



Bath Clean Air Plan

Bath and North East Somerset Council

Evaluation, Monitoring & Benefits Realisation Plan

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Acronyms and Abbreviations

AAQM	Ambient Air Quality Monitoring
ANPR	Automatic Number Plate Recognition
AURN	Automatic Urban and Rural Network
B&NES	Bath and North East Somerset
Bath BID	Bath Business Improvement District
CAP	Clean Air Plan
CAZ	Clean Air Zone
CSF	Critical Success Factor
CBTF	Clean Bus Technology Fund
Defra	Department for Environment, Food & Rural Affairs
DfT	Department for Transport
EA	Enterprise Area
EU	European Union
EV	Electric Vehicle
FBC	Full Business Case
GDP	Gross Domestic Product
GHG	Greenhouse Gases
HGV	Heavy Goods Vehicle
HM	Her Majesty
KPI	Key Performance Indicator
JAQU	Joint Air Quality Unit
JSA	Job Seekers Allowance
LEP	Local Enterprise Partnership
LAQM	Local Air Quality Management
LGV	Light Goods Vehicle
MaaS	Mobility as a Service
NO ₂	Nitrogen Dioxide
OBC	Outline Business Case
ONS	Office for National Statistics
PCM	Pollution Climate Mapping
PHE	Public Health England
PHEV	Plug-in Hybrid Electric Vehicle
PHV	Private Hire Vehicle
PTZ	Pan, tilt, zoom
ROAMEF	Rationale, Objectives, Appraisal, Monitoring, Evaluation and Feedback
SME	Small to Medium Enterprise

SOC	Strategic Outline Case
SCOOT	Split Cycle Offset Optimisation Technique
ULEV	Ultra Low Emission Vehicle
UTC	Urban Traffic Control
UTMC	Urban Traffic Management and Control
UWE	University of West of England
VMS	Variable Message Signs
WECA	West of England Combined Authority

1. Introduction

Poor air quality is the largest known environmental risk to public health in the UK¹. Investing in cleaner air and doing more to tackle air pollution are priorities for the EU and UK governments, as well as for Bath and North East Somerset Council (B&NES). B&NES has monitored and endeavoured to address air quality in Bath, and wider B&NES, since 2002. Despite this, Bath has ongoing exceedances of the legal limits for Nitrogen Dioxide (NO₂) and these are predicted to continue until 2025 without intervention.

In 2017 the government published a UK Air Quality Plan for Nitrogen Dioxide² setting out how compliance with the EU Limit Value for annual mean NO₂ will be reached across the UK in the shortest possible time. Due to forecast air quality exceedances, B&NES, along with 27 other Local Authorities, was directed by Minister Therese Coffey (Defra) and Minister Jesse Norman (DfT) in 2017 to produce a Clean Air Plan (CAP). The Plan must set out how B&NES will achieve sufficient air quality improvements in the shortest possible time. In line with Government guidance B&NES is considering implementation of a Clean Air Zone (CAZ), including both charging and non-charging measures, in order to achieve sufficient improvement in air quality and public health.

Jacobs has been commissioned by B&NES to produce an Outline Business Case (OBC) and Full Business Case (FBC) for the delivery of the CAP; a package of measures which will bring about compliance with the Limit Value for annual mean NO₂ in the shortest time possible in Bath. The OBC assessed the shortlist of options set out in the Strategic Outline Case³, and proposed a preferred option including details of delivery. The FBC develops the preferred option set out in the OBC, detailing the commercial, financial and management requirements to implement and operate the scheme. The OBC and FBC form a bid to central government for funding to implement the CAP.

This document is written to support the OBC and FBC and sets out how the benefits of the scheme will be monitored, evaluated and realised. It has been produced in line with the Inception, Evidence and Options Appraisal packages of Guidance issued by the Joint Air Quality Unit (JAQU) in 2017, supplementary central monitoring and evaluation guidance provided by JAQU in October 2018 and July 2019, and the HM Treasury Green Book.

The objective of the scheme is to deliver compliance with NO₂ air quality Limit Values and Air Quality Objectives⁴ in the shortest possible timescales. To understand whether the scheme meets this objective, it is recommended that the “Standard Monitoring” approach set out in the Department for Transport’s (DfT) “Monitoring and Evaluation Framework for Local Authority Major Schemes” (September 2012) is followed. This is supplemented by project-specific guidance provided by JAQU for central monitoring and evaluation.

This report sets out the evaluation strategy and benefits realisation plan for the B&NES CAZ scheme, covering the monitoring of impacts and the approach to determining the projected benefits, impacts and objectives. In line with HM Treasury’s Magenta Book (2011) and DfT’s ‘Monitoring and Evaluation Strategy’ (2013), the plan also covers two stages of the ROAMEF concept (Rationale, Objectives, Appraisal, Monitoring, Evaluation and Feedback). This ensures that the Plan is aligned with the Government’s broad policy making and delivery cycle, depicted in Figure 1.1.

¹ Public Health England (2014) Estimating local mortality burdens associated with particular air pollution.
<https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution>

² <https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017>

³ Bath and North East Somerset Council Clean Air Plan: Strategic Outline Case, March 2018

⁴ http://www.bathnes.gov.uk/sites/default/files/siteimages/Environment/Pollution/strategic_outline_case_bath_28.03.2018_with_annexes.pdf

⁴ Nitrogen dioxide (NO₂) must not exceed 40 µg/m³ as an annual mean (i.e. measured over a calendar year)

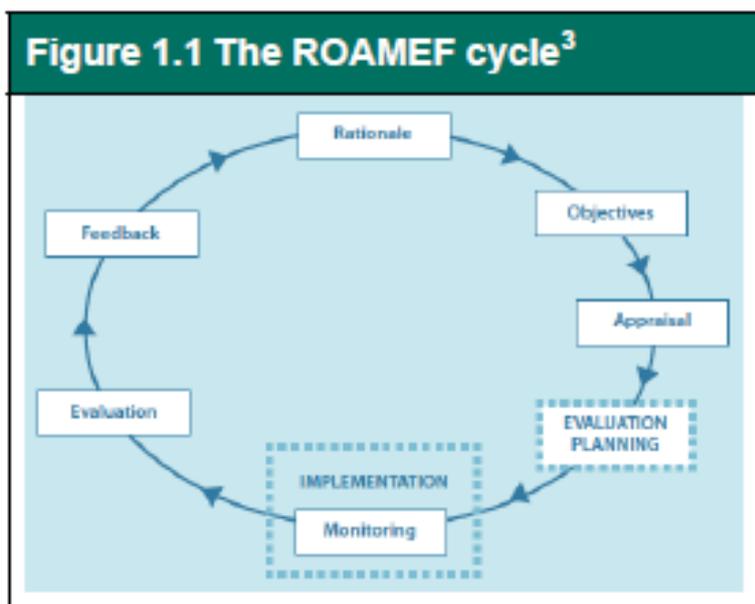


Figure 1-1: The ROAMEF Concept

In addition to local monitoring and evaluation of the B&NES CAZ Scheme, there will be a central evaluation which will take place over two to three years by a separate organisation procured by JAQU, with certain local authorities selected as a case study for a more detailed assessment. The central evaluation will provide B&NES and other Local Authorities with learning that can be used to help delivery of Local Plans. This should include an understanding of what measures are working to reduce emissions in the shortest possible time and improve on the understanding of how Local Plan measures may affect local areas. The central evaluation will also provide Local Authorities with advice on approaches to gather robust data.

1.1 Summary of Evaluation Approach

The proposed evaluation approach is designed to assess whether the outputs and impacts of the scheme deliver the desired benefits and overarching objectives. The approach reflects the scale and type of scheme, plus the resources available to complete an evaluation providing a strong evidence base to feed into the benefits realisation assessment, inform stakeholders and where necessary, refine schemes.

The evaluation will include quantitative and qualitative measures, thereby covering a range of outcomes and impacts. Furthermore, the evaluation strategy will help influence similar schemes. It will comprise both 'process evaluation' and 'impact evaluation', with the former focussing on the processes by which the scheme was undertaken and the latter focussing on whether the desired impacts of the scheme were realised.

To enable evaluation to take place, a monitoring framework needs to be in place. The requirements of the "Standard Monitoring" outlined in the "Monitoring and Evaluation Framework for Local Authority Major Schemes" September 2012 DfT guidance have been used as a guide. This is supplemented by specific monitoring guidance provided by JAQU, which will primarily inform the central evaluation of the scheme.

The following measures (including inputs, outputs, outcomes and impacts) will be monitored:

- Scheme build
- Delivered scheme
- Outturn costs
- Scheme objectives
- Travel demand, including behavioural change
- Travel times and reliability of travel times

- Out-turn value for money
- Impacts on the economy
- Carbon impacts.

In addition, air quality will be monitored, even though it is only a requirement under “Enhanced Monitoring”. This is because of the focus of the Scheme on improving air quality across B&NES. Similarly, a study on public health is proposed to assess the health and wellbeing of residents in the zone and surrounding area before and after the introduction of the scheme.

The monitoring, evaluation and benefits realisation plan is defined in two parts, with the first part (Process Evaluation) covering the first three areas listed above: the scheme build, delivered scheme and costs, and the second area (Impact Evaluation) covering the scheme outputs, outcomes analysis and impacts to inform the benefits realisation. The second part will draw on the requirements in so far as they are applicable for this scheme.

The approach to assessing scheme outcomes and benefits realisation is defined in terms of the following stages, as shown in Figure 1-2, where:

- **Desired Impacts** – are in line with the scheme objectives and critical success factors (CSFs) identified within the Business Case submission. The desired impacts reflect the intended consequences of the intervention (labelled D1 to D6. See Section 4).
- **Outputs** – reflect the monitoring process and covers the various metrics and indicators expected to be impacted by the intervention that can be readily measured (labelled M1 to M17, see Section 4).
- **Outcomes** – relate to actual consequences of the intervention and should be closely related to the Desired Impacts where a project is delivered successfully with a clearly defined rationale and appraisal process (labelled O1 to O4, see Section 4). The outcome analysis feeds into the Benefits Realisation, with monitored outputs informing the extent to which the outcomes (including benefits) are realised.

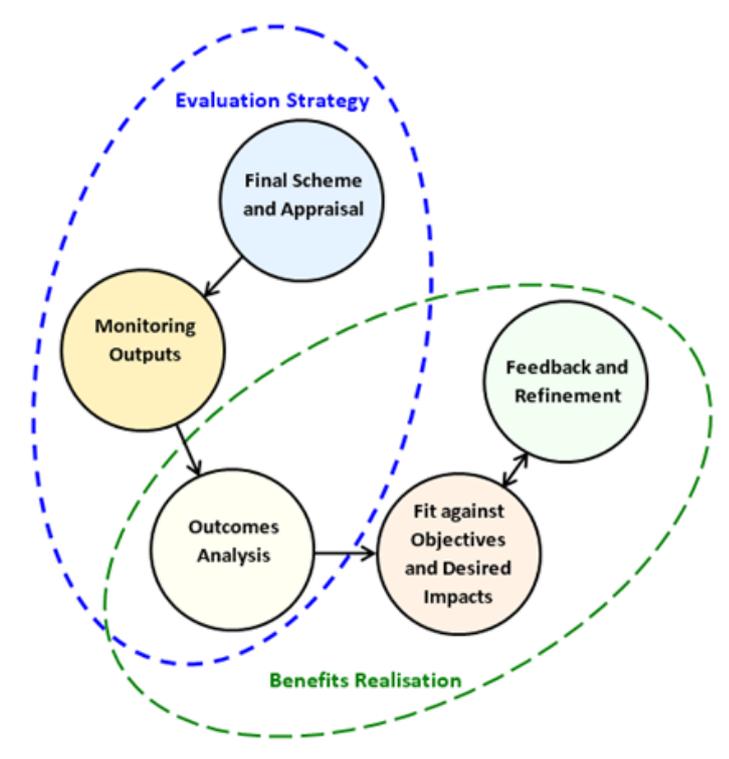


Figure 1-2: Flow Diagram for Evaluation and Benefits Realisation Strategy

1.2 Scope of the scheme

As set out in section 1.1. of the FBC, the UK Government has put in place legislation passed down from the EU, to ensure that certain standards of air quality are met, by setting Limit Values on the concentrations of specific air pollutants. In common with many EU member states, the EU limit value for annual mean nitrogen dioxide (NO₂) is breached in the UK and there are on-going breaches of the NO₂ limit value in Bath. The UK government is taking steps to remedy this breach in as short a time as possible, with the aim of reducing the harmful impacts on public health. Within this objective, the government published a UK Air Quality Plan and a CAZ Framework in 2017. The latter document provides the expected approach for local authorities when implementing and operating a CAZ.

