomes with other local authorities. We will also utilise other data sources such as DEFRA background maps to provide estimates of background concentrations for specific pollutants. These can then be used in air quality assessments to better understand the contribution of local sources to total pollutant concentrations.

The Council will also liaise with the Central Evaluation Team, Public Health colleagues in Derby and air quality teams in other local authorities to understand what public health data might usefully and consistently be reported in relation to the preferred scheme.

Figure 1

The current and proposed approximate locations of ATCs, ANPR cameras and diffusion tubes

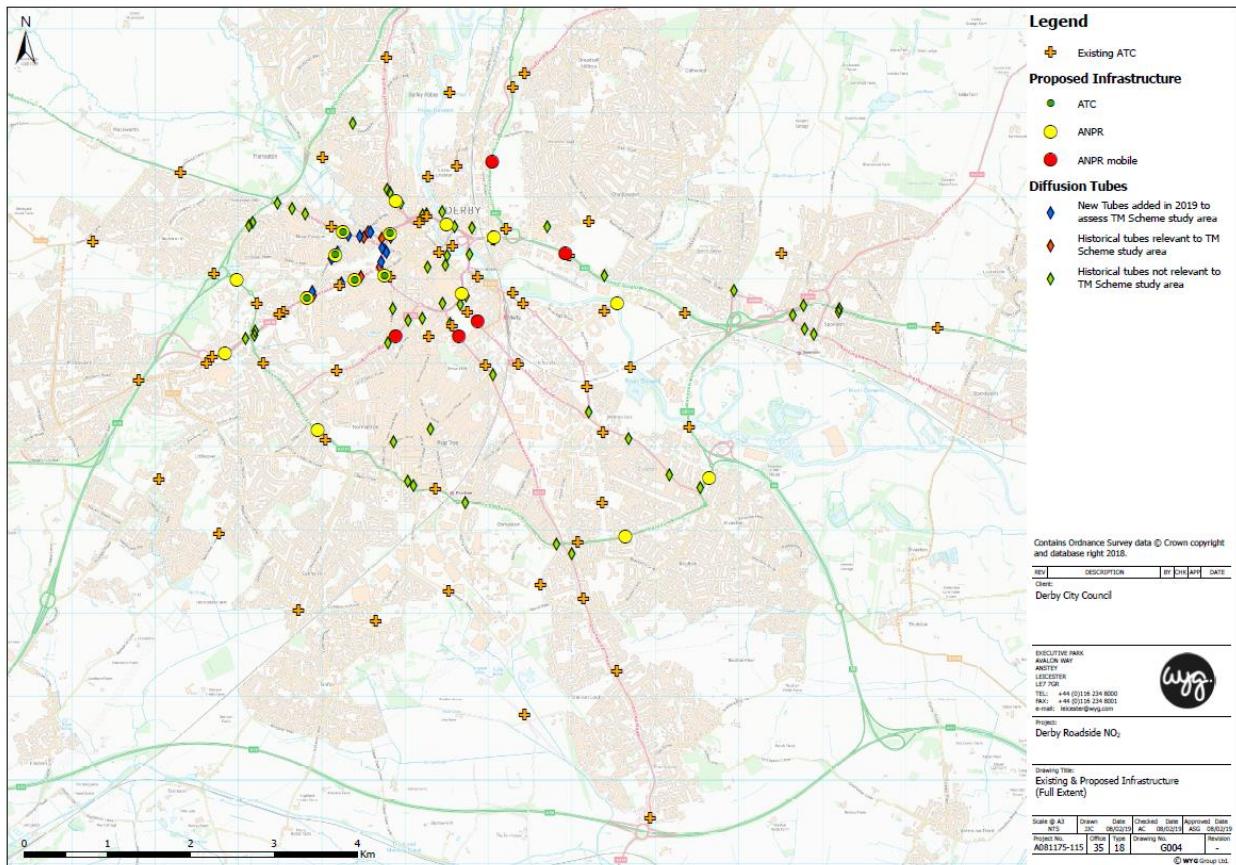


Figure 2

Core Area - current and proposed approximate locations of ATCs, ANPR cameras and diffusion tubes