Due to forecast air quality exceedances, B&NES Council was directed in July 2017 by Minister Therese Coffey (Defra) and Minister Jesse Norman (DfT) to produce a CAP to achieve air quality improvements in the shortest possible time. In line with Government guidance, as part of the Plan, B&NES Council is implementing a CAZ, including both charging and non-charging measures, in order to achieve sufficient improvement in air quality and public health.

The focus of this CAP is on achieving air quality and public health improvements in the shortest time possible in accordance with the High Court Order in November 2016⁵.

As highlighted in section 2.2. of the FBC, poor air quality is the largest known environmental risk to public health in the UK⁶ and investing in cleaner air and doing more to tackle air pollution are priorities for the EU and UK governments as well as for B&NES. To this end, legislative bodies at all levels are motivated to implement air quality standards to be achieved through actions and policies, with the health of local people at the heart of the measures implemented.

JAQU have established two primary funding mechanisms to support project expenditure as part of the delivery of local CAPs. The Implementation Fund will provide funding for activities and schemes that facilitate the achievement of air quality limit values and objectives. The Clean Air Fund will provide funding for activities and schemes that mitigate against any potential negative impacts of the CAP on vulnerable social and business groups, with a focus on SMEs in particular. Further, there is potential to fund additional activities and schemes through any net revenue surplus generated as a result of charging elements of the project (i.e. the CAZ).

Within this context, the Bath CAP scheme comprises of:

Implementation scheme components (to be delivered through funding from the Implementation Fund):

- A Class C CAZ. The extent of the CAZ covers Bath City Centre and its immediate surrounds, as depicted in Figure 1-3. Class C designation means that all taxis, private hire vehicles, LGVs, HGVs, buses and coaches that do not meet emission standards will be charged for entering the zone. The charge is set at £9 (for taxis, private hire vehicles and LGVs), and £100 for HGVs, buses and coaches.
- Queen Square traffic management. This comprises additional signal control in the north-west and south-west corners of Queen Square in Bath City Centre to mitigate the continued predicted exceedance (2021) on A4 Gay Street, between George Street and Queen Square. The aim is to restrict the flow of traffic and encourage use of the alternative routes.

⁵ November 2016 in R (ClientEarth) (NO₂) V Secretary of State for Environment Food and Rural Affairs [2016] EWHC 2740 (Admin)

⁶ Public Health England (2014) Estimating local mortality burdens associated with particular air pollution.

<https://www.gov.uk/government/publications/estimating-local-mortality-burdens-associated-with-particulate-air-pollution>

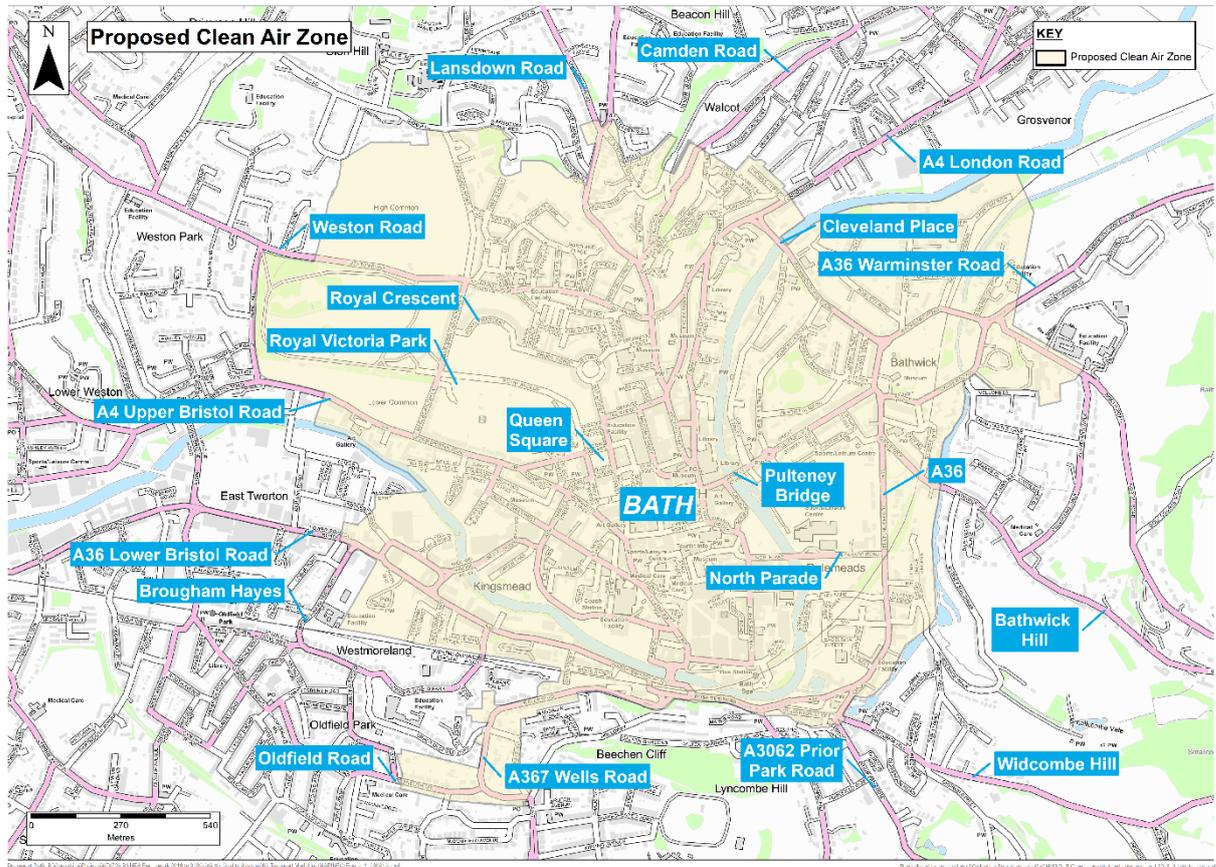


Figure 1-3: Map of the Bath CAZ boundary⁷

Mitigation Measures (to be delivered through funding from the Clean Air Fund):

Confirmed

- Expanding the existing Clean Technology Bus Fund (CTBF) programme by providing additional funding for retrofitting registered, local Euro 3/4/5 buses.
- Financial support for replacing pre-Euro 6 diesel and pre-Euro 4 petrol non-compliant vehicles with compliant ones.
- Provide additional travel advisors to facilitate the use of the mitigation schemes by the impacted groups and ensure uptake.

Unconfirmed

- Provide support and facilities for alternative delivery and servicing options for businesses.

Other Measures

- Anti-idling enforcement (to be delivered through funding from Implementation Fund)
- Weight restriction enforcement (to be delivered through funding from Implementation Fund)
- ULEV parking permit scheme (to be delivered through funding from Early Measures Fund)

⁷ © Crown Copyright 2018. License number 100023334

Revenue Components (to be delivered in the event of net revenue surplus from charging):

- Enhancing the non-charging measures already being funded by the Government's Implementation Fund and Clean Air Fund
- Enhancing the monitoring and evaluation of the Scheme (and implementing the contingency plans if required)
- Maintaining and enhancing the existing walking and cycling network and creating low traffic neighbourhoods
- Supporting walking, scooting and cycling to school initiatives and creating school streets
- Supporting and enhancing the public transport network, including home to school transport
- Maintaining and enhancing the public EV charge point network
- Supporting and enhancing sharing schemes such as the electric cycle hire scheme and car and van club network
- Providing additional park and ride capacity and security at the existing park and ride sites and on existing bus routes
- Providing schemes to reduce the impact of vehicles on the health and wellbeing of residents and visitors
- Supporting the development of a mobility as a service (MaaS) platform
- Related research and policy development.

2. Process Evaluation

In line with HM Treasury's 'Magenta Book' (2011), process evaluation assesses whether a policy is being implemented as intended; by focussing on the processes, timelines and budgets surrounding the implementation phase.

To provide evidence of the impacts, delivery and costs of the final scheme, which could be used to understand the case for similar interventions within the city and elsewhere in the UK, the following will be assessed against the planned Scheme outcome and process:

- **Scheme Build** - covering procurement of the scheme, achievement of timescale and key milestones, risk outcomes and stakeholder feedback.
- **Delivered Scheme** – covering scheme refinements and success of the proposed design and materials used. This will include any measures taken to minimise any identified negative impacts during implementation.
- **Outturn Costs** - compared to forecasts covering capital and on-going operating and maintenance costs, ensuring the scheme financial performance is in line with the business case.

3. Impact Evaluation

In line with HM Treasury's 'Magenta Book (2011)', impact evaluation attempts to provide an objective test of what changes have occurred, and the extent to which these can be attributed to the policy.

3.1 Local scheme objectives

To understand what changes have occurred as a result of the project and scheme, it is first necessary to refer to the desired impacts of the intervention, as established through project objectives and CSFs. The full details of the development process that led to the identification of the scheme are to be found in the SOC, OBC and FBC. As part of this process it was established that the scheme should meet the following objectives:

- The primary spending objective of the Plan, in accordance with JAQU Options Appraisal Guidance, is to deliver a scheme that leads to compliance with the EU's NO₂ concentration Limit Values in the shortest possible time.
- A secondary spending objective is to deliver a scheme which leads to compliance with the LAQM air quality Objectives for NO₂ as set out in the Air Quality (England) Regulations (SI 2000/ 928 as amended).

Supplementary spending objectives identified for the scheme include:

- Demonstrating Value for money.
- Demonstrating an evidence-based justification for the intervention, based on real-time local evidence of air quality, emission sources, and levels of air pollution in Bath.
- Minimising the impacts on local residents and businesses, including on disadvantaged groups such as low-income households.
- Minimising the impacts on economic growth and development in Bath, helping to accelerate the transition to a low emission economy, and creating a healthy place to live, visit and work.

Based on these objectives, the OBC presents a series of CSFs that are used to assess each option, building on the findings of the SOC. The secondary CSFs defined for the CAP have been grouped using the five-case model approach set out in the DfT's guidance on 'Transport Business Cases' (2013) as a framework. These have been carried forward to the FBC.

- Primary CSF – combining the primary and secondary spending objectives, the primary CSF seeks to deliver compliance with NO₂ air quality Limit Values and Air Quality Objectives in the shortest possible timescales. At SOC stage, only those options that achieved this CSF (based on modelling available at that time) were shortlisted for further analysis.
- Secondary CSF – related to the supplementary spending objectives listed above, the following secondary CSFs were used at SOC stage to undertake a comparative assessment of shortlisted options, and carried forward to OBC stage:

Strategic

- All trip purposes treated equitably.
- Compliance with Defra CAZ framework, including minimum requirements.

Economic

- Mitigate financial impact on low income groups.
- Maximise health improvements of low-income groups.
- Net economic benefit.
- Improve general public health.

Commercial

- Is the market able to supply in the time available?

Financial

- Likelihood of revenue equating to implementation/operational costs.
- Upfront capital required for scheme.
- Risk of financial penalty to the Council/s.

Management

- Public acceptability.
- Local, regional and national political acceptability.

3.1.1 Desired Impacts to Monitor

The following desired impacts, established through consideration of the objectives and CSFs presented above, are considered to be appropriate to evaluate the outcomes of the proposed scheme, and it is these below that should be monitored and assessed for the realisation of benefits as part of this plan:

Objectives of Implementation Fund Scheme:

- Deliver compliance with NO₂ air quality Limit Values.
- Deliver compliance with NO₂ air quality Air Quality Objectives.
- To minimise the impact to residents, particularly low-income groups

Objectives of Clean Air Fund Scheme:

- To minimise the impact to local businesses and low-income groups.
- To minimise adverse traffic impacts.
- Contribute to the delivery of the 'Getting Around Bath' Transport Strategy and WECA's Joint Local Transport Plan.

Measuring the impacts on health and wellbeing from interventions to reduce air pollution is complicated. This is due to a number of reasons including difficulties in distinguishing the harmful effects of air pollution from the impacts of unhealthy lifestyles and socioeconomic deprivation on health, and the fact that a pollutant may have both short term and long-term impacts on health.

Therefore, the wider objective of improving public health is not suggested as a desired impact, however B&NES Council, in collaboration with the Air Quality Management Resource Centre in the University of the West of England (UWE), is proposing to carry out local evaluation of health and wellbeing impacts linked with the implementation of a CAP in Bath. This is in recognition that, whilst many health benefits can only be seen over a lifetime, some impacts on health and self-perception of health could be seen over the shorter period of scheme delivery, and improvements in air quality are known to produce improvements in public health (and vice versa). Where the scheme demonstrates compliance with the Limit Values and Objectives, an improvement in public health should also have been achieved.

This proposal is included in Appendix A.

Additionally, in March 2019, B&NES Council declared a Climate Emergency and passed a motion recognising the urgent need to cut carbon emissions (as a result of burning fossil fuels) and become carbon neutral by 2030. The vehicle fleet and traffic data as detailed in section 4 below (Monitoring Plan) enables, by use of the Emission Factor Toolkit, the ability to assess changes in emissions of Greenhouse Gases (GHGs).

3.2 Central evaluation

As well as the local scheme plan, information gathered will be provided to support the central evaluation of all the CAPs implemented in the UK. The following aspects are to be assessed centrally:

1. What impact have Local Plans had on air quality, NO₂ emissions and health?
2. How have Local Plans affected behaviours of car owners, public transport users and local businesses? Have behaviours changed in expected or unexpected ways?
3. How has the impact of the Local Plans varied for different local groups, including more vulnerable residents or transport users?
4. How have external factors influenced the effectiveness of the Local Plans?
5. How does the approach to implementing Local Plans affect the scale and pace of impacts?

The central evaluation will be undertaken by a separate organisation procured by JAQU, with certain local authorities selected as a case study for a more detailed assessment. It is assumed that the information required from B&NES is covered by the plan in Section 4.

4. Monitoring Plan

4.1 Introduction

The monitoring plan aims to define a programme of data collection and information collation tasks (labelled M1 to M19) that will provide outputs to assist in determining if the actual impacts of the proposed package are as projected.

The proposed monitoring plan is intended to be synchronised with wider B&NES, Wiltshire and other stakeholder programmes, so as to reduce resource and minimise costs. The proposed methods are also linked to the data collection completed as part of the continuing development of the air quality and transport modelling tools, so maximising use of the data used to identify the scheme impacts and benefits.

The key questions to be answered through the monitoring plan are listed below:

- Was the scheme delivered to costs and timescale?
- Has the scheme delivered the types and scale of forecast benefits, and show out-turn value for money as projected?
- Has the scheme delivered the desired objectives?
- What lessons can be learnt to help shape future air quality strategies for the City?
- When will the zone be switched off?

The scheme monitoring will focus on the main areas of impact of the scheme.

A separate study is also proposed to assess the impacts of the CAZ on public health. This is included in Appendix A.

4.2 Data Collection and Information Collation

In order to answer the key questions outlined above, a series of data collection and information collation will be required. Table 4-1 below, lists the data collation which is needed to provide inputs to a series of data monitoring outputs, as specified in the September 2012 monitoring guidance and the JAQU 2018 and 2019 guidance. These data monitoring outputs will then be used to assess the performance of the CAZ and be put to answer the key questions posed.

The areas of data collection are as below:

- M1: Air quality data
- M2: Traffic flows
- M3: Vehicular fleet information
- M4: Retail/business/office space vacancy figures
- M5: Retail footfall surveys
- M6: Park and Ride passengers data
- M7: Walking and cycling counts
- M8: Bus usage data
- M9: Stakeholder Feedback from Council User Group Forums
- M10: Taxi fares and unmet demand surveys

Measures M11 to M15 are to monitor and evaluate the proposed mitigation measures:

- M11: Early Measures Fund - ULEV Parking Permits
- M12: Bus retrofit uptake/compliance data
- M13: Financial support scheme uptake
- M14: Travel advisor session uptake
- M15: Anti-idling enforcement
- M16: Weight restriction enforcement
- M17: Delivery and servicing plans uptake

Although not a specific measure, it is proposed that a separate study is undertaken to assess the impacts of the CAZ on public health. This can be found in Appendix A.

Table 4-1: Data Collation and Collection

Measure	Data to be Used	Rationale for Inclusion	Data Collection Methods	Frequency of Data Collection
M1: Air quality data	NO ₂ concentrations data collected at existing monitoring locations in Bath and wider B&NES	To understand changes in air quality data, particularly NO ₂ concentrations.	Diffusion tubes and real time monitoring	Baseline (pre-scheme) then continuous monitoring.
M2: Traffic Flows	Traffic Flows in and around the CAZ areas will be collected to understand the changes in traffic flows as a result of the scheme.	To understand changes in traffic flows along key corridors and links on the highway network. This will include possible 'rat-run' routes which may have been created by the CAZ, so responding to consultation concerns by residents in specific areas.	ANPR cordon and ancillary Manual Classified Counts (MTC) or Automated Traffic Counts (ATC) on key roads or perceived 'rat-runs'	Minimum 2 weeks during baseline (pre-scheme) then continuously through permanent ATCs (analysed quarterly)
M3: Vehicular fleet information	Number of compliant/non-compliant vehicles travelling within Bath	To understand changes in the type of vehicles travelling in Bath.	ANPR cordon, cross-referencing with DVLA vehicle database	Baseline (pre-scheme) then quarterly (March, June, September and December)
M4: Retail/business/office space vacancy figures	Vacancy statistics from internal council data (B&NES economy and growth team). Market data from property consultants. Purchasing Managers Index.	To understand changes to the number of businesses operating in Bath in order to assess economic impacts.	Internal data collection as part of ongoing process. Regular property market reports published by property consultants in the public domain could also be utilised.	Baseline (pre-scheme) then annually
M5: Retail footfall surveys	Footfall data from Bath Business Improvement District data and internal council data.	To understand changes to the number of people entering shops in Bath as well as the time they spend in each shop.	Bath BID and B&NES collect this data as part of ongoing processes.	Baseline (pre-scheme) then annually

Measure	Data to be Used	Rationale for Inclusion	Data Collection Methods	Frequency of Data Collection
M6: Park and Ride passengers data	Occupancy statistics (Cloud Amber) and bus ticket data (First). Monitor fleet mix	To understand changes in the number of people and the type of vehicle using the park and ride into Bath.	Collected as part of ongoing monitoring activities by operators. ANPR at entrance to Park and Rides	Baseline (pre-scheme) then biannually
M7: Walking and cycling counts	Pedestrian and cycle counts on key arterial routes	To understand changes in the number of people walking and cycling on key routes within Bath.	Commissioning of new surveys	Baseline (pre-scheme) then annually
M8: Bus usage and fare data	Occupancy statistics (Cloud Amber) and bus ticket data (First).	To understand changes in the number of people using the bus on each route into Bath.	Collected as part of ongoing monitoring activities by operators.	Baseline (pre-scheme) then annually
M9: Stakeholder Feedback from Council User Group Forums	Stakeholder Feedback covering relevant elected members, stakeholder groups, the LEP. Voice Box survey. Protected groups survey.	Understand the views of stakeholders to scheme delivery and impacts, and to understand some of the less quantified effects, including package effects.	Part of the on-going consultation process for transport strategies in the City.	1, 3, 5 years after scheme opening
M10: Taxi fares and unmet demand	Taxi fare data and unmet demand surveys	To understand changes to fares and demand on taxis in order to assess the economic impacts	Collected as part of ongoing monitoring activities by operators.	Baseline (pre-scheme) then annually
M11: Early Measures Fund - ULEV Parking Permits	Statistics on ULEV scheme uptake	To understand the popularity	Collected as part of the parking permit scheme operation	Baseline (pre-scheme) then biannually
M12: Bus retrofit uptake/compliance data	Statistics on bus retrofit scheme uptake and bus compliance	To understand changes to bus fleet operating in Bath.	Collected by ANPR cameras, as part of ongoing monitoring activities by operators and from the retrofit scheme	Baseline (pre-scheme) then biannually
M13: Financial support scheme uptake	Statistics on financial support scheme uptake	To understand the success and popularity of the financial support schemes in changing to compliant vehicles	Collected as part of the financial support scheme operation	Biannually after scheme roll-out
M14: Travel advisor session uptake	Statistics on meetings with travel advisors	To understand the overall success of travel advisors and	Collected as part of the travel advisor scheme operation	Biannually after scheme roll-out
M15: Anti-idling enforcement	Data from enforcement action for anti-idling	To understand the success of the measure in reducing idling	Collected as part of the anti-idling enforcement scheme operation	Biannually after scheme roll-out
M16: Weight restriction enforcement	Data from enforcement action for anti-idling	To understand the success of the measure in enforcing weight restrictions	Collected as part of the weight restriction enforcement scheme operation (from Trading Standards)	Biannually after scheme roll-out

Measure	Data to be Used	Rationale for Inclusion	Data Collection Methods	Frequency of Data Collection
M17: Delivery and servicing plans uptake	Statistics on delivery and servicing plans uptake	To understand the success of the delivery and servicing plans measure with businesses	Collected as part of the delivery and servicing plans operation	Biannually after scheme roll-out

Collection of data from Measures M1 and M2 is mandatory and is required for submission to JAQU’s evaluation team. There are a number of other areas of data collection proposed which will also support the process of monitoring and evaluation, to demonstrate that the scheme meets with the Critical Success Factors and desired local outcomes.

As such the three key monitoring areas to determine the impacts of the Scheme are considered to be air quality, traffic flows and public health. Further details about the monitoring of these metrics is provided in Sections 4.2.1 to 4.2.3 below.

4.2.1 Air Quality Monitoring

4.2.1.1 Pre-scheme Monitoring

A programme of air quality monitoring in Bath has been in place since the mid-1990s, using diffusion tubes and continuous analysers. This has been developed and refined for the purposes of the CAZ, as well as B&NES ongoing obligation to monitor local air quality.

The following changes have been made to the monitoring network since the inception of the project:

- 43 new sites were added in 2018
- 3 sites were removed at the beginning of 2019 on the edge of Bath as concentrations were below 25 µg/m³; 1 site in the centre of Bath close to an existing site was also removed
- 44 new sites were added in 2019 with 39 sites made triplicate, in accordance with the latest JAQU monitoring guidance
- A new AURN location was established in 2019 (as B&NES were unable to continue using the previous location).

The monitoring locations have been reviewed and where possible, relocated as close to modelled LAQM and PCM exceedances. This will enable the most accurate possible assessment of air quality levels at key locations.

The diffusion tubes will continue to be monitored on a quarterly basis. This information will be used to inform the pre-scheme baseline and be included in the Stage 1 report.

4.2.1.2 CAZ Scheme Monitoring

Figure 4-1 presents the air quality monitoring sites currently in place and proposed for monitoring the CAZ.

This information will be used to understand the direct impact of the CAZ on air quality, particularly NO₂ concentrations, and is vital to demonstrate that the scheme achieves compliance in the shortest possible time.

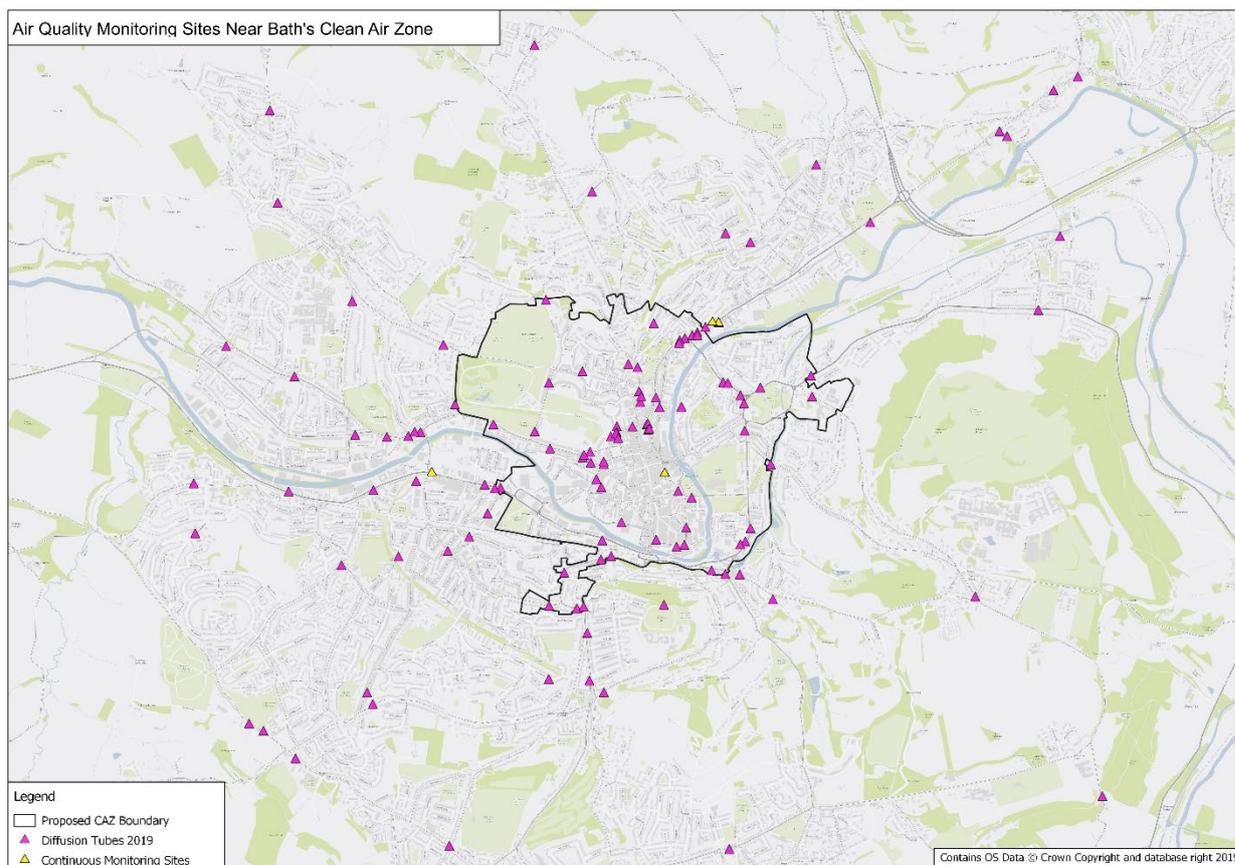


Figure 4-1: Air Quality Monitoring Sites Near Bath Clean Air Zone

The type of monitoring applied to each location is informed by the level of NO₂ the model predicts. For example, at locations where NO₂ concentrations are predicted to be $\geq 34\mu\text{g}/\text{m}^3$, three diffusion tubes are co-located (triplicates); where concentrations are predicted to be $\geq 36\mu\text{g}/\text{m}^3$, addition (where possible) 'reference method' continuous analysers have been located. Additionally, where predicted concentrations $\geq 36\mu\text{g}/\text{m}^3$, fully classified permanent ATC will be located in order to help identify the causes of the changes in measured values.

Diffusion tubes are selected as the primary source of NO₂ data as they can be located at a large number of locations compared to continuous analysers because they can be mounted on existing street furniture and do not require additional power and communications. As recommended in the guidance provided by JAQU sites have also been located on both sides of the road where possible at key locations.

Whilst there is comprehensive coverage across Bath, in accordance with recommendations made by JAQU's independent technical review panel, air quality will also be monitored at key locations on a gradient.

Estimated NO₂ emissions will also be calculated by using the Vehicular Fleet information collected (M3). This data will be run through the Emissions Factor Toolkit from scheme commencement, to provide a 'snapshot' every April and October to compare with the baseline and forecast data. This will be undertaken by an air quality monitoring officer for key locations and made available for the next monitoring report (in June and December).

As part of the central evaluation process, air quality monitoring data will also be issued to JAQU/Defra on a quarterly basis.

4.2.2 Traffic Flow Monitoring

4.2.2.1 Pre-scheme Monitoring

Figure 4-2 shows the location of the traffic monitoring sites near Bath Clean Air Zone. This includes both the permanent ATC sites and historic temporary traffic monitoring sites.

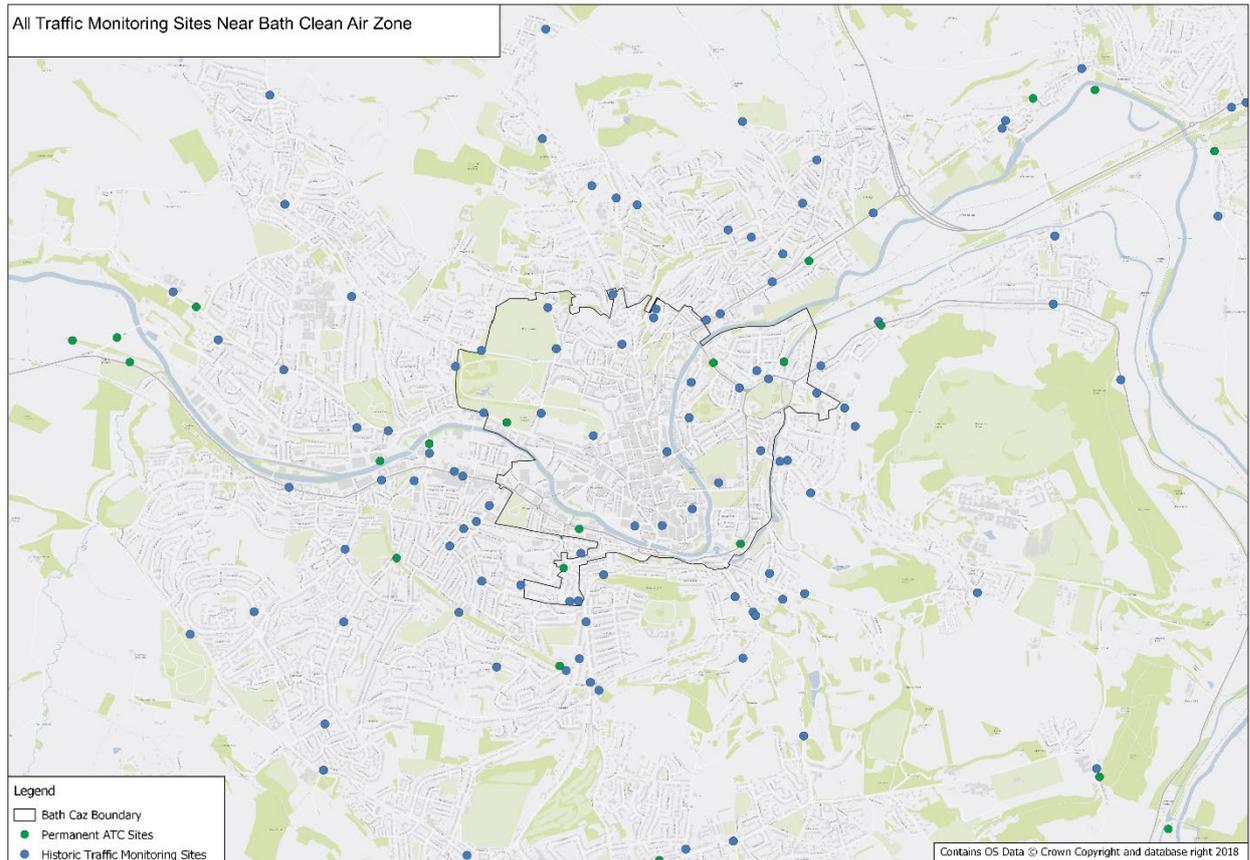


Figure 4-2 Traffic Flow Monitoring Sites Near Bath Clean Air Zone

This information will be used to inform the pre-scheme baseline and will be included in the Stage 1 report.

4.2.2.2 CAZ Scheme Monitoring

Figure 4-3 presents the proposed traffic monitoring locations near the CAZ.

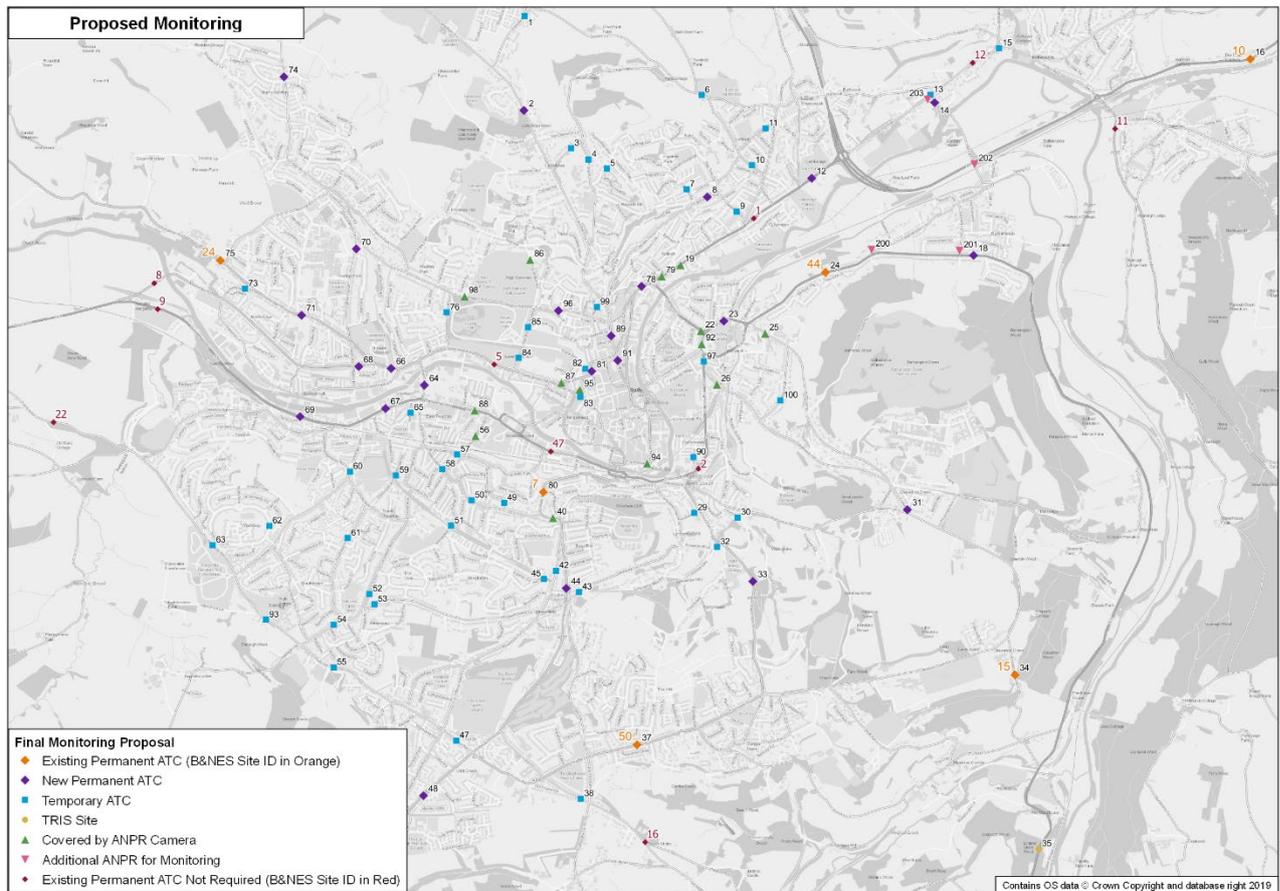


Figure 4-3: Traffic Flow Monitoring Sites Near Bath Clean Air Zone

Traffic monitoring when the CAZ is operational will be primarily undertaken using two methods:

1) Data from the ANPR cameras

The locations of the proposed ANPR camera locations used for enforcement at and within the CAZ cordon will provide an extremely valuable source of volumetric and fleet data for monitoring change post-scheme implementation (M2 and M3). Another useful output will be the ability to monitor changing ‘through’ traffic patterns within the CAZ area by matching registration plates at entry and exit points. A lot of vehicle movements will of course not be matched due to either the origin or destination of the trip being inside the cordon. However, this will give a valuable insight into the number of trips crossing the CAZ cordon which are driving into and terminating in the City Centre or generated internally from origins within the CAZ.

It is anticipated that these permanent ANPR cameras will be in place and usable prior to formal scheme opening, allowing them to also be used to obtain base-line information.

Additional ANPR cameras are also proposed at the park and ride sites, in Bathampton (see Section 4.2.2.3) and in Wiltshire (see Section 4.2.2.4).

2) Data from permanent ATCs

A wider count programme will also be needed to monitor changes outside the CAZ boundary and as a result of the traffic management scheme at Queen Square. In accordance with the latest JAQU guidance, a series of permanent ATCs have been targeted at these locations, as well as utilisation of existing permanent ATCs.

These will be particularly important in areas where residents raised concerns during the formal consultation about potential issues with induced avoidance rat-running by non-compliant vehicle traffic.

ATC data may be supplemented by temporary ATC survey data should the need arise. For example, should a location without an ANPR camera or permanent ATC experience an adverse traffic issue that may be attributed to the CAZ, this will need to be investigated further using temporary ATCs.

It will also be important to establish what is a 'CAZ induced' change, or where an observed increase is due to natural growth in traffic. For example, growth in the City Centre related to the Enterprise Area (EA) development can be expected to add traffic pressure to the road network in central Bath by 2021 irrespective of CAZ implementation. This will primarily apply to primary routes or important secondary routes. Further data collection up to CAZ implementation will enable what appears to be an underlying growth trend to be established. In the post-CAZ scenario, this can then be accounted for in establishing any true additional effects of the CAZ.

This data will be reviewed quarterly and used to assess traffic flow and fleet changes.

4.2.2.3 Key routes

Specific areas and 'targeted' routes, that have already been considered, will include the following, but this list is not exhaustive:

Oldfield Park

- Westbound route between the B3111 Oldfield Road and Bellotts Road (A36), via King Edward Road, Moorland Road, West Avenue and other residential roads
- Eastbound route between Brook Road and the B3111 Oldfield Road, via Triangle North, Lower Oldfield Park and Junction Road

The inclusion of the A36/Brougham Hayes junction and the B3111 Oldfield Road within the CAZ could lead to diversionary routing changes between Egerton Road and Brook Road through upper Oldfield Park.

Widcombe

- Sydney Buildings/Horseshoe Walk

Bathwick

- Sydney Place/Sydney Road
- North Road

Bathampton

- Bathampton Lane/Mill Lane/Toll Bridge Road route - both directions

In Bathampton, where there is concern about increased traffic from residents, permanent ANPR cameras are proposed. This will allow assessment of the changing traffic flows and potentially journey times on the Bathampton Lane/Mill Lane/Toll Bridge Road route in the pre-CAZ and post-CAZ scenarios. Pre-monitoring and historic data will be used to establish the natural growth trend up to CAZ opening.

Queen Square Traffic Management

- Marlborough Buildings
- Julian Road
- Journey Time Data across Queen Square

4.2.2.4 Neighbouring authorities

Transport and air quality conditions in Wiltshire and Somerset are linked to the proposed CAP, where measures targeted at reducing exceedances could directly impact on Wiltshire. For example, if any proposed measures make the highway routes through Bath less attractive, it is possible that traffic will find alternative routes through Wiltshire and Somerset. Likewise, any accelerated improvement in fleet composition in Bath is likely to have positive spill over impacts on neighbouring local authorities such as Wiltshire.

Whilst modelling indicates minimal impacts beyond the zone, it is considered that monitoring on key routes in neighbouring authorities may be required to further verify that the implementation of a CAP in Bath does not cause adverse diversionary impacts. This will preferably be undertaken by permanent ANPR cameras installed at the following locations:

- A46: Gloucester Road
- A4: Box Road, east of A4/A363 roundabout
- A363: Bathford
- A36: south of Bathampton
- A361: Beckington
- A350: Westbury

The implementation of these cameras is subject to local and central government agreement, funding and surveys.

4.2.3 Public health impact

B&NES Council, in collaboration with the Air Quality Management Resource Centre in the University of the West of England (UWE), is proposing to carry out local evaluation of health and wellbeing impacts linked with the implementation of a CAP in Bath. This proposal is included in Appendix A.

The plan covers four years and proposes:

- A qualitative baseline and annual assessment of people's perception of impacts of the CAZ on their health and wellbeing;
- Identification and selection of urban stressors through information routinely available to the local authority – baseline and annual monitoring;
- A time series study from clinical records of a sample of registered patients in CAZ boundary with a chronic health condition affected by air pollution;
- A critical appraisal of the feasibility of using and validity of findings of Public Health England's (PHE) tool to estimate the local impact of air pollution on health and related health and social care costs over time, taking baseline and annual assessments; and
- Baseline and annual focus groups with vulnerable populations e.g., a primary school or Care Home heavily impacted by traffic in Bath.

4.3 Monitoring Outputs and Desired Outcomes

The following desired impacts, established through consideration of the objectives and CSFs presented above in Section 3.1, are considered to be appropriate to evaluate the outcomes of the proposed scheme, and it is these below that should be monitored and assessed for the realisation of benefits as part of this plan:

Objectives of Implementation Fund Scheme:

- D1: Deliver compliance with NO₂ air quality Limit Values
- D2: Deliver compliance with NO₂ air quality Air Quality Objectives
- D3: To minimise the impact to residents, particularly low-income groups

Objectives of Clean Air Fund Scheme:

- D4: To minimise the impact to local businesses and low-income groups
- D5: To minimise adverse traffic impacts
- D6: Contribute to the delivery of the 'Getting Around Bath' Transport Strategy and WECA's Joint Local Transport Plan.

When considering objective D3, this has been largely met by implementing a CAZ which does not charge private cars. However it is recognised that there may be some residual impact in relation to the traffic management scheme at Queen Square, and also to those households who use public transport and vehicles eligible affected by CAZ charges. As such it is still considered within the desired outcomes, with some of the monitoring outputs used to assess the impact to this group.

The Monitoring Outputs of the monitoring process link to the Desired Impacts as summarised in Table 4-2.

Table 4-2: Monitoring Outputs for Assessing Desired Impacts (showing primary links only)

Desired Impacts (D) by Monitoring Outputs (M)	M1: Air quality data	M2: Vehicular fleet information	M3: Traffic Flows	M4: Retail/ business /office space vacancy figures	M5: Retail footfall surveys	M6: Park and Ride passengers data	M7: Walking and cycling counts	M8: Bus usage data	M9: Stakeholder Feedback from Council User Group Forums	M10: Taxi fares and unmet demand	M11: Early Measures Fund – ULEV Parking Permits	M12: Bus retrofit /compliance data	M13: Financial support scheme uptake	M14: Travel Advisor session uptake	M15: Anti-idling enforcement	M16: Weight restriction enforcement	M17: Delivery and servicing plans uptake
Implementation Fund Scheme:																	
D1: Deliver compliance with NO ₂ air quality Limit Values																	
D2: Deliver compliance with NO ₂ air quality Air Quality Objectives																	
D3: To minimise the impact to residents, particularly low income groups																	
Clean Air Fund Scheme:																	
D4: To minimise the impact to businesses																	
D5: To minimise adverse traffic impacts																	
D6: Contribute to the delivery of the 'Getting Around Bath' Transport Strategy.																	

4.4 Outcomes Analysis

The Outcome Analysis (defined as O1 to O4) to be derived from the data collated and collected as part of the monitoring exercise is summarised below. These outcomes are the main benefits derived in the Business Case and are closely associated with the desired impacts presented above:

- O1: Deliver compliance with NO₂ air quality Limit Values and Air Quality Objectives in CAZ boundary (linked to D1 and D2)
- O2: Deliver compliance with NO₂ air quality Limit Values and Air Quality Objectives across Bath (linked to D1 and D2)
- O3: Minimise financial impact on businesses (linked to D4)
- O4: Overall neutral impact or improvement to the economy (linked to D3, 5 and 6)

Table 4-3 shows how the different data monitoring outputs (M1 to M15) will be used to feed the outcome analysis (O1 to O4), and hence the assessments of benefits realisation and the achievement of desired impacts and overarching objectives.

Table 4-3: Mapping of Monitoring Outputs and Outcomes Analysis (showing primary links only)

Monitoring Outputs (M) by Outcome Analysis (O)	O1: Deliver compliance with NO ₂ air quality Limit Values and Air Quality Objectives in CAZ boundary	O2: Deliver compliance with NO ₂ air quality Limit Values and Air Quality Objectives across Bath	O3: Minimise financial impact on businesses	O4: Overall neutral impact or improvement to the economy
M1: Air quality data				
M2: Traffic Flows				
M3: Vehicular fleet information				
M4: Retail/business/office space vacancy figures				
M5: Retail footfall surveys				
M6: Park and Ride passengers data				
M7: Walking and cycling counts				
M8: Bus usage data				
M9: Stakeholder Feedback from Council User Group Forums				
M10: Taxi fares and unmet demand				
M11: Early Measures Fund – ULEV Parking Permit				

Monitoring Outputs (M) by Outcome Analysis (O)	O1: Deliver compliance with NO ₂ air quality Limit Values and Air Quality Objectives in CAZ boundary	O2: Deliver compliance with NO ₂ air quality Limit Values and Air Quality Objectives across Bath	O3: Minimise financial impact on businesses	O4: Overall neutral impact or improvement to the economy
M12: Bus retrofit uptake/compliance data				
M14: Financial support scheme uptake				
M14: Travel advisor session uptake				
M15: Anti-idling enforcement				
M16: Weight restriction enforcement				
M17: Delivery and servicing plans uptake				

4.5 Benefits Realisation

Table 4-4 overleaf shows the linkage between Outcome Analysis (O1 to O4) and the Desired Impacts (D1 to D6), so completing the loop of the outputs, outcomes and impacts. The loop is iterative and the approach to the package or monitoring process and analysis allows for refinement to optimise benefits, assess all impacts and ensure the full benefits of the package are realised.

Consideration will be given to key exogenous drivers of travel demand, including GDP, population, employment levels, fuel, fares, with a comparison made to assumptions in the modelling and forecasting processes to understand the way such factors will have influenced change.

4.5.1 Benefits Profile

The Scheme in this study aims to bring about benefits to the city as soon as possible. It is important to gain an understanding of when each element of the scheme is likely to produce an impact on behaviours and air quality so that the time necessary for the monitoring of each scheme can be accurately assessed.

In line with the ministerial direction, the objective of the B&NES CAP is to achieve compliance with air quality Limit Values and Objectives in the shortest time possible. As such, the scheme elements are expected to be implemented and contribute to outcomes in the shortest time possible too. Therefore, any benefits resulting from the scheme are likely to be realised in a very short time-frame following implementation of the CAP. That said, the outcomes, in particular those outcomes related to the primary objective to achieve compliance with air quality limit values and objectives, need to be sustained through the medium and long term.

For example, the CAP is expected to deliver compliance with air quality limit values and objectives by 2021. However, ongoing monitoring and evaluation should be maintained for a period of up to five years following compliance to ensure that compliance is ongoing. At the same time, impacts on households and businesses may develop over time, from the point of implementation into the future. Therefore, it is appropriate to monitor related outcomes over the longer period of up to five years following compliance also. Within this context, an assessment period of up to five years following compliance is appropriate for all benefit and outcome analysis.

Table 4-4: Mapping of Desired Impacts and Outcome Analysis (showing primary links only)

Outcome Analysis (O) by Desired Impacts (D)	O1: Deliver compliance with NO ₂ air quality Limit Values and Air Quality Objectives in CAZ boundary	O2: Deliver compliance with NO ₂ air quality Limit Values and Air Quality Objectives across Bath	O3: Minimise financial impact on businesses	O4: Overall neutral impact or improvement to the economy
Implementation Fund Scheme:				
D1: Deliver compliance with NO ₂ air quality Limit Values	■	■		
D2: Deliver compliance with NO ₂ air quality Air Quality Objectives	■	■		
D3: To minimise the impact to residents, particularly low income groups				■
Clean Air Fund Scheme:				
D4: To minimise the impact to businesses			■	
D5: To minimise adverse traffic impacts	■	■		■
D6: Contribute to the delivery of the 'Getting Around Bath' Transport Strategy	■	■	■	■

5. Strategy Delivery

5.1 Costs

Evaluation costs, covering monitoring and benefits realisation analysis are summarised in this section and included within the project costs supporting the Financial Case of the FBC. The timing of expenditure on monitoring, evaluation and benefits realisation is assumed to be consistent across the assessment period, given the common frequency of data collection and assessment alluded to in Table 4-1. The core scheme capital infrastructure cost estimate is £155,100, and it is assumed that a further £113,916 will be required in surveys to inform the baseline position in 2019 and 2020 prior to scheme implementation, with £240,291 required in each of the post-implementation assessment years (2021 to 2025).

A sum has also been included in the scheme costs for the provision of B&NES staff to undertake ongoing monitoring of the scheme, including progress/performance reporting, user satisfaction surveys and other related activities. An estimate of £112,876 per year has been included for 3 FTE staff members for this role.

Costs for the evaluation of health and wellbeing impacts of the implementation of a CAZ for Bath are estimated at £47,159 per annum for ongoing operation.

Additional ANPR camera coverage requested by neighbouring authorities is included at a capital cost of £248,200.

A more detailed breakdown and justification for the cost estimates is provided in Table 5-1.

Table 5-1: Cost Estimate for Monitoring, Evaluation and Benefits Realisation Activities

Monitoring, Evaluation and Benefits Realisation Activities	Cost Estimate	Justification
M1: Air quality data	£10,100 CAPEX for pole-mounted automatic air quality monitor equipment £7,700 per annum for diffusion tube infrastructure	Continuous annual average monitoring at existing locations. Includes replacement of diffusion tubes and maintenance.
M2: Vehicular fleet information and M3: Traffic Flows	£145,000 CAPEX for permanent ATC infrastructure £10,000 per annum for maintenance and data subscriptions £14,458 per annum for temporary ANPR survey	Permanent ATC Monitoring/data collection via ANPR cameras. Includes installation of 29 permanent ATC sites and ongoing data subscriptions and maintenance.
M4: Retail/business/office space vacancy figures and M5: Retail footfall surveys	£25,000 per assessment	Although most data required is already collected as part of other B&NES processes, it will be necessary to obtain similar data for benchmark/comparator locations to aid evaluation
M6 and M8: Public Transport indicators	No additional costs	Data already collected as part of other B&NES/operator processes
M7: Walking and cycling counts	£25,000 per assessment	New data collection will need to be commissioned for each assessment year
M9: Stakeholder Feedback from Council User Group Forums	No additional costs	Data already collected as part of other B&NES/operator processes
M10: Taxi fares and unmet demand	No additional costs	Data already collected as part of other B&NES/operator processes

Monitoring, Evaluation and Benefits Realisation Activities	Cost Estimate	Justification
M11: Early Measures Fund – ULEV Parking Permits	No additional costs	Data will be collected as part of scheme operation
M12 to M17: Various mitigation measures	No additional costs	Data will be collected as part of scheme operation
Evaluation of health and wellbeing impacts of the implementation of a CAZ for Bath	£47,159 cost per annum	See Appendix A.
ANPR Cameras in other authorities	£248,200 CAPEX	Installation and maintenance of 6 permanent ANPR camera sites to monitor impact of CAZ on surrounding network
Staff Costs	£112,876 per annum	One monitoring and evaluation lead, supported by two monitoring officers.

5.2 Timescales

The timescale for data collection stages are summarised below:

- Stage 1 – Before opening – surveys in 2019 and 2020
- Stage 2 – 1 year after full opening of the package – surveys in 2021;
- Stage 3 – annually for up to 5 years after full opening of the package – surveys in 2022 onwards.

These timescales are consistent with the benefits profile outlined in Section 2.5.

It is proposed that data is reviewed against the Monitoring Outcomes biannually for the first three years, in April and October, moving to annually from 2022 onwards. At each review the key questions proposed below should be assessed and documented, or updated, as appropriate:

- When will the zone be switched off?
- Was the scheme delivered to costs and timescale?
- Have the schemes delivered the types and scale of forecast benefits, and show out-turn value for money as projected?
- Has the scheme delivered the desired objectives?
- What lessons can be learnt to help shape air quality strategies for the City?

Any areas that may require corrective action should be identified during this review. Refer to Section 5.7 for corrective action options. Further, any proposed changes to this Plan will also be identified.

5.3 Reporting

The outcome of the reviews will be presented to the Project Board or Transportation Programme Board (depending on the phase of the project), along with any recommendations. This will enable any decision-making to be progressed.

Air quality and traffic flow monitoring will be provided to JAQU on a quarterly basis.

An Evaluation Report will be produced at Stages 2 and 3. The report will be provided to JAQU and made available to stakeholders via the B&NES website. The cost of producing these Evaluation Reports is included within the broad cost estimates listed in Table 5.1.

The reporting timescales are summarised in Table 5-2.

Table 5-2: Reporting Schedule

Report	Contents	Delivery Date
Stage 1 - Baseline Report	Baseline air quality monitoring Baseline traffic monitoring Baseline data from M1 to M19	End of October 2020
Stage 2 Report – Completion of Scheme	First year AQ results First year traffic results Data from M1 to M19 Assessment of compliance	End of June 2022
Stage 3 Report – Ongoing Impacts	Annual air quality monitoring results Annual traffic monitoring results Data from M1 to M19	Annually until scheme completion (at end of June)
Quarterly Monitoring Report	Air quality monitoring Traffic flow monitoring	End of March End of June End of September End of December
Corrective Action Report	Latest corrective action log sheet Corrective action needs	Annually at end of June
Public Health Report	Data gathered through public health assessment	Annually at end of December

5.4 Governance

The evaluation and benefits realisation strategy and reporting will be managed by the B&NES Project Manager, reporting to the Project Board, with support from relevant officers during the implementation phase. During operational phases this responsibility will pass to the B&NES CAZ Operations Manager, reporting to the Transportation Programme Board. They will ensure the plan is successfully completed in accordance with the quality assurance defined by B&NES and the wider management strategy outlined in the Management Case.

5.5 Risks

The main risks identified in the completion of this Evaluation, Monitoring and Benefits Realisation Plan are as below:

- Availability of data from third parties. Some of the proposed benchmarking and comparator town/city analysis assumes that economic data will be available either within the public domain or made available by relevant local authorities.
- Further, some publicly available data (e.g. business demography data published by ONS), is only available with a minimum of one-year lag. For example, data for the current year is not typically available until the Autumn of the following year. This could lead to some delay in assessment when using data available in the public domain.
- Collaboration with local stakeholders. Some of the data collection focused on Bath is collected by local stakeholders such as First (bus operator) or Bath BID. The Plan assumes this data will be made available by these stakeholders.

- Failure to isolate the impact of the Clean Air Plan. A range of exogenous factors may influence the extent to which objectives and outcomes are achieved, particularly in relation to wider economic performance. To try and isolate the explicit impact of the Clean Air Plan, a benchmarking exercise will be undertaken comparing economic performance in Bath with relevant comparator cities.
- Any air quality analysis assumes that current B&NES monitoring programmes are maintained.
- With respect to air quality monitoring, there will be a requirement to rely on diffusion tube data. Measurements made with diffusion tubes are generally of lower quality than those from continuous analysers. It is improved by applying bias correction (to the continuous analyser), and using triplicate tubes limits data loss and highlights suspect results.

5.6 New Data Collection

Table 5-3 shows the data collection and collation that needs to be completed at each stage. All other data can be obtained from other sources within B&NES, DfT or from other third parties currently providing data to B&NES.

Table 5-3: Data Collection and Collation

Monitoring Outputs (M)	Stage 1 – Before Opening	Stage 2 – 1 Year After Opening	Stage 3 – 2-5 Years After Opening
M1: Air quality data	Monitoring already in place by B&NES, across network of automatic and passive (diffusion tube) monitoring locations	Monitoring already in place by B&NES, across network of automatic and passive (diffusion tube) monitoring locations	Monitoring in place across network of automatic and passive (diffusion tube) monitoring locations
M2: Traffic flows	New traffic surveys required	Data available from ANPR cameras installed as part of CAZ enforcement. New traffic surveys required outside of CAZ boundary	Data available from ANPR cameras installed as part of CAZ enforcement. New traffic surveys required outside of CAZ boundary
M3: Vehicular fleet information	Data available from ANPR survey undertaken as part of business case preparation	Data available from ANPR cameras installed as part of CAZ enforcement	Data available from ANPR cameras installed as part of CAZ enforcement
M4: Retail/business/office space vacancy figures	Already collected by B&NES. Focus on Central Bath. Held by economy and growth team	Already collected by B&NES. Focus on Central Bath. Held by economy and growth team	Already collected by B&NES. Focus on Central Bath. Held by economy and growth team
M5: Retail footfall surveys	Already collected by Bath BID. Focus on retail core.	Already collected by Bath BID. Focus on retail core.	Already collected by Bath BID. Focus on retail core.
M6: Park and Ride passengers data	Already collected by B&NES/bus operators.	Already collected by B&NES/bus operators.	Already collected by B&NES/bus operators.
M7: Walking and cycling counts	New surveys required along key arterial routes and in central Bath.	New surveys required along key arterial routes and in central Bath.	New surveys required along key arterial routes and in central Bath.
M8: Bus usage data	Already collected by B&NES/bus operators.	Already collected by B&NES/bus operators.	Already collected by B&NES/bus operators.
M9: Stakeholder Feedback from Council User Group Forums	Existing framework extended to cover Clean Air Plan issues	Existing framework extended to cover Clean Air Plan issues	Existing framework extended to cover Clean Air Plan issues
M10: Taxi fares and unmet demand	Already collected by B&NES	Already collected by B&NES	Already collected by B&NES

Monitoring Outputs (M)	Stage 1 – Before Opening	Stage 2 – 1 Year After Opening	Stage 3 – 2-5 Years After Opening
M11: Early Measures Fund – ULEV Parking Permits	To be collected as part of scheme operation	To be collected as part of scheme operation	To be collected as part of scheme operation
M12: Bus retrofit uptake/compliance data	Compliance data available from ANPR survey undertaken as part of business case preparation	Data available from ANPR cameras installed as part of CAZ enforcement and retrofit scheme operation	Data available from ANPR cameras installed as part of CAZ enforcement and retrofit scheme operation
M13: Financial support scheme uptake	To be collected as part of scheme operation	To be collected as part of scheme operation	To be collected as part of scheme operation (although scheme may have closed after two years)
M14: Travel advisor session uptake	To be collected as part of scheme operation	To be collected as part of scheme operation	To be collected as part of scheme operation
M15: Anti-idling enforcement	To be collected as part of scheme operation	To be collected as part of scheme operation	To be collected as part of scheme operation
M16: Weight restriction enforcement	To be collected as part of scheme operation	To be collected as part of scheme operation	To be collected as part of scheme operation
M17: Delivery and servicing plans update	To be collected as part of scheme operation	To be collected as part of scheme operation	To be collected as part of scheme operation

As demonstrated in the table, data relating to Air Quality (M1), economic indicators (M4-5), bus operations (M6 and M8) and taxis (M10) is already collected as part of B&NES or partners' ongoing operations. Further, data will be automatically generated through some scheme elements (e.g. ANPR cameras for traffic data (M2-3 and 12). Data relating to the mitigation measures (M11-17) will be collected as part of the scheme operation. As a result, new and independent data collection processes only need to be initiated for walking and cycling surveys (M7).

5.7 Corrective Action Plan

5.7.1 Potential Issues

Whilst the CAZ class selected for implementation and the traffic/air quality modelling undertaken to establish its performance seeks to provide a high 'likelihood' or probability of achieving compliance, there will always remain a potential risk of residual issues due to local conditions. Also, the use of charging zones to achieve air quality improvements is relatively untested, and currently lacks significant precedence. It is therefore important to implement a corrective plan to mitigate any unforeseen issues should they arise, particularly if they impinge upon the ability of the scheme to achieve compliance in the shortest possible time.

It is also important to ensure that the scheme does not cause adverse impacts in relation to undesirable CAZ-induced traffic re-routing and volume increase impacts in areas within, adjacent to but outside the zone, or potentially further away.

Whilst this is not an exhaustive list, key issues could be as follows:

- Marginal 'hot spots' unexpectedly increase (36-40 $\mu\text{g}/\text{m}^3$ pre-scheme)
- Identified 'hot spots' don't decrease as expected (greater than 40 $\mu\text{g}/\text{m}^3$ pre-scheme)
- Traffic types and/or volumes on links expected to see no change (or decreases) unexpectedly increase
- Traffic types and/or volumes on links expected to see small changes increase more than expected

5.7.2 Planning for Corrective Action

An assessment of the baseline air quality and traffic data available immediately prior to scheme commencement will be used to define the locations of marginal or confirmed air quality 'hot spots' as well as marginal or confirmed links expected to experience diversionary impacts. This will take place at a workshop approximately one month prior to scheme commencement using the most up-to-date baseline data available at the time, and the quarterly thereafter. A log will be compiled and held by the scheme Monitoring and Evaluation Lead, and the locations will then be reviewed when compiling each quarterly submission. Any locations of concern will be flagged during these reviews.

It is recognised when monitoring air quality that seasonal variations and conditions can affect results, and that the aim is to achieve a satisfactory annual average. As such locations flagged on 2 or more consecutive occasions will be considered for corrective action, with corrective action taken following the subsequent flagged reading if necessary.

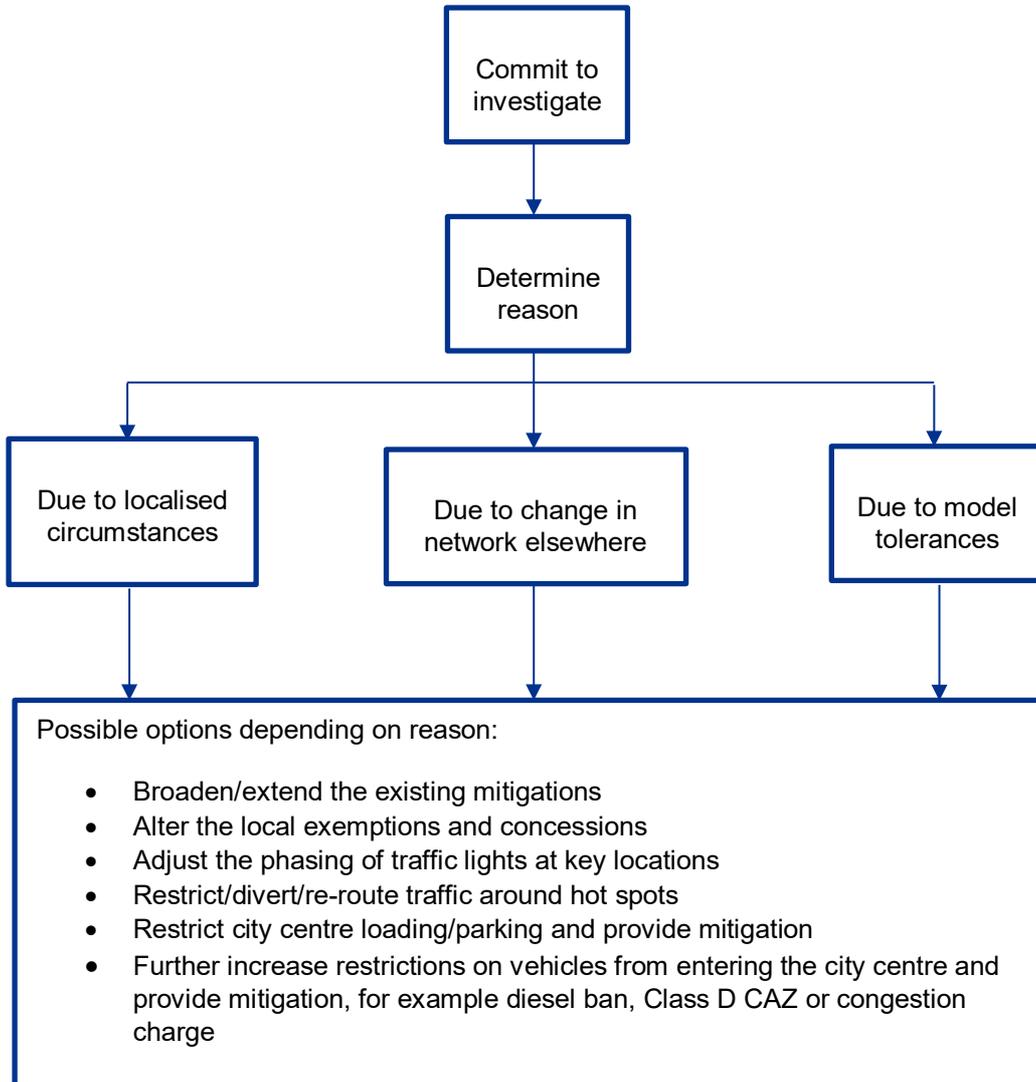
When considering traffic monitoring data, whilst also affected by seasonal variations, this will require additional judgement to identify if corrective action is required. It may also be supplemented by feedback from the public or other council teams. As such it is not proposed to define a frequency that it is raised before taking corrective action, rather any issues identified will be reviewed on a case-by-case basis at the quarterly monitoring and evaluation meeting.

Identifying the most suitable solution is dependent on the reason for and nature of the issue. This will require discussion with the project team and agreement from the Project Board or Transportation Programme Board (depending on the phase of the project) to take the proposed corrective action forward as part of the quarterly review process. The cost of the corrective action will be covered by the revenue from the scheme, or if there is insufficient revenue, by JAQU.

5.7.3 Corrective Action Options

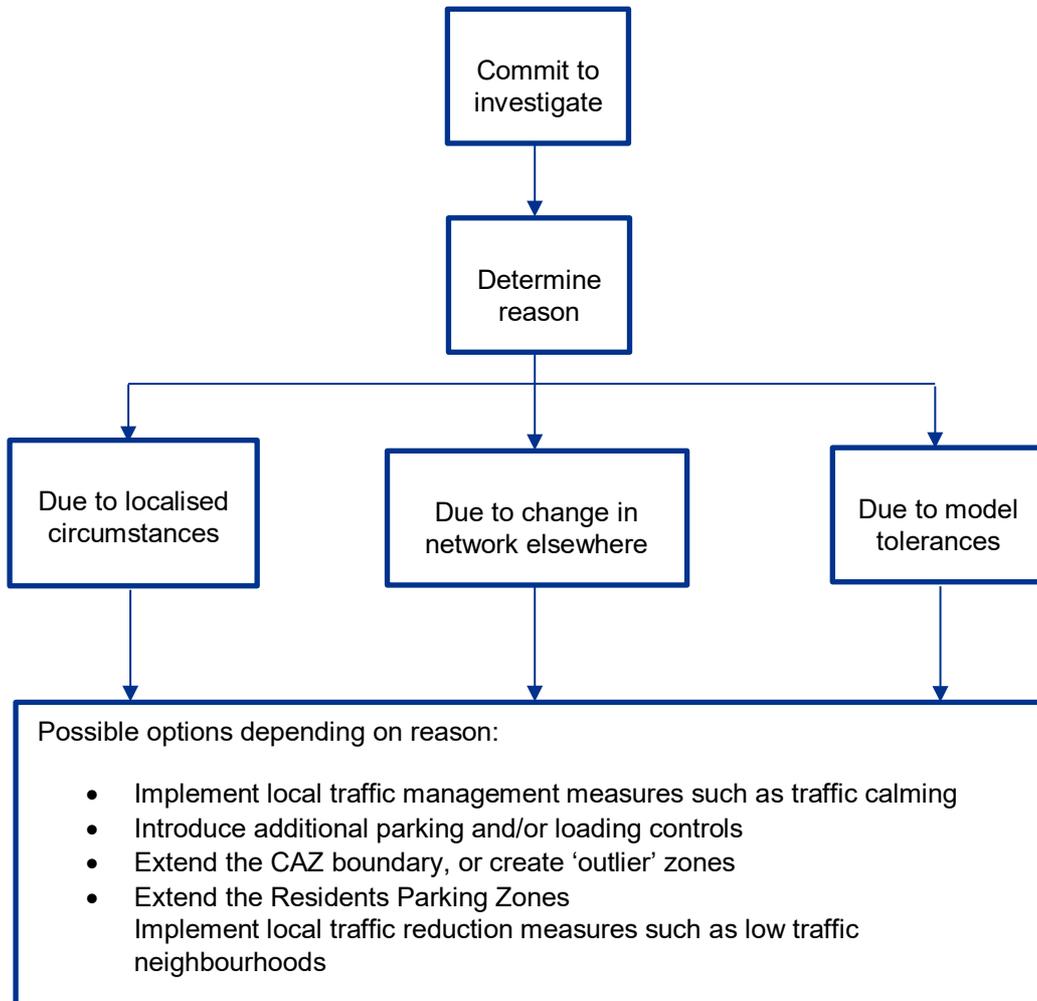
Where an air quality issue is identified the following procedure will be followed:

Air Quality



Where a 'rat-running' or other adverse traffic or parking issue is identified the following process will be followed:

Traffic



5.8 Queen Square and Gay Street Daily Operations

5.8.1 Background

It has been demonstrated using modelling that suitable restraint applied to traffic using Gay Street would achieve the required air quality compliance in Bath by 2021. By 'gating' or restricting traffic on the A367 Chapel Row and A4 Charlotte Street approaches (as required), the NO₂ emission level in this specific location is shown to be reduced from above 40 µg/m³ to 36.9 µg/m³. The modelling output suggested a cycle time at both proposed signal junctions of 70 seconds would be required to enact this change in resultant air quality.

Not unexpectedly, 'restraining' capacity through Queen Square and Gay Street will create diversionary routing increases on some surrounding roads to the north and west. Limiting the impact of this route and behaviour change will therefore depend on achieving the right level of restraint to achieve the air quality objective in Gay Street. In other words, there would be potential scope to reinstate some vehicle capacity should air quality be better than anticipated on Gay Street once the scheme is introduced. However, to actively manage the level of traffic 'restraint' at Queen Square to achieve the required air quality outcome whilst mitigating detrimental effects on alternative routes, the Council would require real-time data (or close to real-time data) and a means of actioning timing changes based upon this. This has been explored and a proposed methodology is set out below.

5.8.2 Equipment

It is proposed that the Council will install a pole mounted electro-chemical automatic air quality monitor (AAQM) on Gay Street, which detects nitric oxide, nitrogen dioxide and carbon dioxide levels at frequent daily intervals. This will be located where prior regular air quality detection has taken place.

It is understood that this data will not be as precise as that provided by diffusion tubes. Therefore, these will also continue to be used at this location but only to provide data when manually collected on a monthly basis, in line with other locations. The diffusion tube data will be compared with data provided by the AAQM whilst taking account of other considerations such as humidity (which can affect readings from this unit) to ensure calibrated baseline data is available for officers to use.

The Council will also procure the Idox Transport 'modules' to enhance their existing Urban Traffic Management and Control (UTMC) common database system. This will facilitate faster and smarter responses to be made using automatic AAQM generated data at Queen Square. This will ensure that annual mean NO₂ levels on Gay Street are kept below 40 µg/m³ in line with EU requirements. The 3No. modules are specifically:

1. An Air Quality Module and Monitor Adapter to enable the receipt and storage of data from the new monitor installed on Gay Street
2. A Journey Times Engine to take data feeds from various sources including SCOOT vehicle detection loops connected to traffic signals at Queen Square and encrypted CAZ ANPR data from cameras on approach to Queen Square, enabling both road segment volumes and speeds to be calculated
3. A UTC to UTMC Integration Module enabling connection with the existing Siemens UTC system. This will enable either automatic or remote intervention responses to be made upon traffic signal junction timings based upon data parameter thresholds being met (from 1 and 2 above)

It is also planned for 2No. traffic monitoring CCTV cameras to be installed, one at each new junction with pan, tilt, zoom (PTZ) capability. This will provide complete coverage of the road network in the square including its immediate approaches from the south and west. Live images will be delivered to the Council's traffic control room in addition to the images provided by the existing CCTV camera located at the current signal junction with New King Street.

5.8.3 Operations

Having a rich source of data from Queen Square in terms of air quality, traffic volume, traffic speed, congestion levels and queue lengths all connected to a single system will provide the Council's traffic signals engineer the

facility to either restrict traffic flow into the square should air quality levels be declining towards or be above $40 \mu\text{g}/\text{m}^3$. Conversely adjustments could also be made to allow increased traffic flow into the square should air quality levels be better than expected on Gay Street. It will be hugely beneficial to have this data and being able to reinstate vehicle capacity taken out using a reduced 70 seconds cycle time, should this be beneficial overall.

Clearly the process and procedure for making direct changes to signal timings will be iterative. A period of adaptation will be required prior to scheme launch interpreting baseline data and understanding the impacts from timings given to each approach at Queen Square and the impact upon air quality and congestion levels. Equally the effects upon diversionary routes will also need to be accounted for in order to keep any impacts on alternative routes to a minimum. This proposal will provide the data to Council officers in a timely manner in order that actions can be taken.

It will also be possible to set 'strategies' which could be triggered automatically by the UTMC system should staff be unavailable to undertake manual interventions based upon data received. Again, a period of time would be required to understand the most appropriate thresholds to set within the system. Once configured this will allow either a reduction or increase to signal timings to automatically change traffic flowing into the square. Clearly the key driver for any change made will firstly be air quality levels. Thus, data from the AAQM will therefore need careful assessment with regular sensor checks undertaken and comparisons made with diffusion tube data. Although data from the AAQM should be provided in 'real time' it is assumed that there will be some latency in the system which will also need to be accounted for in the decision making.

5.8.4 Monitoring and Evaluation

Data collected will be stored in the UTMC database and monitored / reported upon in future KPI management reporting. This will give regular air quality data for Gay Street and allow officers to make correlations between air quality and other data parameters such as traffic signal timings and traffic volumes for example. This will inform officers, enabling evidence-based improvements and refinements to be made to the 'strategies' employed within the system.

5.9 Overall Scheme Review and Completion

In order to demonstrate that the Scheme has achieved compliance in accordance with the LAQM Policy Guidance, there should be at least three years where all air quality monitoring sites record NO₂ levels of 36µg/m³ or less for the entirety of the period. It is noted that compliance is achieved at 40µg/m³, however 36µg/m³ is selected as the threshold level as this is 10% below the limit for the compliance. This provides a greater degree of confidence that compliance has been achieved and that this will continue beyond completion of the scheme.

When this has been achieved, the Transportation Programme Board will determine when to initiate the process of 'switching off' of the CAZ upon compliance with the air quality limit values. This may be through a single member or Cabinet decision. Once this process has been initiated by B&NES, DEFRA will also need to verify that the CAZ can be removed.

Appendix A. Public Health Impact Evaluation

PROPOSAL FOR THE EVALUATION OF HEALTH AND WELLBEING IMPACTS OF THE IMPLEMENTATION OF A CLEAN AIR ZONE IN BATH

1. Background

In 2013 the Committee on the Medical Effects of Air Pollutants (COMEAP) reported on work it had undertaken to better understand the impact of NO₂ on health. Initially it had been hoped that the COMEAP report would be able to provide a specific figure for deaths singly attributable to NO₂; however, after analysing available data, COMEAP concluded that uncertainty in assessing the impact of NO₂ individually compared to other pollutants, such as PM_{2.5}, made it difficult to arrive at an individual figure wholly attributable to NO₂. However, the evidence is clear on the scale of harm from air pollution. It is the largest environmental risk to the public's health in the UK with an estimated 28,000-36,000 deaths attributable to long-term exposure of air pollution (NO₂ and PM_{2.5}) each year. This is greater than the numbers estimated to die from obesity related factors, road traffic accidents, or alcohol.

Although the harms of air pollution are well known, measuring the direct impacts on health and wellbeing from any specific intervention to reduce air pollution is very complicated. This is due to a number of reasons including difficulties in untangling the harmful effects of air pollution from the impacts of unhealthy lifestyles and socioeconomic deprivation on health, the fact that a pollutant may have both short term and long term impacts on health, difficulties in determining where geographically exposure to air pollution occurs over the course of a person's life, and separating out the impact of other initiatives introduced that improve air quality.

Clean Air Zones (CAZ) are proposed by government as a key approach where targeted action in identified geographical areas is taken to improve air quality. Evidence of their impact on health and wellbeing of the population is still weak, so it is essential that we strengthen our understanding in this area and contribute to the wider body of evidence. In this was resources are spent on those interventions likely to be most effective in improving health. This proposal aims to contribute to the wider knowledge base and help inform local action. It is expected that it will also inform the national evaluation that is planned.

2. Evaluation study proposal

Bath and North East Somerset Council in collaboration with the Air Quality Management Resource Centre in the University of the West of England (UWE)¹ is proposing to carry out local evaluation of health and wellbeing impacts linked with the implementation of a CAZ in Bath.

This local proposal is written alongside a separate outline proposal being prepared by a consortium for the UK Prevention Research Partnership (UKPRP) Consortium Award call, funding research evidence on innovative strategies for the primary prevention of non-communicable diseases. Currently Local Air Quality Management focuses on a hotspot approach, i.e. targeting areas where concentrations of air pollution exceed legislative targets without reference to other factors, such as socioeconomic status or exposure to other environmental determinants (e.g. noise pollution). Such wider factors may also be affecting the prevalence and vulnerability of populations within these geographical areas to non-communicable diseases. Research has shown that such factors may have multiplicative effects on public health when occurring simultaneously with exposure to air pollution. The UKPRP proposal therefore aims to explore the potential to reframe LAQM in a broader public health perspective in order to maximise the impact and the cost-effectiveness of efforts, whilst also eliminating any conflicting policies. The UKPRP consortium is led by the University of the West of England in Bristol and comprises partners from nine academic institutions across five case study areas in England, Scotland and Wales, with support from local and national government partners and public health agencies.

Should the UKPRP application be successful, then this proposal will complement it and add validity/challenge to the findings by adding a bottom-up approach derived from local data. Should the UKPRP application be unsuccessful, then this proposal will stand alone and provide insight into the health and wellbeing impacts of implementing the CAZ in Bath.

¹ For more information see <https://www1.uwe.ac.uk/et/research/aqmrc.aspx>

3. Proposal aims and objectives

Aim: To investigate the impact of introducing a CAZ in Bath on the health and wellbeing of a sample of people affected.

The project will run from April 2020 until end March 2024. Baseline data will be gathered in 2020 before the introduction of the CAZ, and then annually for three further calendar years.

Objectives:

- a) To quantify the health and wellbeing (HWB) (through surveys of physical and mental health and quality of life measures) of identified study populations before and after CAZ introduction to capture any changes
- b) To quantify the health and wellbeing of comparison groups over the same timeframe
- c) To investigate the changes in potential explanatory variables for the changes in H&WB, e.g. air pollutants, traffic volume, noise, individual lifestyle changes (travel choices, physical activity levels, time spent outdoors, work and socialisation patterns, shopping and eating choices)
- d) To have an understanding of changes in potential confounding variables for the changes in health and wellbeing
 - a. weather
 - b. levels of circulating infectious disease
 - c. other significant external events e.g. transport strikes, healthcare service interruptions
- e) To quantify the demographics of the study population in order to detect differences in impacts on sub groups of the population e.g. by level of deprivation, by age, by existing respiratory disease
- f) To examine the study population's perceptions of the CAZ introduction on their H&WB, with a distinct focus on vulnerable populations

4. Evaluation study design

This evaluation study will take a mixed methods approach to investigate the impact on health and wellbeing of introducing a CAZ in Bath, using routinely collected data and from the generation of new data. The study will be made up of six work streams: [*Reference to Tasks: refer to Appendix One: Project Timescale*]

- a) **Inform the development of survey tools to be used in b) and f)** below by carrying out early consultation with key stakeholders and members of the public, including vulnerable groups. Information provided through the two completed CAZ consultation processes will also be used to inform this development stage of the evaluation study [*Task 5*]
- b) **Carry out baseline and annual assessment(three further years) of changes in the health and wellbeing of the study population and of their perception of the impacts of the CAZ on their health and wellbeing**, including: overall quality of life measure, modal shift, physical health, mental wellbeing, social connectedness, exacerbation of health conditions associated with air pollution, lifestyle changes, perception of noise pollution, access to green spaces, food purchases, and perception of the impact of the CAZ on dependents [*Tasks 6-8, 11, 12*]
 - a. Methodology: A questionnaire using mixed open and closed questions will be created and used. The survey will be disseminated to respondents on-line (for widest reach), and also completed face-to-face in areas where the public frequent (eg, shopping centres, high streets, GP practices etc). The same group of respondents, as far as possible, would be followed up each year after baseline. A sample size will be identified at the start of the study of sufficient size to provide statistical validity, allowing for drop off over the period of the study. An agreed survey platform will be used that is compliant with data management and GDPR requirements
 - b. Ethics: Ethics approval will be sought addressing participant information forms, consent forms (including consent to be contacted annually for the length of the study), protecting anonymity, the survey tool, and the collection, storage and analysis of data
- c) **Identification, selection and monitoring of additional environmental determinants of health** (e.g. noise, heat) that can exacerbate air quality impacts for which information is routinely available to the local authority – baseline and annual monitoring [*Tasks 10,17*]
- d) **Explore the potential to carry out a time series study from general practice clinical records** of a sample of general practice registered patients within the CAZ boundary with a chronic health condition affected by air pollution, such as asthma. This would enable any changes in the clinical measurements taken at annual asthma review clinics to be quantified before and after introduction of the CAZ. Measurements from a comparison sample of patients from general practices not affected by the CAZ would be taken for comparison. This time series may or may not be possible, but the Council does have experience of successful partnership working with local GP practices and the Clinical Commissioning Group to access data for a separate evaluation study. If the study is feasible it will run for four years total (baseline plus three further years) [*Tasks 14, 15*]
 - a. Secure ethics approval if d) goes forward
- e) **In collaboration with Public Health England and other colleagues, critically appraise the feasibility of using and validity of the findings of PHE's resource 'Air pollution: a tool to estimate healthcare costs'** in the B&NES context to estimate the local impact of air pollution on health and related health and social care costs over time - baseline and annual assessments [*Task 16*]
- f) **Identify and carry out baseline and annual qualitative work with vulnerable populations affected by the CAZ on perceived impacts on health and wellbeing.** The CAZ Equality Impact Assessment will be used to identify vulnerable groups [*Tasks 7, 9, 13*]
 - a. Methodology: Focus groups using a semi-structured interview, working through existing connections that local agencies have with the identified groups

- b. Ethics: Ethics approval will be sought addressing participant information and consent forms, protecting anonymity, the interview guide, and the collection, storage and analysis of data

5. Evaluation study populations

- a) People who live within the CAZ and work within it
- b) People who live within the CAZ and work outside it
- c) People who live in the immediate area surrounding the CAZ

6. Project management

Given the research nature of this evaluation study it is proposed that an academic researcher be recruited to implement it. The researcher will be employed and given academic supervision by the University of West Of England's Air Quality Management Resource Centre (AQMRC UWE), working in partnership with B&NES Council who will provide access to data and support in the development and implementation of the different work packages. This arrangement will be made clear in a collaboration agreement to be drawn up between B&NES Council and the University using a similar agreement recently entered into with the University of Bath as a basis. This will also include requirements for regular progress reporting and for sharing any interim findings with the Council and if appropriate, the Joint Air Quality Unit's (JAQU) central monitoring and evaluation team.

The Air Quality Management Resource Centre at the University of the West of England has over 20 years' experience linking science and policy, integrating research and its application in the real world. It has a national and international track record in providing air quality support to local, national and international practitioners, researchers, governments and other stakeholders, through a combination of research and consultancy projects. Key projects of relevance that AQMRC UWE have led on institutionally are:

- a) National Institute for Health and Care Excellence (NICE): '*An economic analysis of the cost effectiveness of local authority activities to reduce exposure to air pollution from road traffic*'
<https://www1.uwe.ac.uk/et/research/aqmrc/researchprojects/ukprojects/aneconomicanalysis.aspx>.
- b) European Environment Agency (EEA): '*Qualitative assessment of links between exposure to noise and air pollution and socioeconomic status*'. <https://uwe-repository.worktribe.com/output/869590>
- c) H2020: '*ClairCity: Citizen Led Air pollution Reduction in Cities*' www.claircity.eu,
<https://www1.uwe.ac.uk/et/research/aqmrc/researchprojects/europeanunionprojects/claircity.aspx>

7. Project timescale

See Appendix One

8. Costs

The breakdown of costs across the life time of the proposed project is shown in the table below.

	Year 1 Apr '20 / Mar '21	Year 2 Apr '21 - Mar '22	Year 3 Apr '22 - Mar '23	Year 4 Apr '23 - Mar '24	Total
Staffing, hosting and academic supervision	41,659	42,988	44,362	45,784	174,793
Consumables/venue hire	3750	3750	3750	3750	15,000
Hardware/software	500	500	500	500	2,000
Staff travel	1250	1,250	1250	1250	5,000
Total	47,159	48,488	49,862	51,284	196,793

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Appendix One: Project Timescale

		2020				2021				2022				2023				2024	
		Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	
TASK																			
Planning																			
1	Form evaluation study steering group and arrange meetings	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█
2	Recruit researcher	█																	
3	Firm up evaluation proposal		█																
4	Sign off proposal		█																
Development																			
5	Carry out consultation to inform development of tools and participant engagement		█																
6	Write study materials		█	█															
7	Secure ethics approval for different parts of the study			█		█													
8	Identify and recruit survey study participants			█	█														
9	Identify and recruit focus group participants from vulnerable populations			█	█														
10	Identify sources of routinely available data for identified environmental determinants of health		█																
Implementation																			
11	Pilot questionnaire				█														
12	Run on-line questionnaire and analyse results			█	Baseline		█	█			█	█			█	█			
13	Carry out focus groups with vulnerable populations and analyse results			█	Baseline		█	█			█	█			█	█			
14	Explore feasibility of carrying out GP time series study					█													
15	Carry out GP time series study and analyse results						█	█			█	█			█	█			
16	Critically appraise PHE tool					█													
17	Annual measurements of routinely available data for identified environmental determinants of health					█				█				█				█	
Write up																			
18	Write up interim findings for publication					█				█				█					
19	Write up completed study for publication																█	█	
Report back																			
20	Feedback study findings to public, study participants and stakeholders				█				█			█					█	█	